SATHYABAMA
INSTITUTE OF SCIENCE AND TECHNOLOGY
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SCHOOL OF BUILDING AND ENVIRONMENT

DEPARTMENT OF ARCHITECTURE

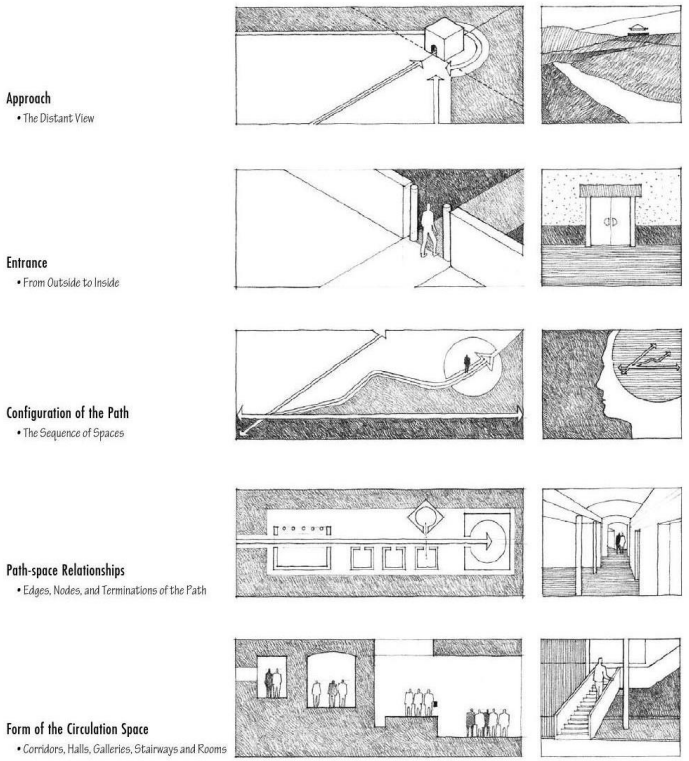
UNIT – I – PRINCIPLES OF COMPOSITION – SARA 1202

THEORY OF ARCHITECTURE-II

CIRCULATION

In architecture, **circulation** refers to the way people move through and interact with a building.

In public buildings, circulation is of high importance; Structures such as *elevators, escalators, and staircases* are often referred to as circulation elements, as they are positioned and designed to optimize the flow of people through a building, sometimes through the use of a core.



The path of our movement can be conceived as the perceptual thread that links the spaces of a building or any series of the interior and exterior spaces together.

Since we move in time
Through a sequence
Of Spaces

We experience space in relation to where we have been and where we anticipate going.

What are the elements of circulation?

Approach

The Distant View

Entrance

From Outside to Inside

Configuration of the Path

The Sequence of Spaces

Path-Space Relationships

Edges , Nodes and Terminations of Paths

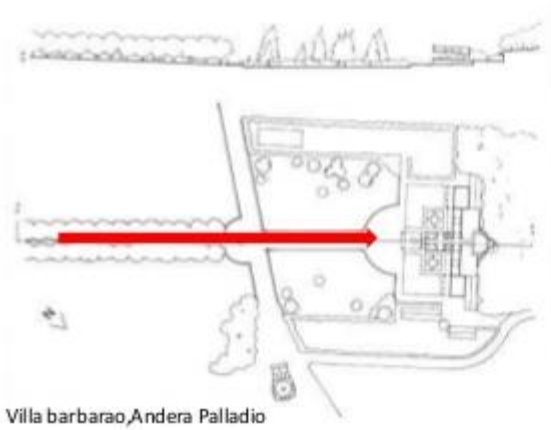
Form of the Circulation Space

Corridors, Halls, Galleries, Stairways and Rooms

Approach

May vary from a few paces to a lengthy circuitous route.
May be perpendicular to the primary façade or oblique to it.
May be in continuity or contrast to its termination and interior

Types of Approach

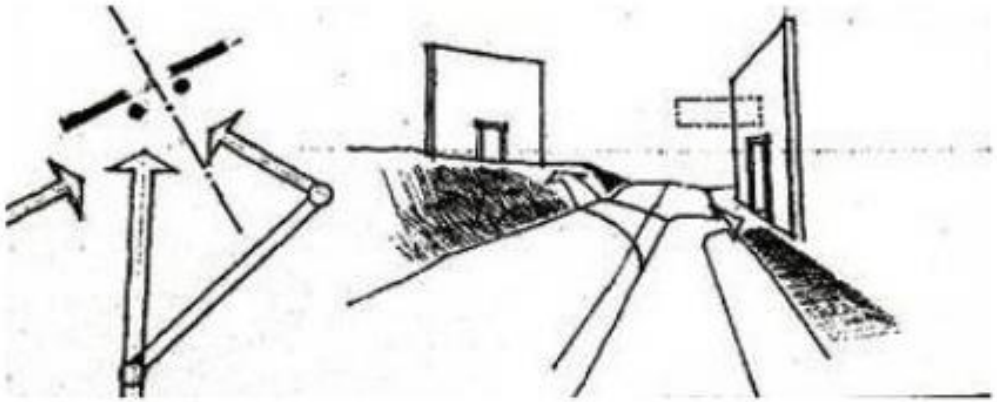


Villa barbarao,Andera Palladio

Frontal

Leads directly to the building along a straight, axial path.
The visual goal the terminates the approach is clear- may be the entire façade or an elaborate entrance within the plane

Types of Approach

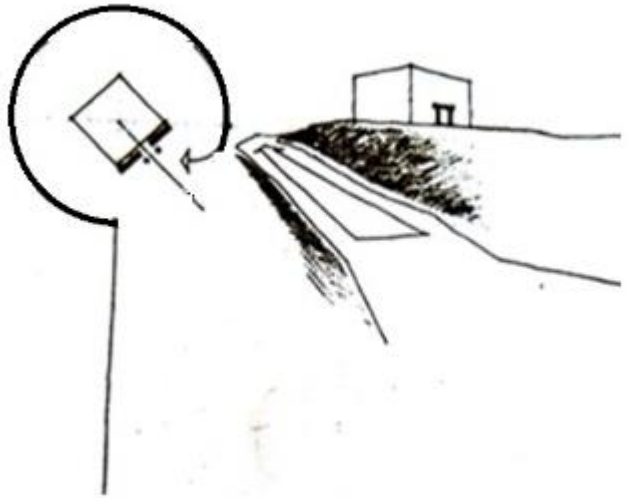


Glass house, Philip jhonson

Oblique

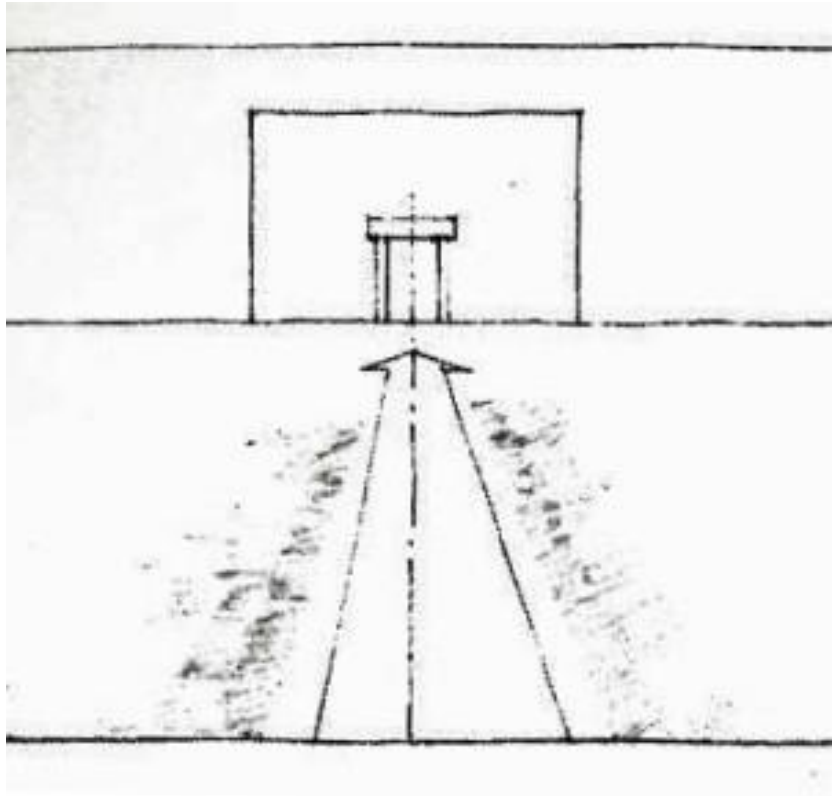
Enhances the effect of perspective on the front facade and the form of the building.
Can be redirected one or more times to delay and prolong the sequence.
If the building is approached at an extreme angle, the entrance can project beyond its façade to be more visible.

Types of Approach



Spiral

Prolongs the sequence of the approach.
Emphasizes the 3-dimensional form of the building.
Building entrance might be viewed intermittently during the approach to clarify its position or maybe hidden until the point of arrival.



Portals and Gateways

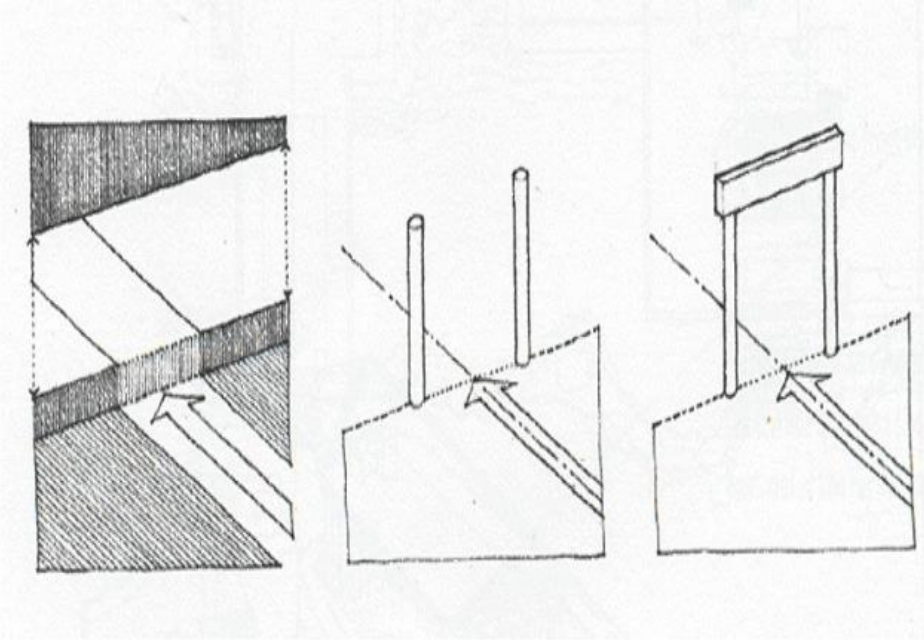
Have traditionally been ways of orienting us to the path beyond and welcoming our entry.

Entrances

Penetrating

Involves the act of penetrating a vertical plane which distinguishes one space from another.
Distinguishes Here and There

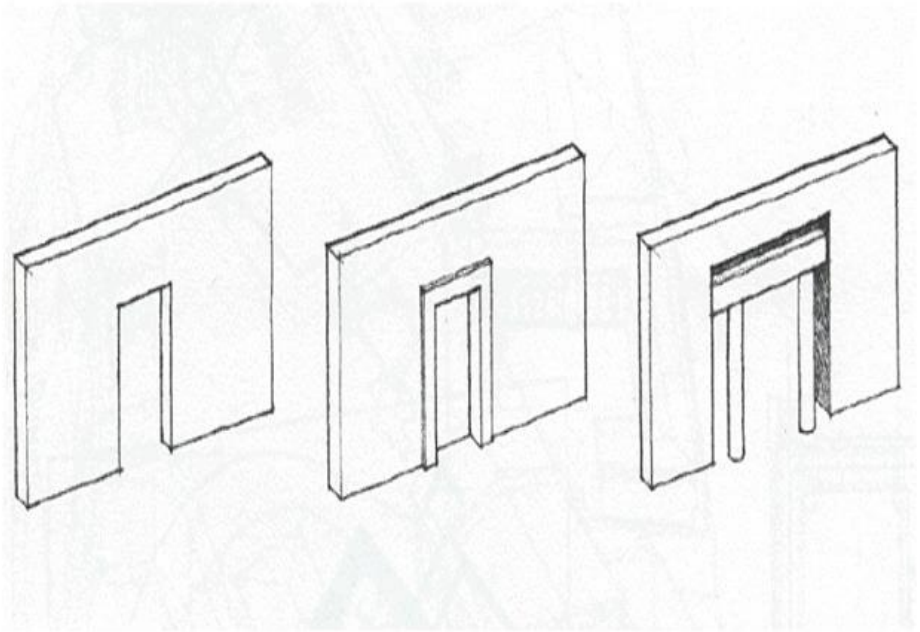
Entrances



The act of entering

Punching a hole in a wall
Passage through an implied plane established by two pillars or an overhead beam.
Even a change in level can establish a threshold.

Entrances

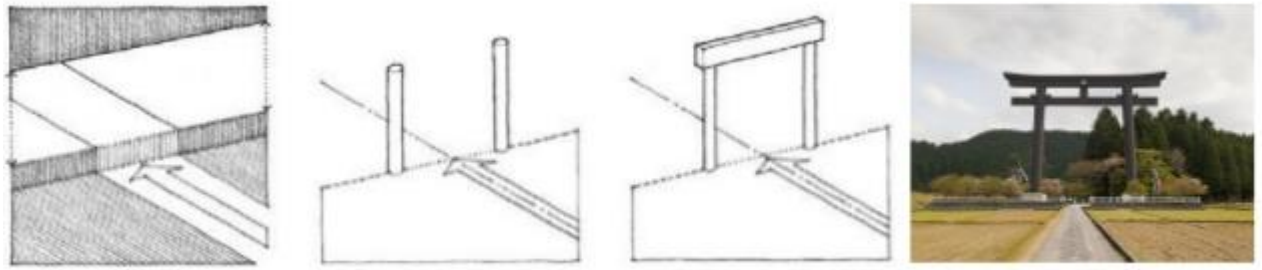


Opening in the plane or wall

Simple hole on the wall
Or an elaborate articulated gateway.

Entrances

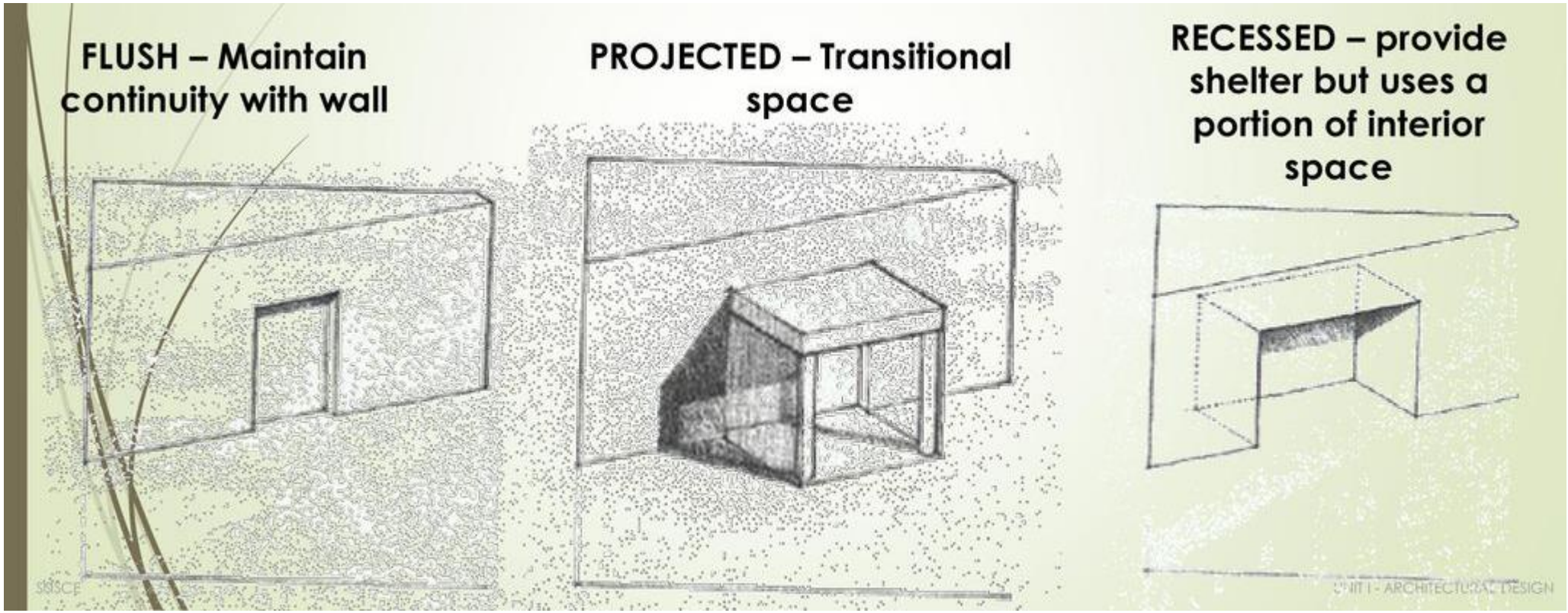
- Establishing two pillars or
- An overhead beam or
- By changing in level



Significance

Best signified by establishing a real or implied plane perpendicular to the path of approach.

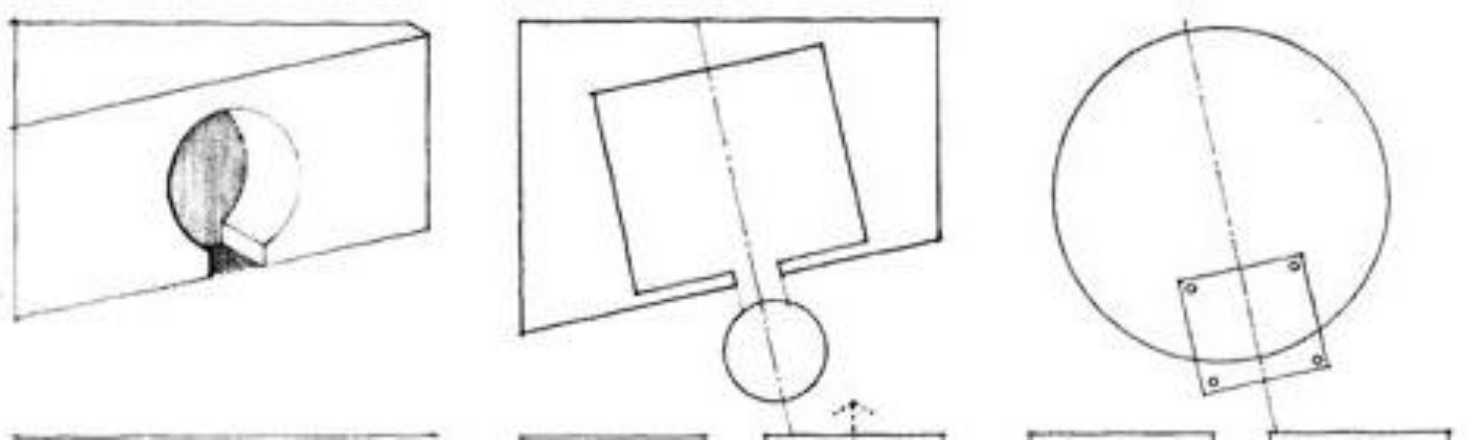
Entrances



Types of Entrances

Flush
Projected
Recessed

Entrances



Form of Entrances

can be similar to and serve as a preview of the form of the space being entered.
Or Contrast to it

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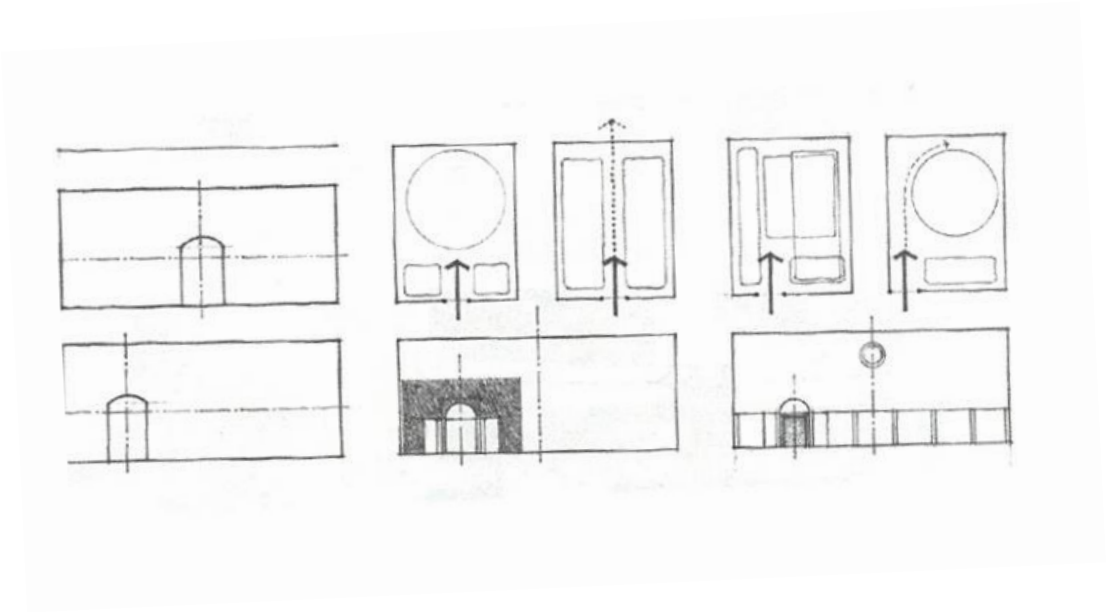
Entrances

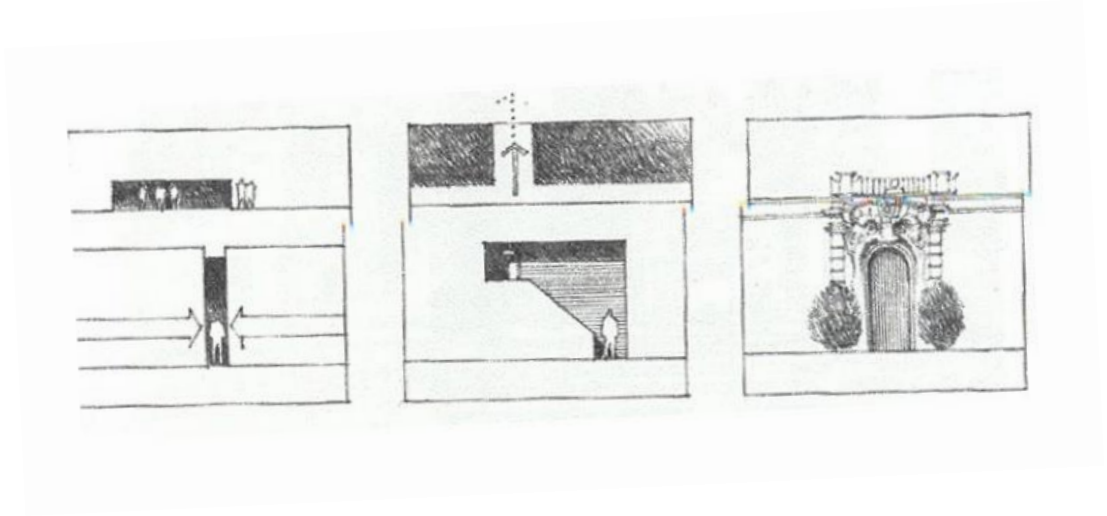


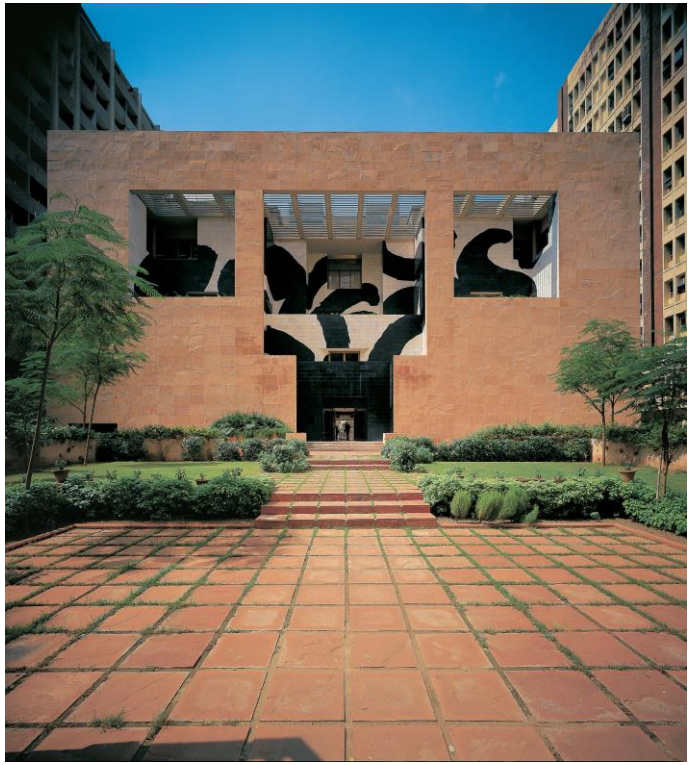
Location of Entrances

Centered within the frontal plane.
Off centered to create a condition local symmetry

The location will determine the configuration of the path and the pattern of activities within the space.

Entrances





Reinforcing of Entrances

Making the opening wider, lower or narrower than anticipated.
Making the entrance deep or circuitous.
Articulating the opening with ornamentation

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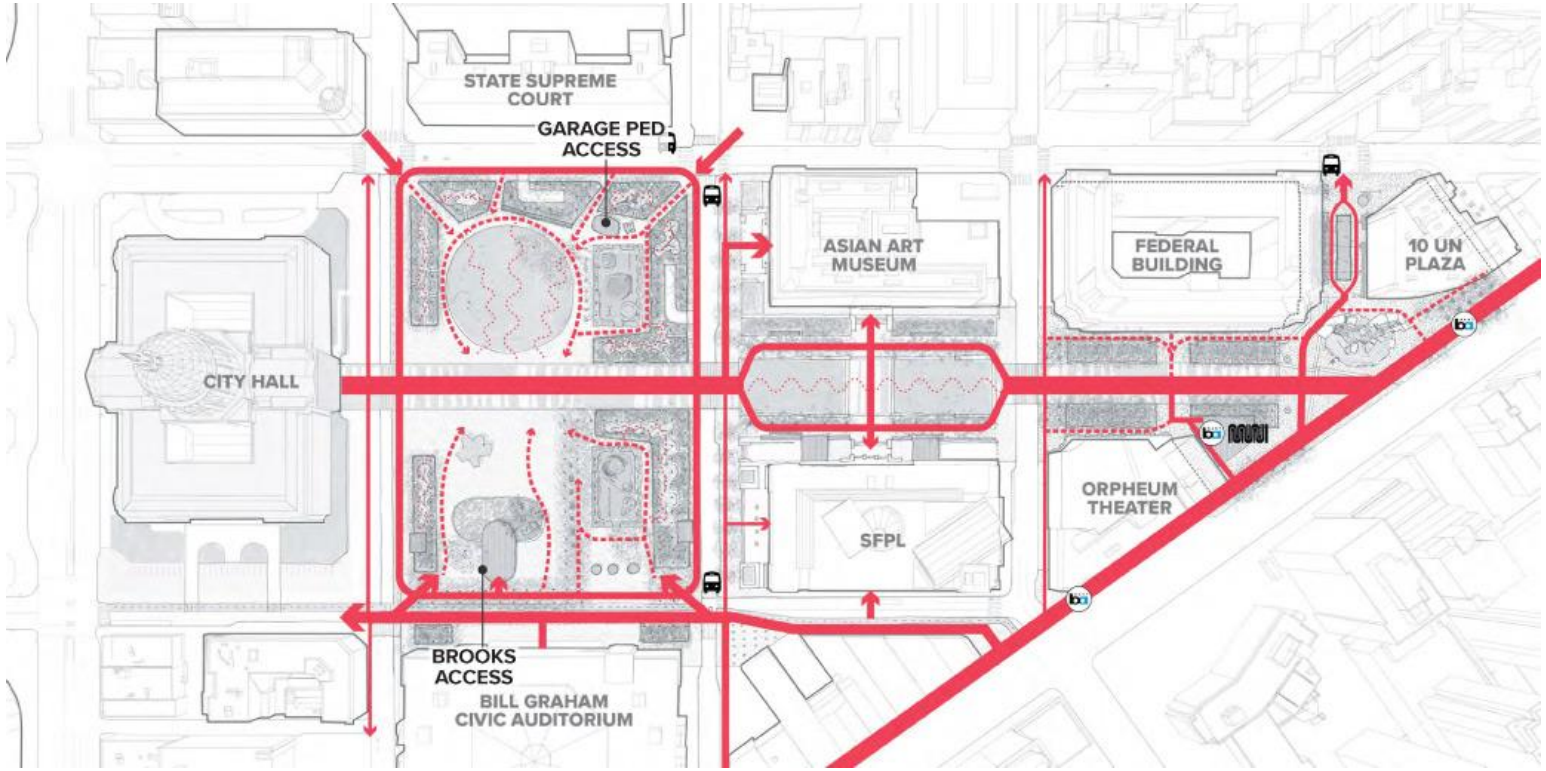
Configuration of the Path



All paths of movement are linear in nature

Have a starting point from which we are taken through a sequence of spaces.
The contour of our path depends on our mode of transportation.

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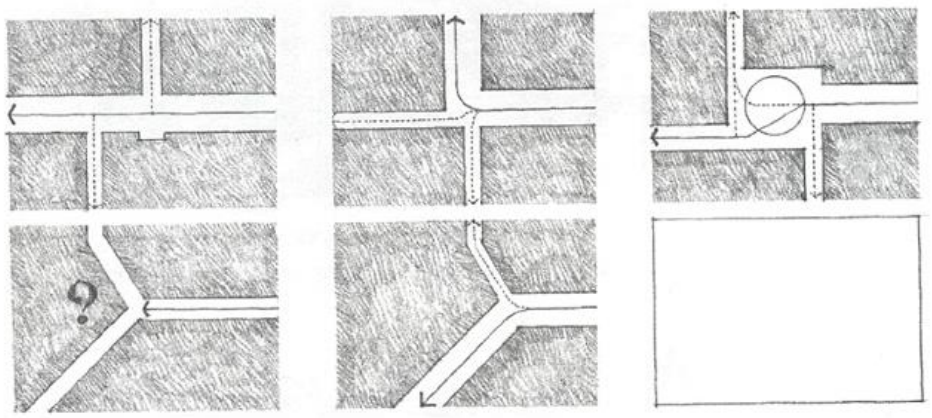
Configuration of the Path



The intersection or crossing of paths is always appoint of decision making for the person approaching it.

The continuity and scale help us distinguish between major and minor routes.
When paths at a crossing are equivalent, sufficient space needs to be provided to allow people to pause and orient themselves.

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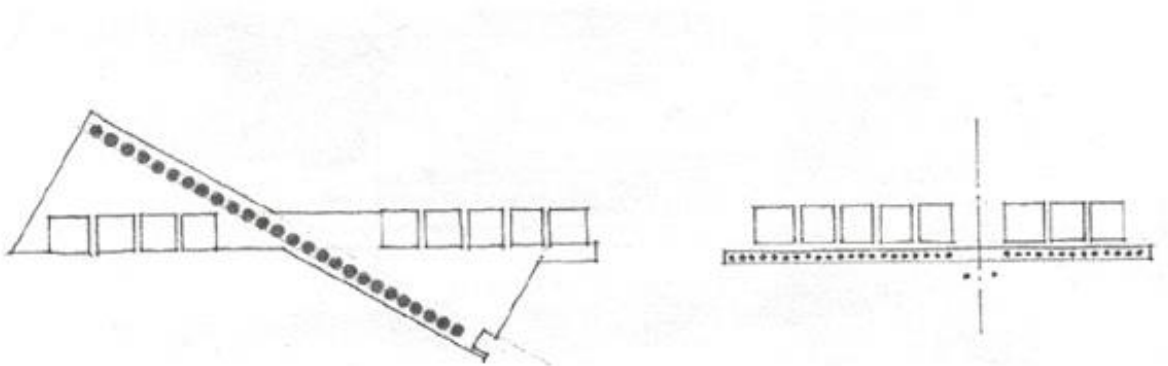
Configuration of the Path



Nature of the Configuration

Both influences and is influenced by the organizational pattern of the spaces it links.
May reinforce a spatial organization by paralleling its pattern.

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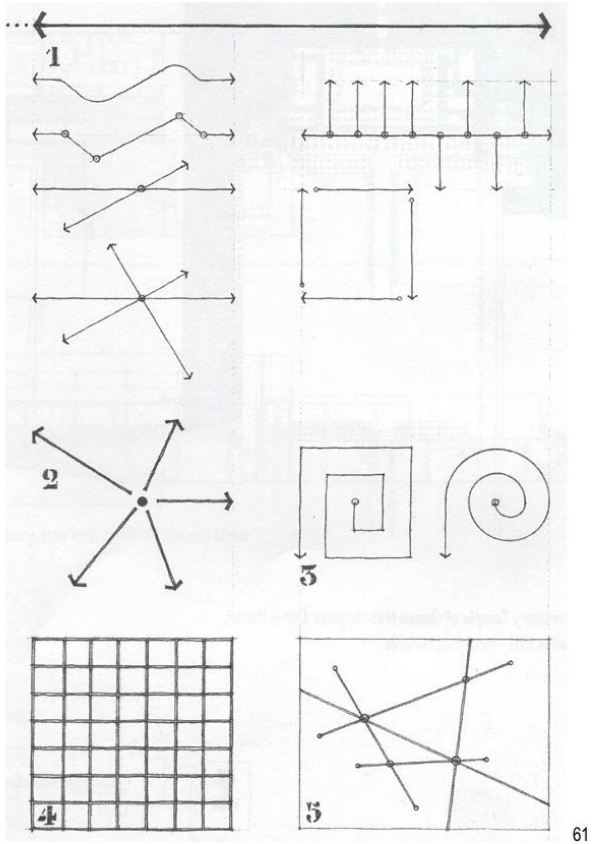
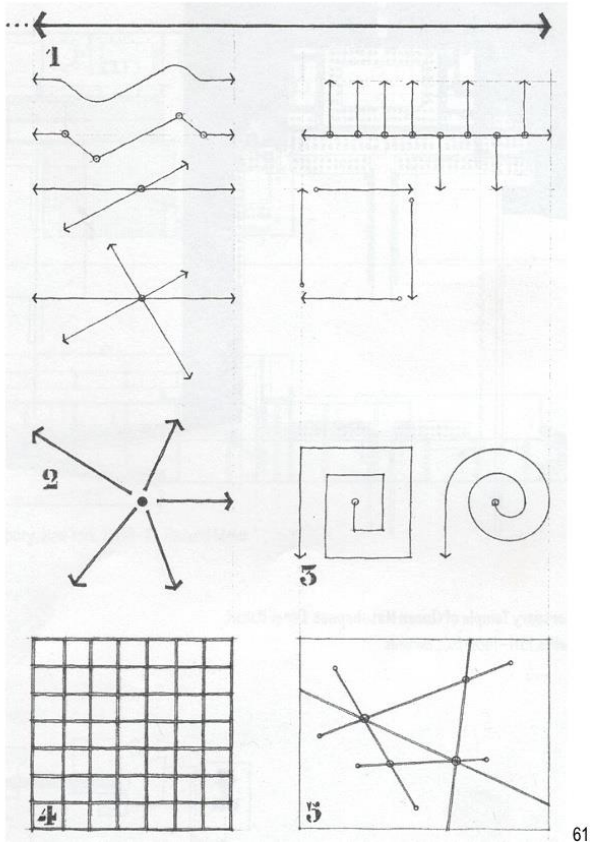
Types Configuration of the Path



Linear

All paths are linear
A straight path may be the primary organizing element for a series of spaces.
It can be curvilinear or segmented, intersect other paths, have branches or form a loop

Types Configuration of the Path



Radial

Has linear paths extending from or terminating at a central, common point.

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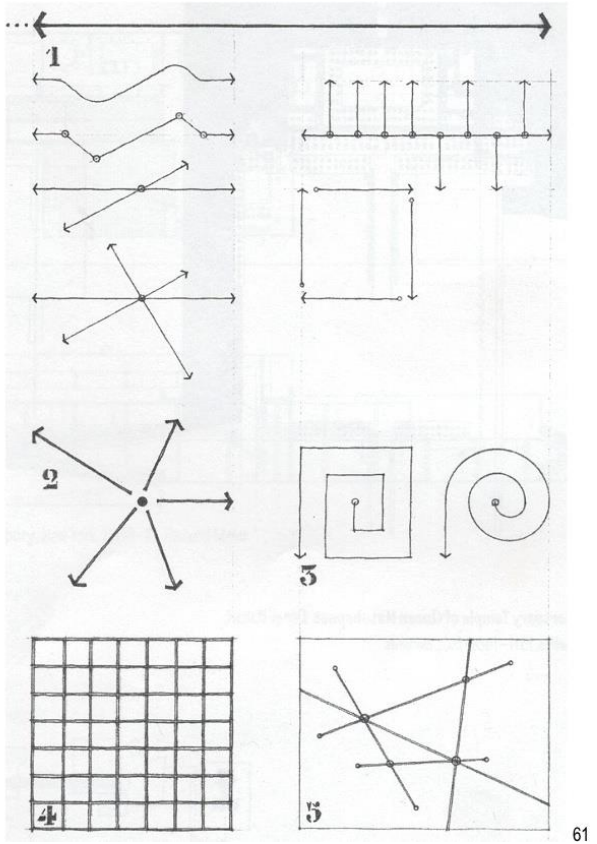
Types Configuration of the Path



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Spiral

Is a single, continuous path that originates from a central point , revolves around it and becomes increasingly distant from it.

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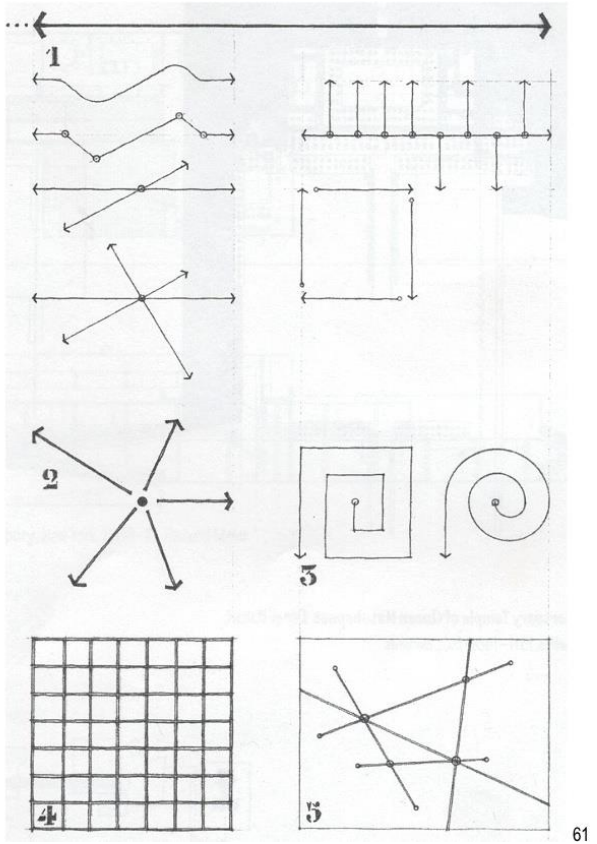
Types Configuration of the Path



Grid

Consists of two sets of parallel paths that intersect at regular intervals and create square or rectangular fields of space.

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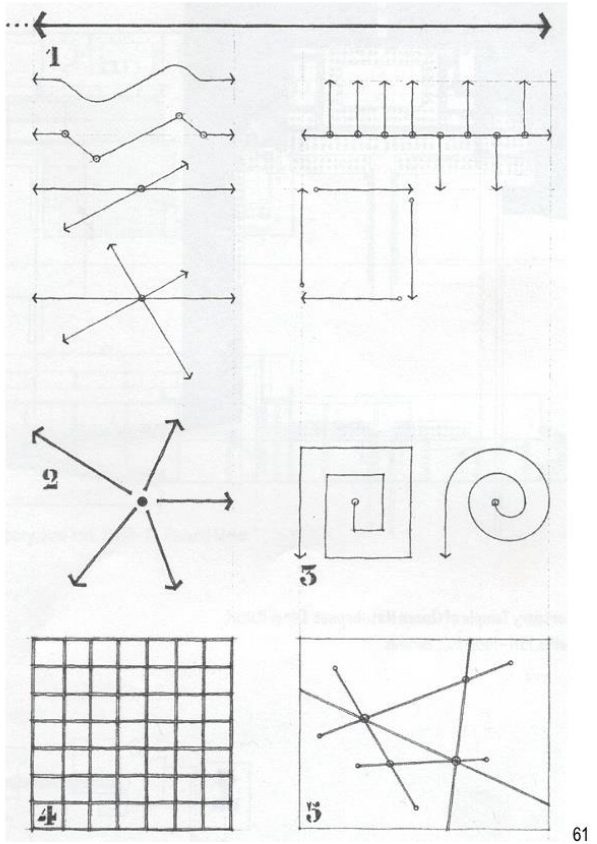
Types Configuration of the Path



Network

Consists of paths that connect established points in space.

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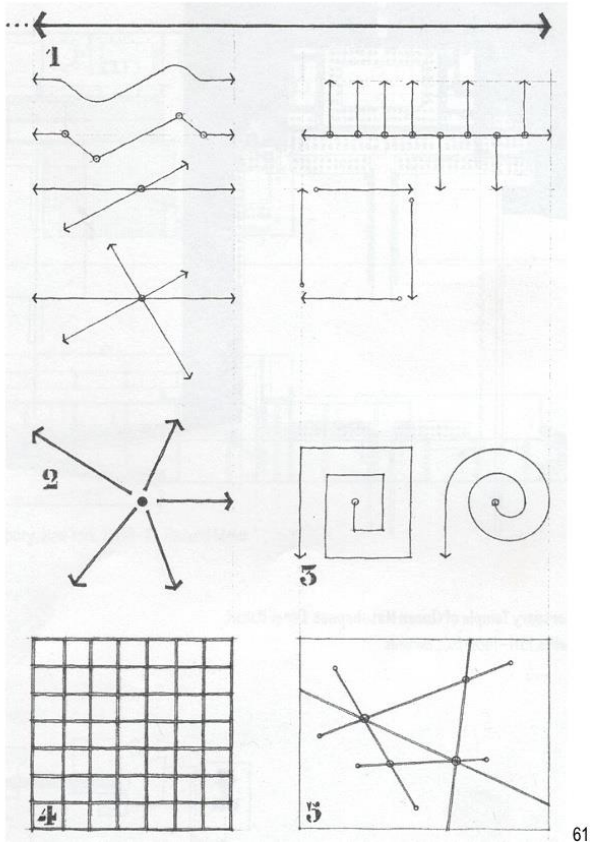
Types Configuration of the Path



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Composite

Employs a combination of the preceding patterns.

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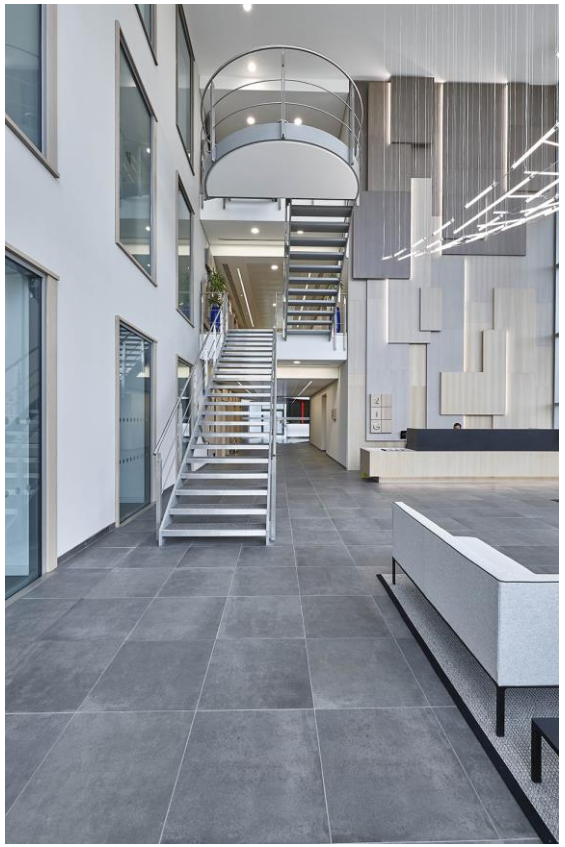
Configuration of the Path



Properties

To avoid the creation of a disorienting maze, a hierarchical order among the paths and nodes of a building should be established by differentiating their

Scale

Form

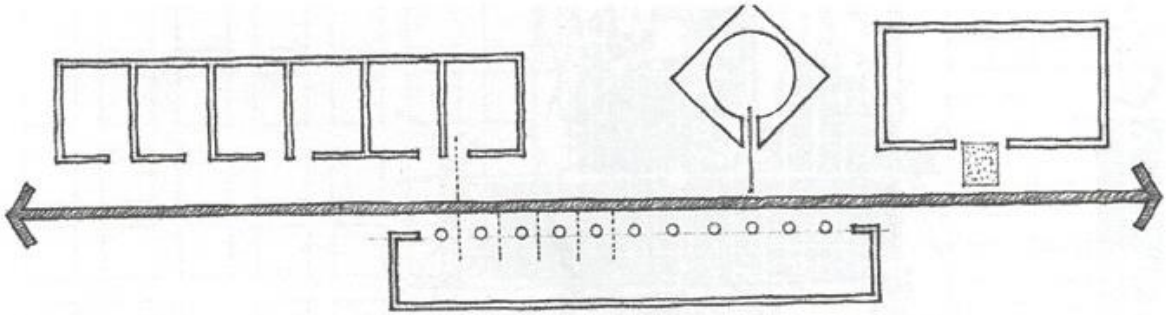
Length

Placement.

Types of Path- Space Relationships

Paths may be related to the spaces they link in the following ways

Types of Path- Space Relationships



Pass By Spaces

Integrity of each space is maintained
The configuration of the path is flexible.
Mediating spaces can be used to link the path with the spaces.

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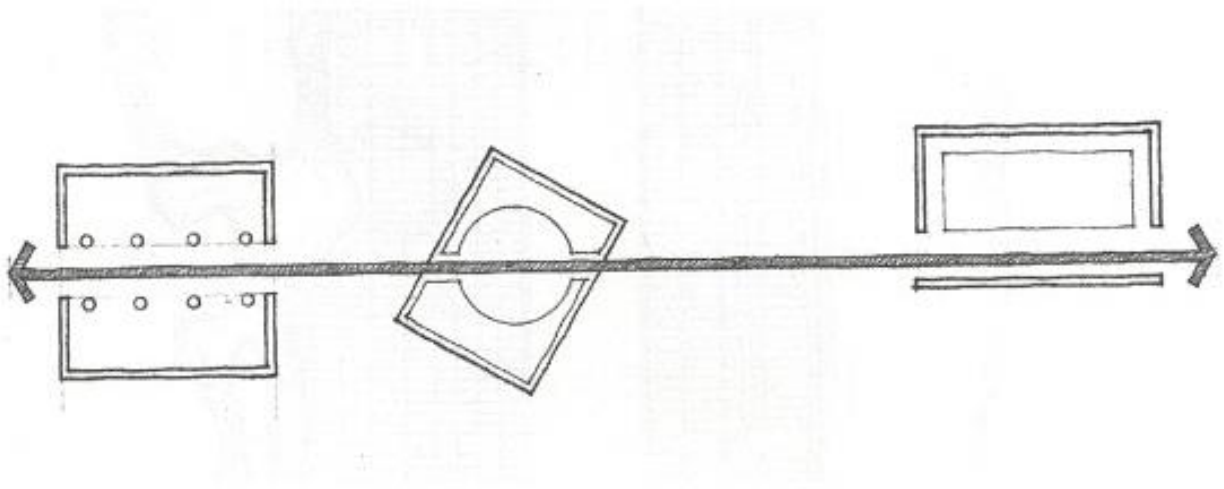
Types of Path- Space Relationships



Pass through Spaces

May pass through a space axially, obliquely or along its edge
In cutting through, it creates patterns of rest and movement within it.

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Path- Space Relationships

Terminate in a Space

The location of a space establishes the path.
Used to approach or enter functionally or symbolically important spaces.

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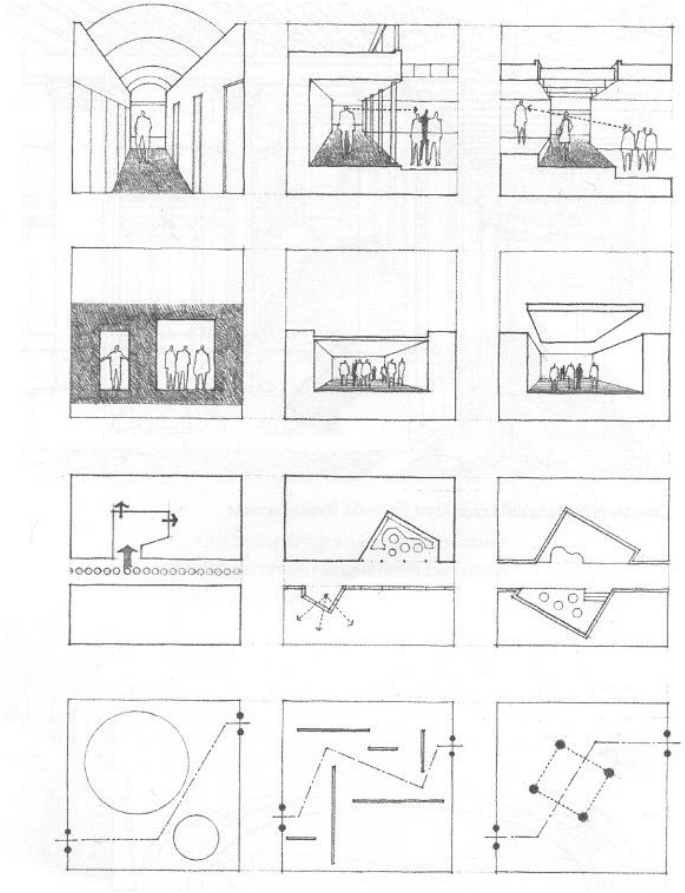
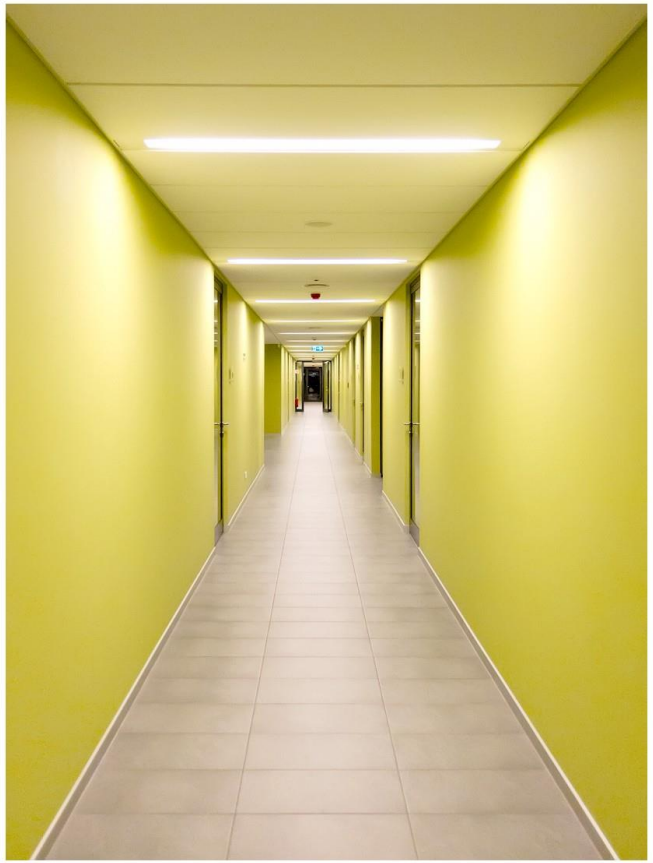
Form of the Circulation Space



The form varies according to how

Its boundaries are defined.
Its form relates to the form of the spaces it links
Its qualities of scale, proportion
Entrance is approached, light and view are articulated

Types of Form - Circulation Space



Enclosed

Forming a public galleria or private corridor that relates to the spaces it links through entrances in wall planes

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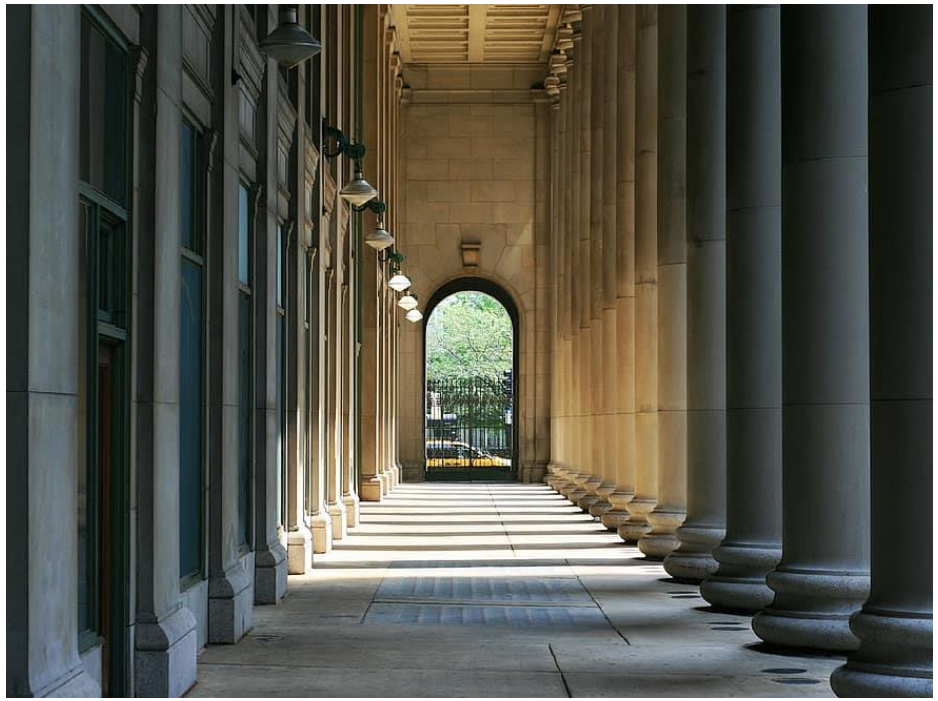
Types of Form - Circulation Space



Open on One Side

Forming a balcony or a gallery that provides visual and spatial continuity with the spaces it links

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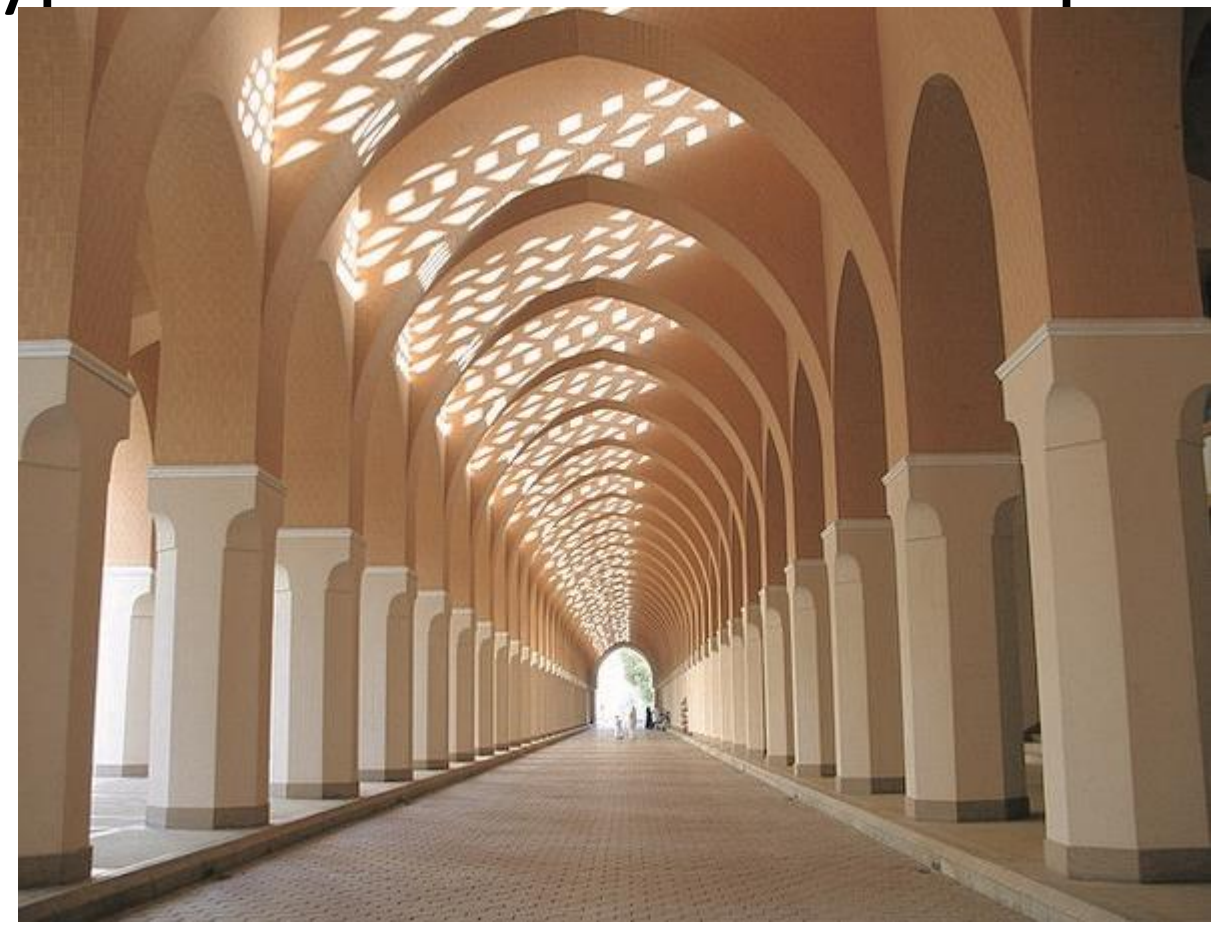
Types of Form - Circulation Space



Open on Both Sides

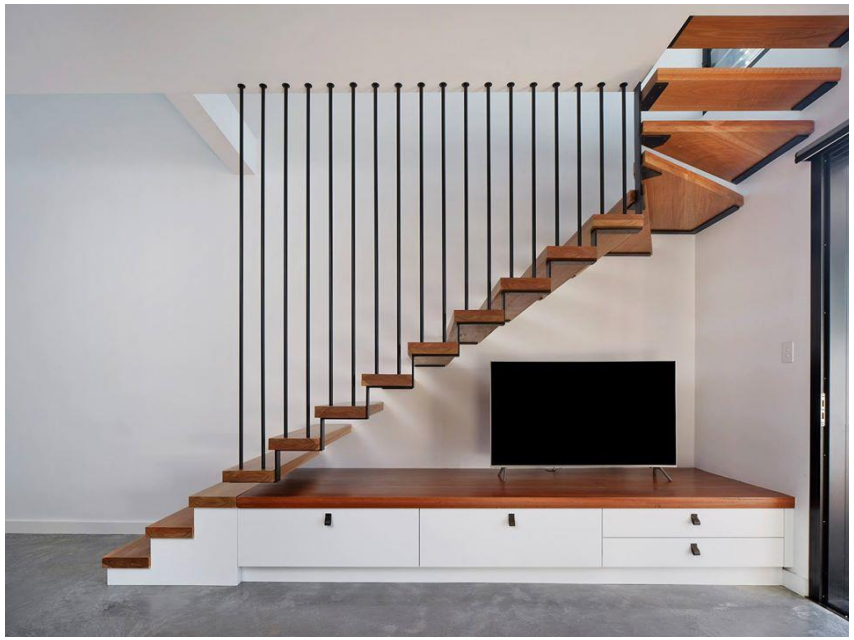
Forming a colonnaded passage way that becomes a physical extension of the space it passes through.

Form of the Circulation Space

Properties

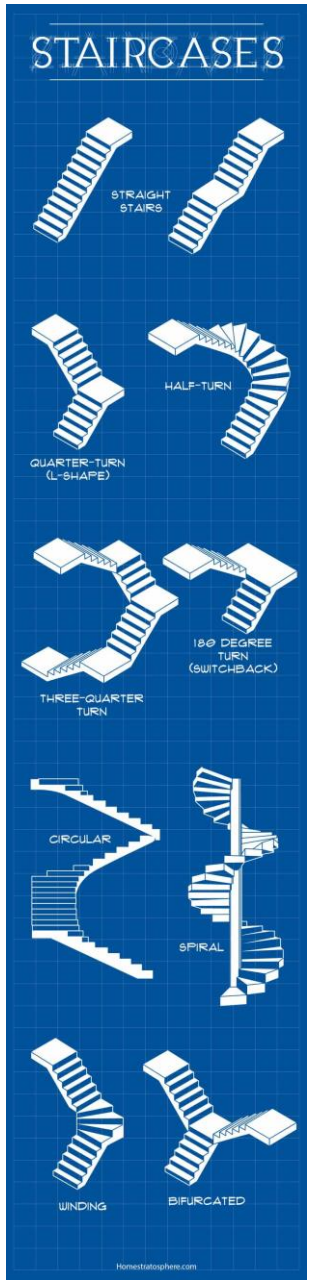
Width and Height should be proportionate with the type and amount of movement it must handle.
A narrow enclosed path naturally encourages forward motion.
To accommodate more traffic as well as to create spaces for pausing, resting or viewing, sections of the path can be widened.
Or by merging with the spaces it passes through.
Within a large space, a path can be random, and be determined by the activities and arrangement of furnishing within the space.

Form of the Circulation Space

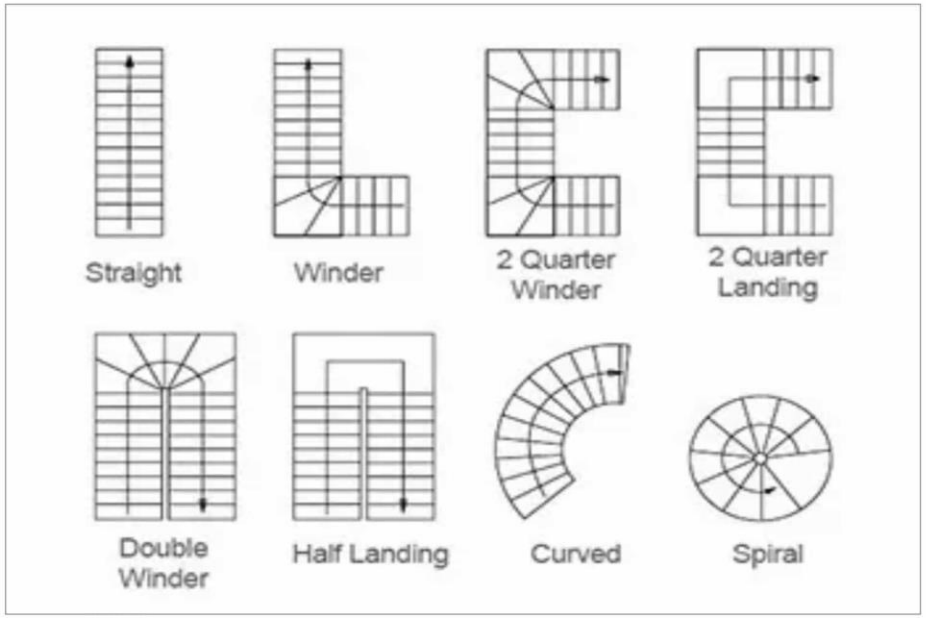


Stairs and Stairways

Provide for vertical movement between the levels of a building or outdoor space.
The slope is determined by the dimensions of its tread and risers- should be proportioned to fit our body movement and capability.
Landing interrupt the run of a stair and enable it to change direction



Form of the Circulation Space



Types of Stairs and Stairways

Straight run stair
L Shaped
U Shaped
Circular Stair
Spiral Stair

THEORY OF ARCHITECTURE-II

DOMINANCE

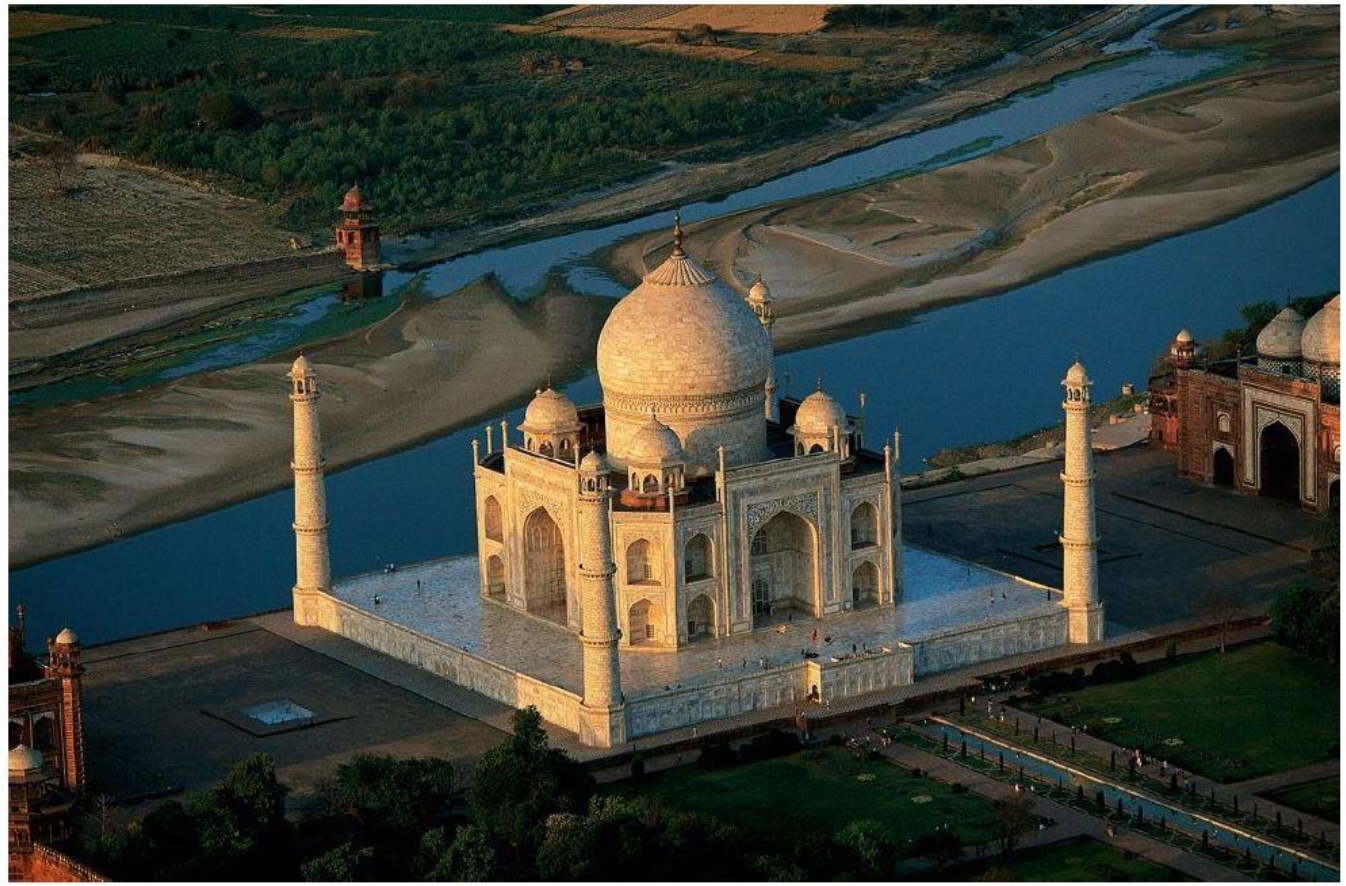
- The state of being of prime importance; supremacy.

- Being in a position of ascendancy over other elements or the immediate built environment.

The Eiffel tower *dominates* its surroundings by virtue of its height and structure.

UNITY

•Oneness; the state or fact of being one undivided entity.



The Taj Mahal is consists of multiple elements such as the minarets and the main structure tied together by the base(datum) and material (marble) to create a sense of *Unity.*

HARMONY

•The orderly, pleasing or congruent arrangement of the elements/parts in an artistic whole

The architecture of this Greek Island appears harmonious through the use of common materials , colours and details.

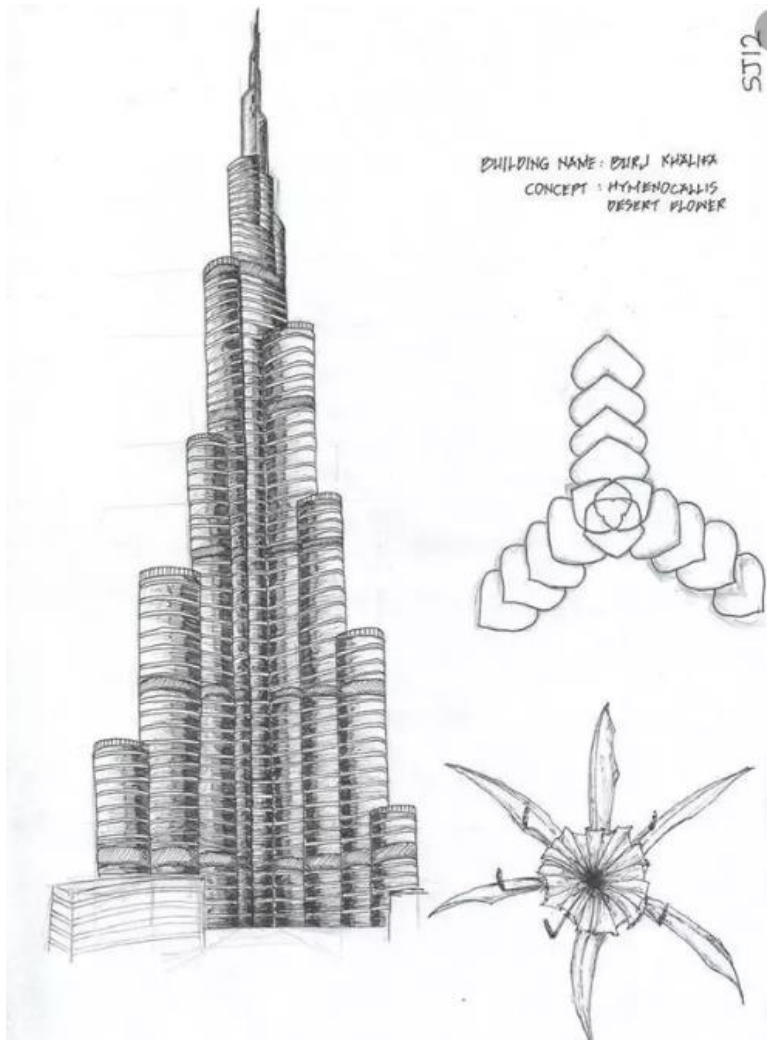
There also exists a harmony in detail where the finer details complement the overall idea .

Straight lines for a linear form and curved lines for a fluid form.

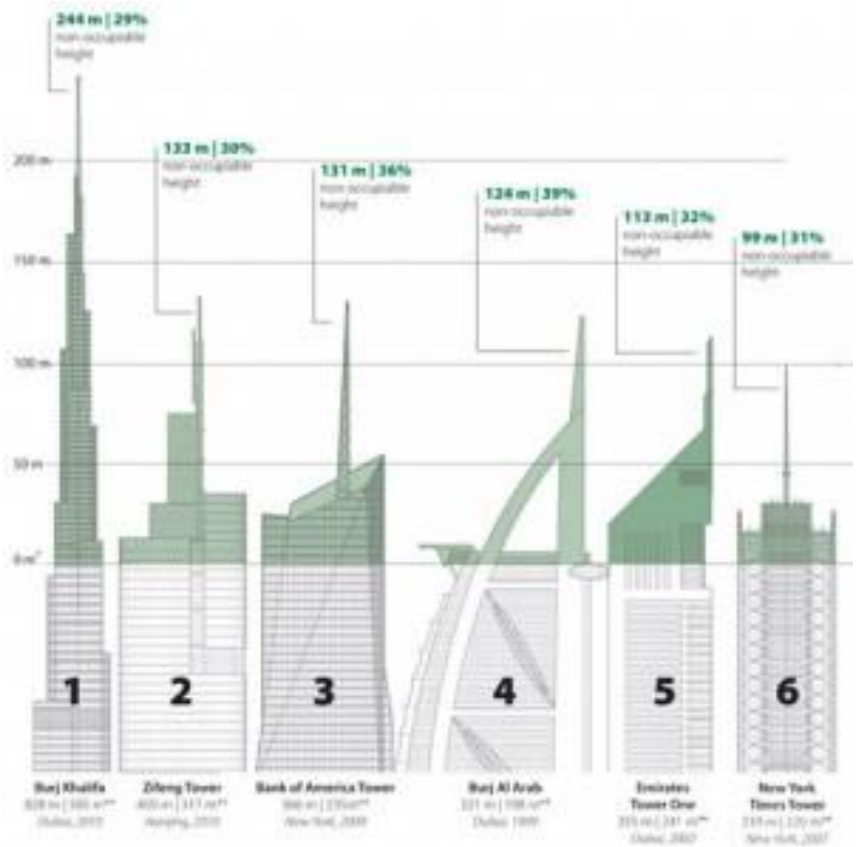
PUNCTUATING EFFECT

- To stress or emphasize.

The Burj Al- Arab defines the skyline of Dubai by its height , emphasizing its power as an emerging metropolis.



The structure of the Burj Al- Arab is inspired the form of the “Hymenocallis” , an indigenous desert flower. The tapering form further punctuates the exaggerated height of the building by accentuating the perspective



The accentuation of the height is done at the cost of usability and purpose and confines a large part of the building to remain unusable as a direct cost of establishing its identity as a landmark.

DRAMATIC EFFECT

- Arresting or forceful in appearance or effect:

Although the significant height of the building is clearly apparent at a distance, there is still a forceful exaggeration of the height when encountered at close proximity (as seen in the image on the right) creating a dramatic effect.

CLIMAX

- A moment of great or culminating intensity in a narrative or drama

In the township of Auroville, the matri mandir is both the spiritual and visual climax of the masterplan and the centre of the township.

The visual journey continues to the interior of the matri mandir and the *climax* is accentuated by the minimalistic palette of the interior.

Other examples - Baahai (Lotus Temple) and the Taj Mahal.

CONTRAST

•Opposition or juxtaposition of dissimilar elements in a work of art to intensify each elements properties and produce a more dynamic expressiveness

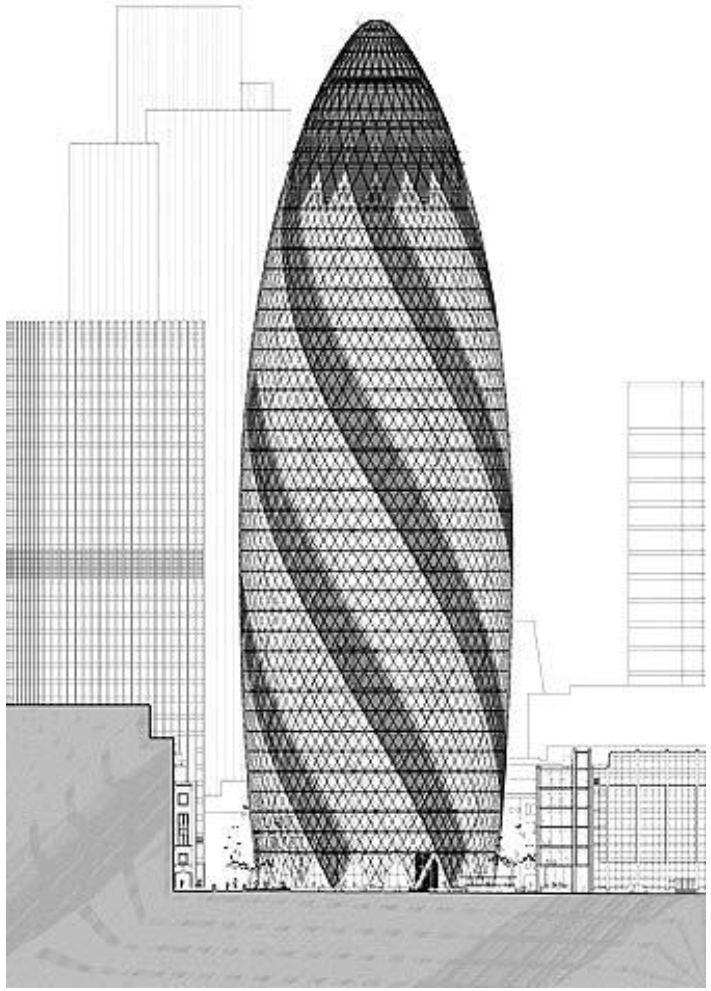
Contrast in Style

Contrast in Colour

Contrast in material

ACCENTUATE

- To stress or emphasize; intensify:



The curved form of the Swiss re tower by Foster Architects is accentuated by the use of triangles in the resolution of the façade , which creates sweeping ribbons of coloured glass.

FLUIDITY

- Smooth and flowing; graceful

This masterplan by Zaha Hadid architects ties the overall development in sweeping curved ribbons to create a fluid form.

NEW YORK , FRANK LLOYD WRIGHT

BILBAO, FRANK GEHRY

GUGGENHEIM MUSEUM

Fluidity can be present in different degrees and used creatively.

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SCHOOL OF BUILDING AND ENVIRONMENT

DEPARTMENT OF ARCHITECTURE

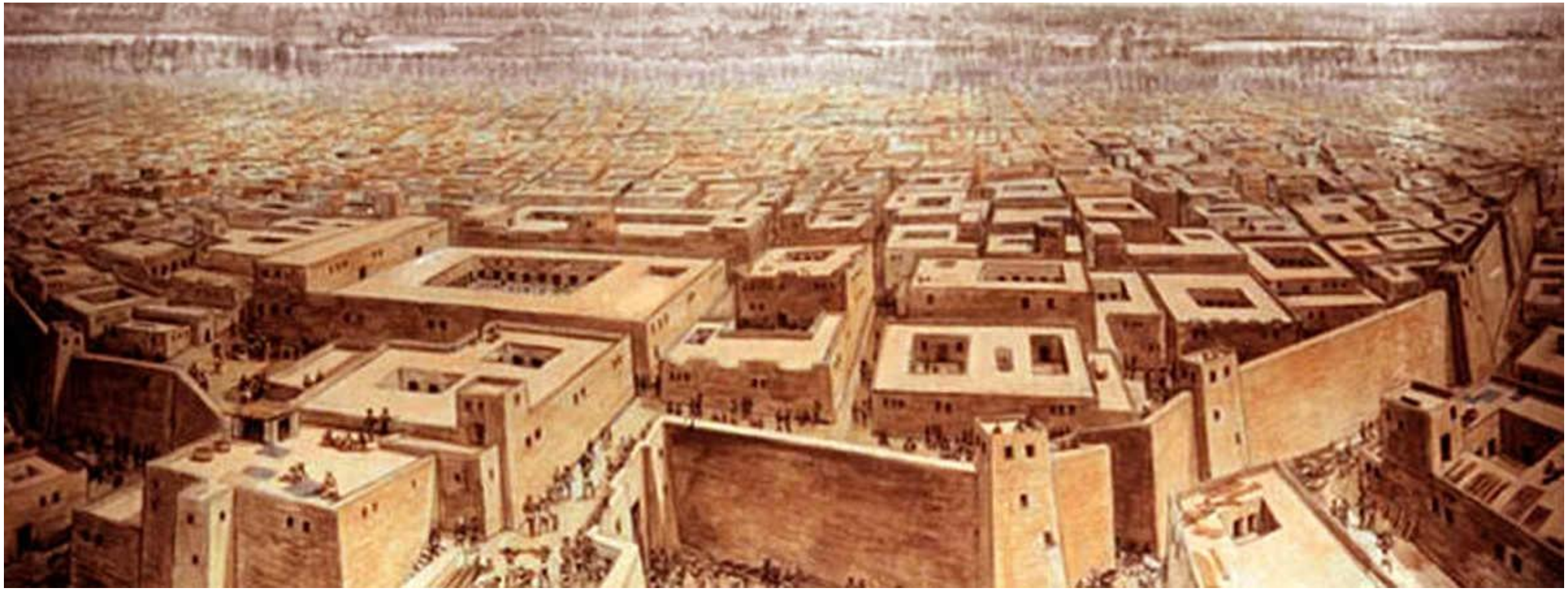
UNIT – II – DETERMINANTS – SARA 1202

THEORY OF ARCHITECTURE-II

What is a DETERMINANT ?

a factor which decisively affects the nature
or outcome of something.

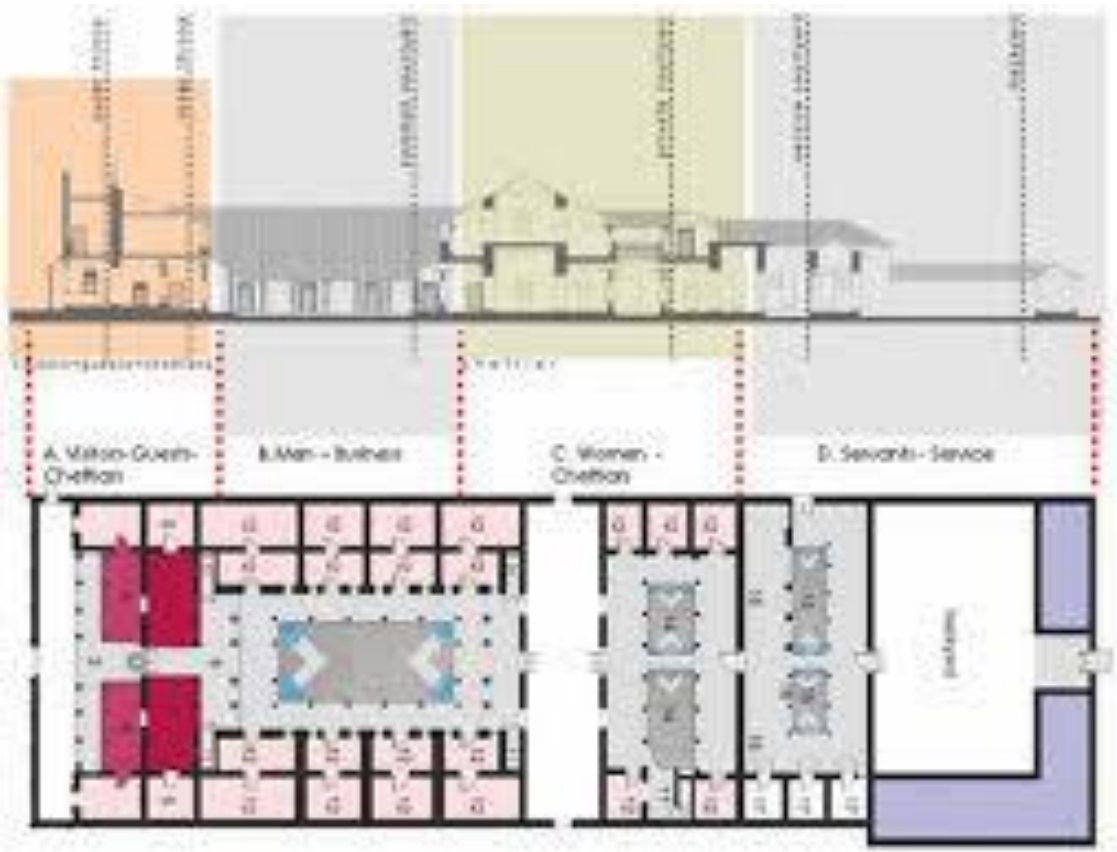
SOCIO CULTURAL DETERMINANTS



Indus Valley (Harappa) civilization , earliest documents structure urban settlement.

Jaisalmer Fort – Settlement around a defensive structure .

Metropolis – Modern day settlements built around commerce and mobility.



FURNITURE LAYOUT

THE CHETTINAD HOUSE
Adyar, Chennai

Tradition Vs Modernity – The transformation of the Chettinad House

CLIMATIC DETERMINANTS

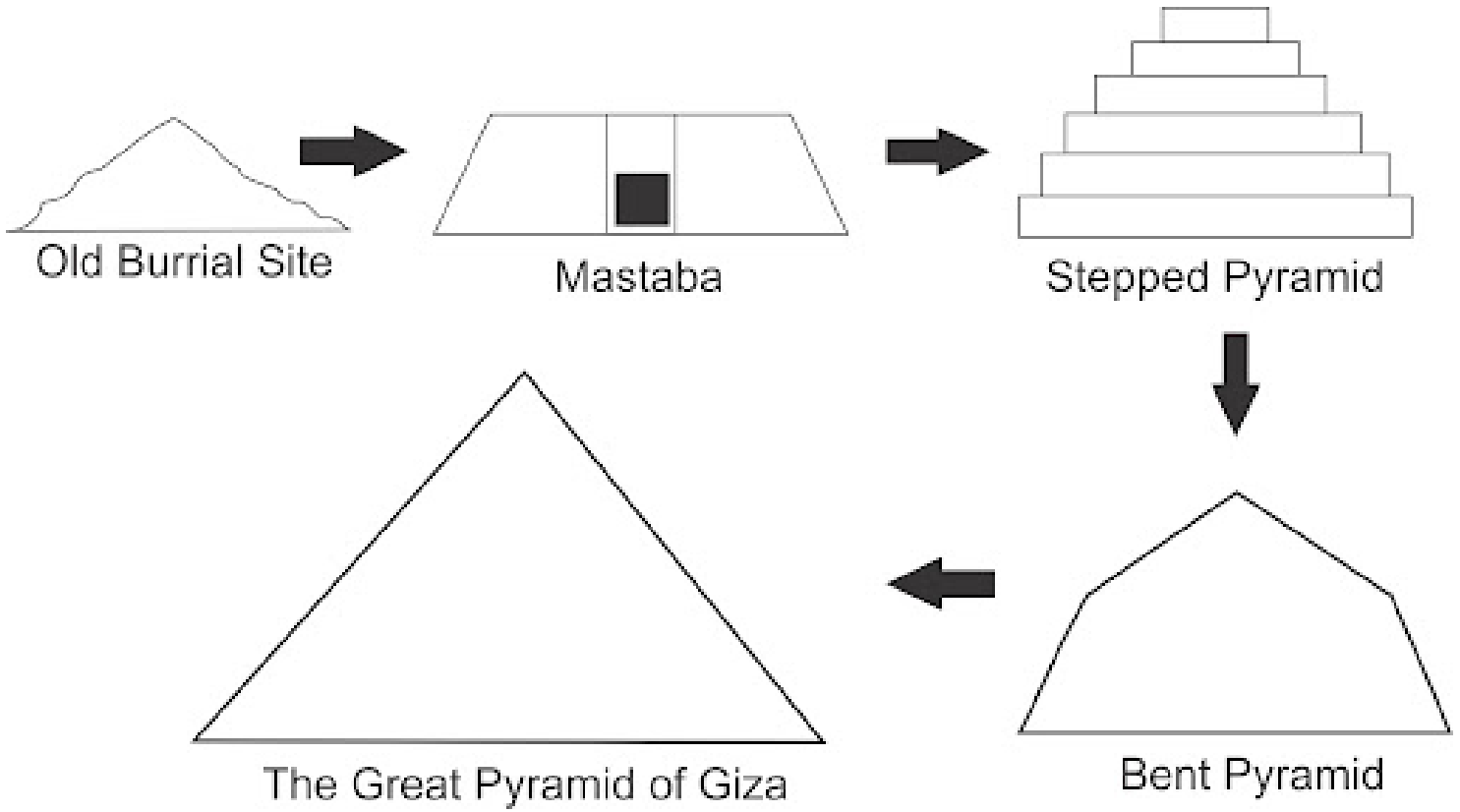
Where a building is located and the materials it uses

Vernacular Vs Green – Response to climate and comfort and the use of resources.

STRUCTURAL DETERMINANTS

The type of building and the techniques and technologies it uses in the application of building materials and construction

Alternative materials and there ability to shape form and aesthetic.

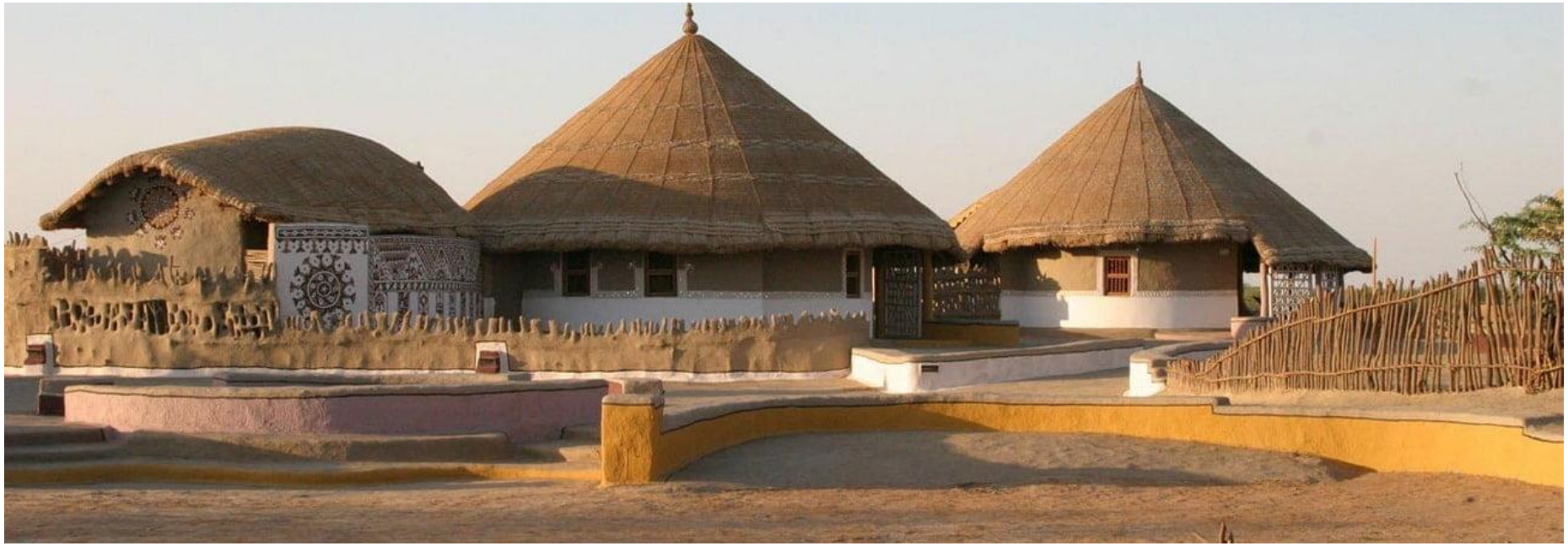


The role of structure in the evolution of form is best illustrated by the development of the pyramids in the Egyptian civilization

OTHER

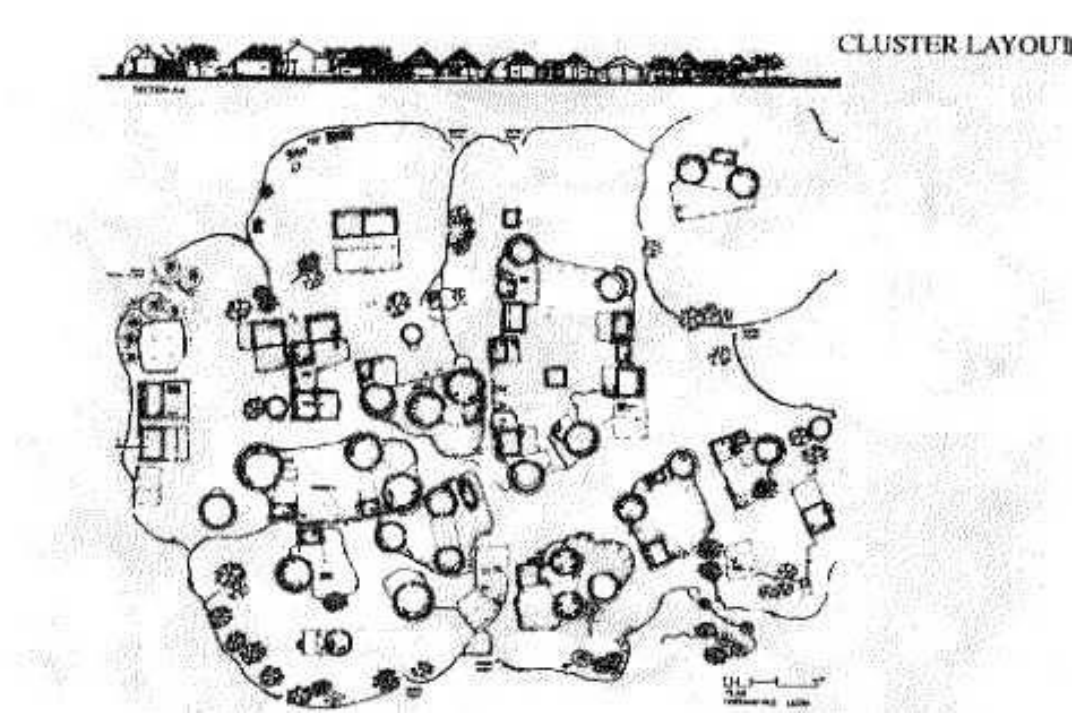
DETERMINANTS

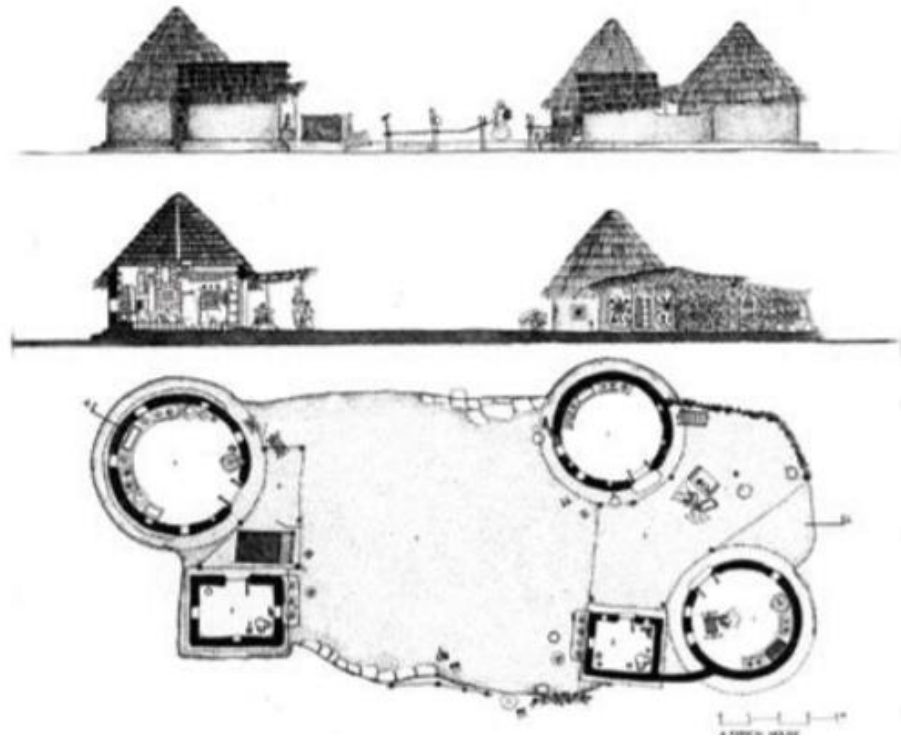
TECHNOLOGY | ECONOMICS | POLITICS | BELIEFS | ASPIRATIONS



BHUNGA HOUSE

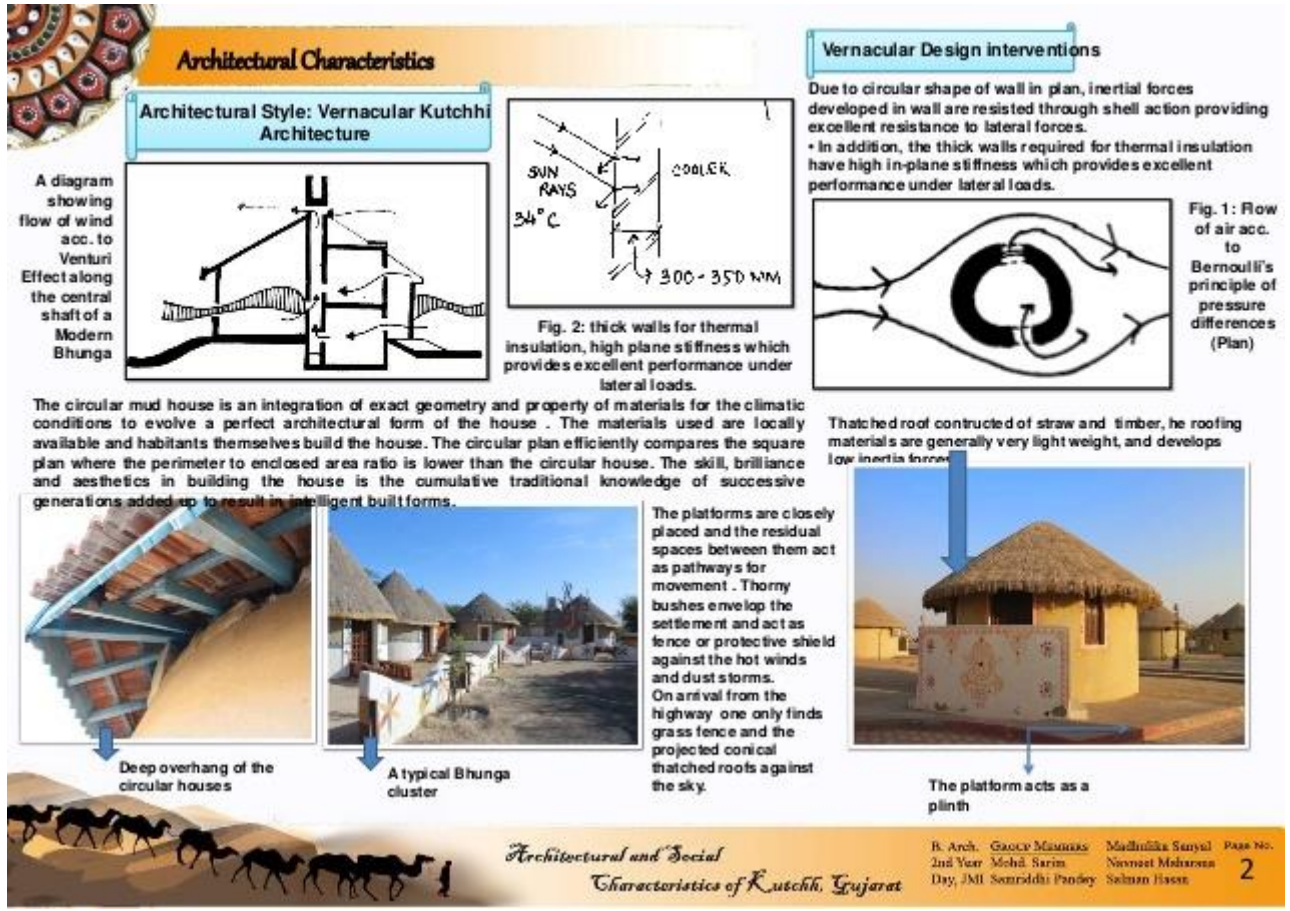
It is the traditional house of Rajasthan and Kutch. It is built very strong such that it can even withstand large earthquakes.



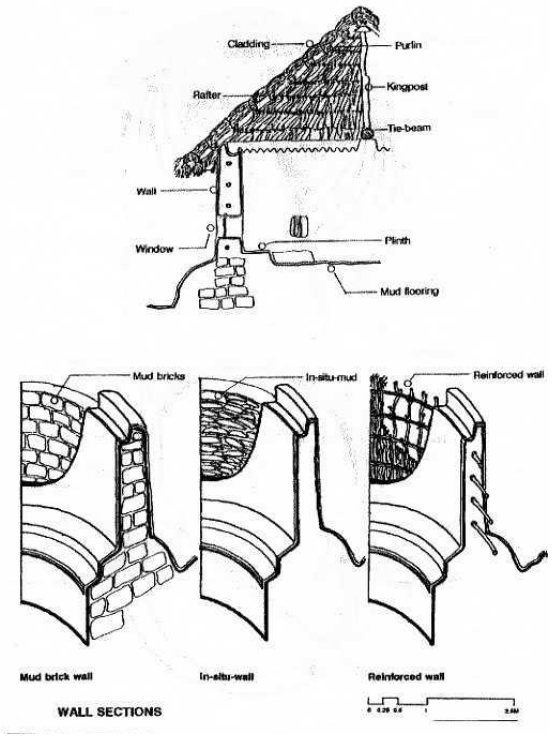


The hut is laid out as a cluster around a central courtyard used to dry produce and rear livestock.

The separate huts are meant for different activities and reflect the societal and cultural values of the community.



They are climate responsive structures. These structures have a circular form which ensures minimum expose to the extremely hot and dry desert.



•**Orientation:** Different orientations of the building produce favorable thermal conditions in the building.

•**Shading:** A building including its external walls and its openings get exposed to sun and water. In Vernacular architecture, overhanging eaves does the protection.

•**Ventilation:** The relative humidity of the building is regulated by cross-ventilation. It is primarily important for huts located in hot and humid climates.

Some of the factors like form and massing, spatial organization and open and built distribution help to control the overall performance of the building.

The thick walls provide thermal comfort. Wooden frames are set at the lower level for cross ventilation.

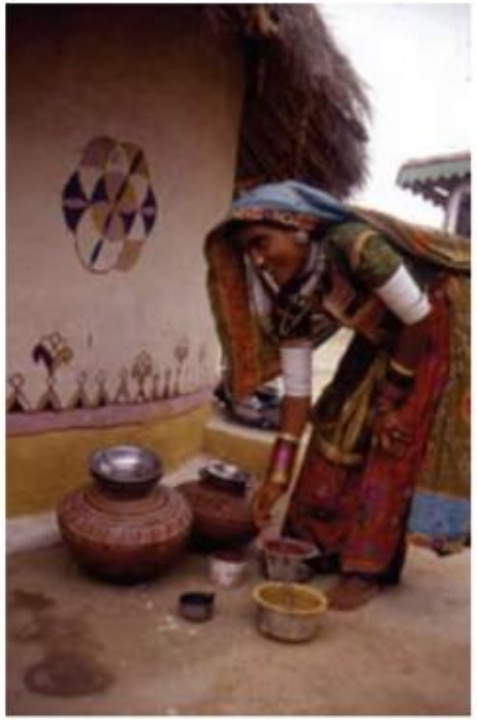
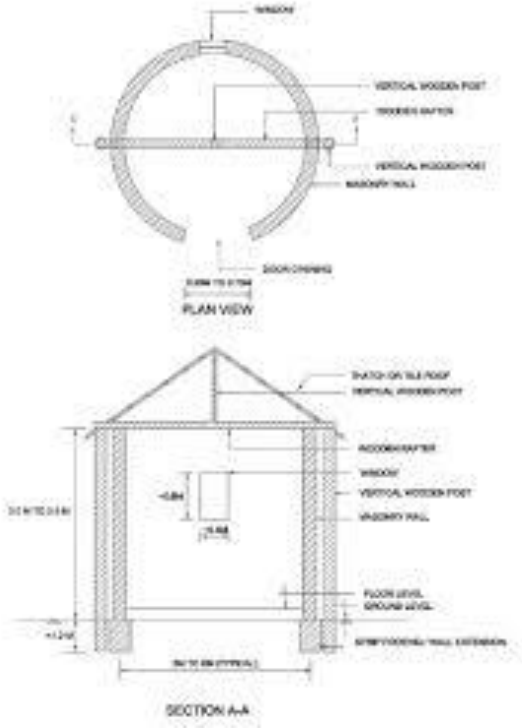
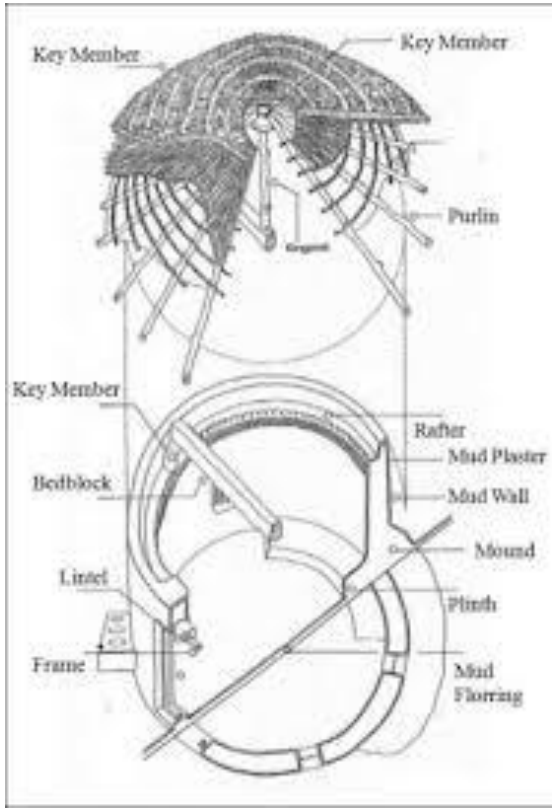


Figure 5.5 Painting of the façade of the *bhunga* indicating high sense of belonging

Figure 5.6 Personalized interior of a household showing its socio-cultural appropriateness

The interiors are aesthetically decorated with mirror work patterns and tribal motifs which reflect and continue the traditions of the community.





The structure is built using materials like mud for walls and thatch for the roof. It is constructed using locally available materials like clay, bamboo, straw, timber, etc.

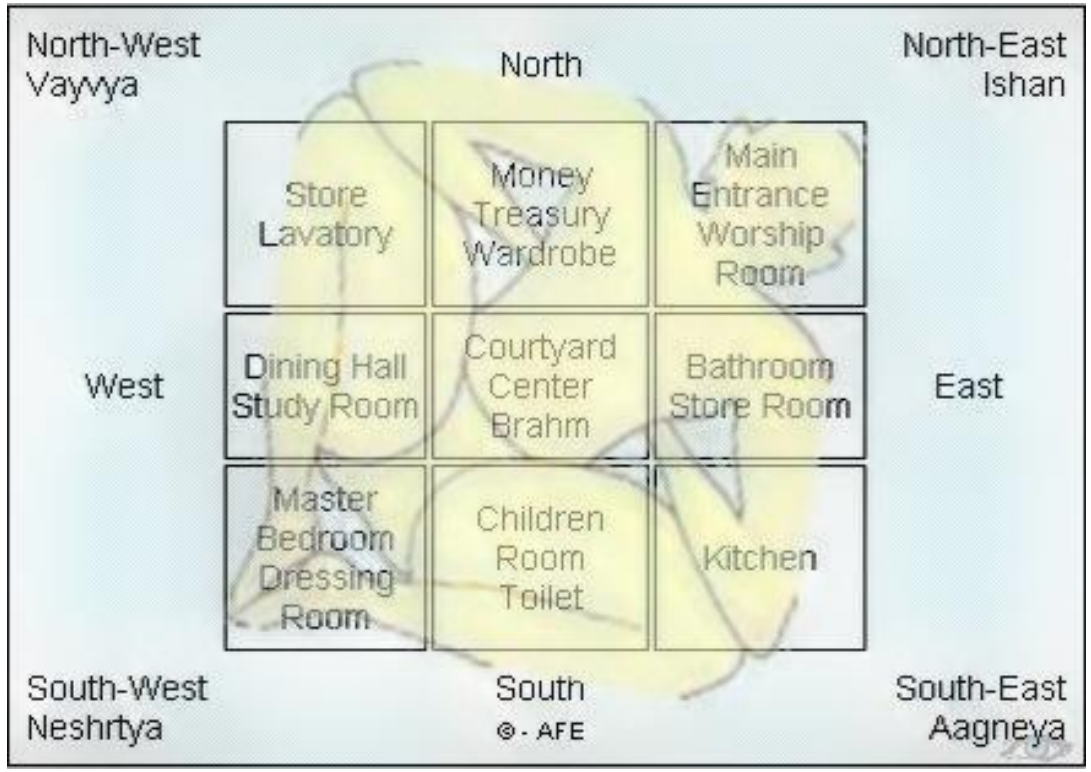
Structurally the roof is placed on two thick wooden posts placed across circular walls. The two posts bear the weight of the roof. The thatched roof is built on the top of the walls which rest on a spiral frame forming a cone resting on the wall

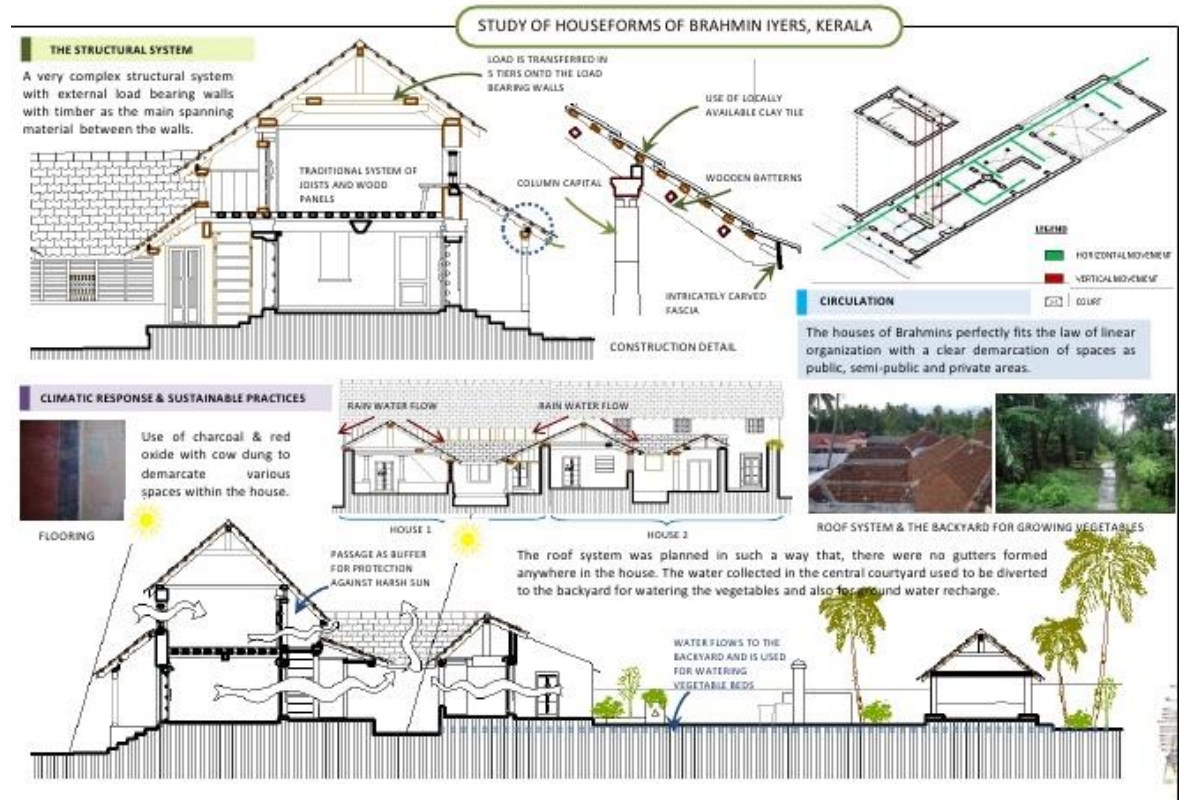
Architectural design values make up an important part of what influences architects and designers when they make their design decisions. However, architects and designers are not always influenced by the same values and intentions. Value and intentions differ between different architectural movements.

It also differs between different schools of architecture and schools of design as well as among individual architects and designers.

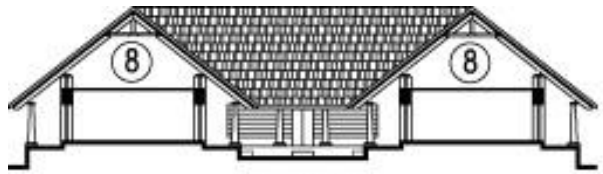
BELIEFS

an acceptance that something exists or is true

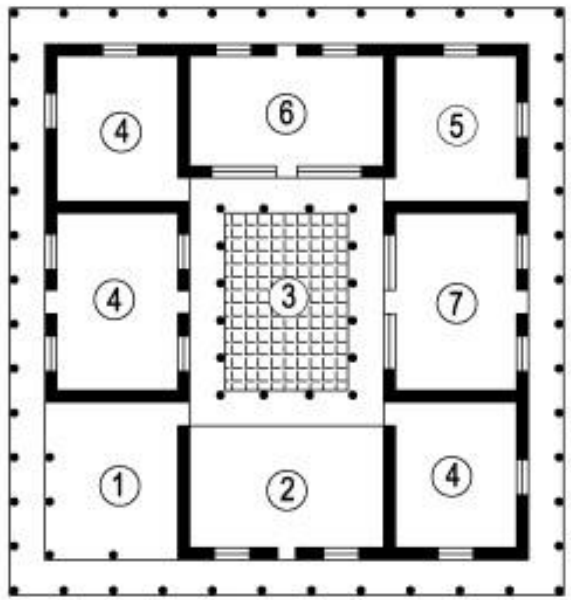




Vaasthu Shaastra – the traditional belief system for buildings from kerala.



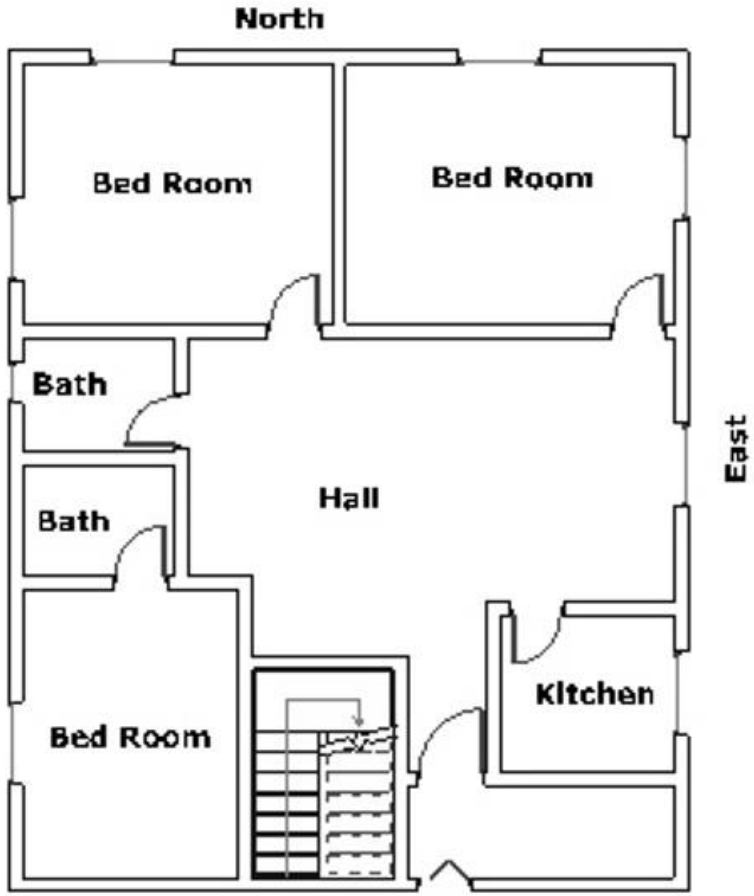
SECTION



PLAN

LEGEND

1. ENTRANCE
2. SEMI OPEN SPACE
3. COURTYARD
4. ROOMS
5. KITCHEN
6. DINING
7. RELIGIOUS RITES
8. ATTIC SPACE



South Facing House

Transformation from what was to was is due to socio economic considerations

ASPIRATIONS

- a hope or ambition

The Taj Mahal is not just the monument of love but also a symbol of power and prowess of the Mughal dynasty. A product of the aspirations of the people of the time and there ability to leave a lingering edifice.

Architecture is also a basic need to provide shelter , this basic need can be stretched to many extremes and this is reflective of the inequities that exist in modern society.


"Architecture is a dangerous mixture of power and impotence"
Rem Koolhaas
@DDN_world

VALUES

Values are individual beliefs that motivate people to act one way or another. They serve as a guide for human behavior. Generally, people are predisposed to adopt the **values** that they are raised with.

People also tend to believe that those **values** are “right” because they are the **values** of their particular culture.

A Western / European Home

A traditional / Indian Home

Our Spaces reflect our values and beliefs. People carry forward culture.

What is CULTURE?...

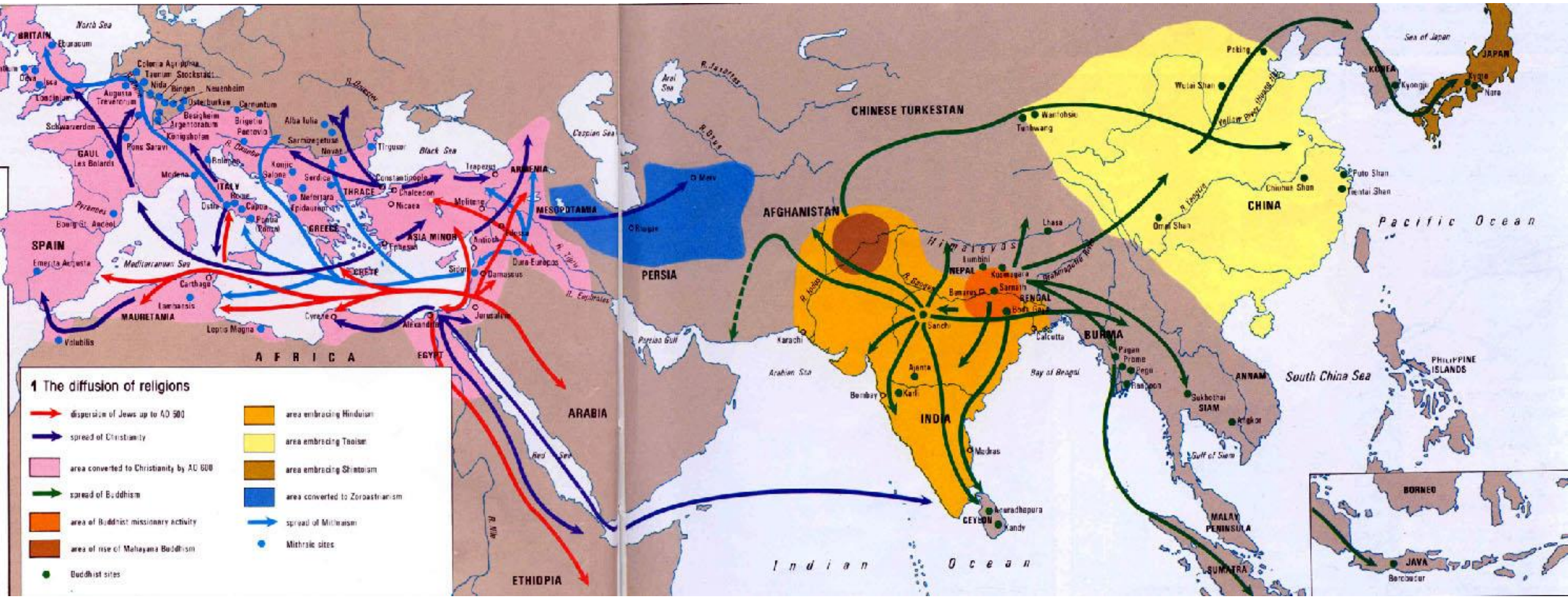
And how does it influence architecture?

“…the customary beliefs, social forms, and material traits of a racial, religious, or social group.”

-Merriam Dictionary

Sacred Building across religions

Sacred Building within the same religion



*illustrative, data is unverified

Buildings across regions

“The whole way of life, material , intellectual and spiritual , of a given society” – Kenney,1994

“ the complex of distinctive attainments, beliefs , traditions [which establish] the background of [a] racial, religious, or spiritual group “ – Kenney 1994

“Culture embraces the complex ways of living , value systems, traditions, beliefs and habits; including knowledge, morals, law and customs, acquired by those within that society. These provide for a set of cultural objects, which symbolize a shared schematic experience, and which we recognize as having cultural value.”

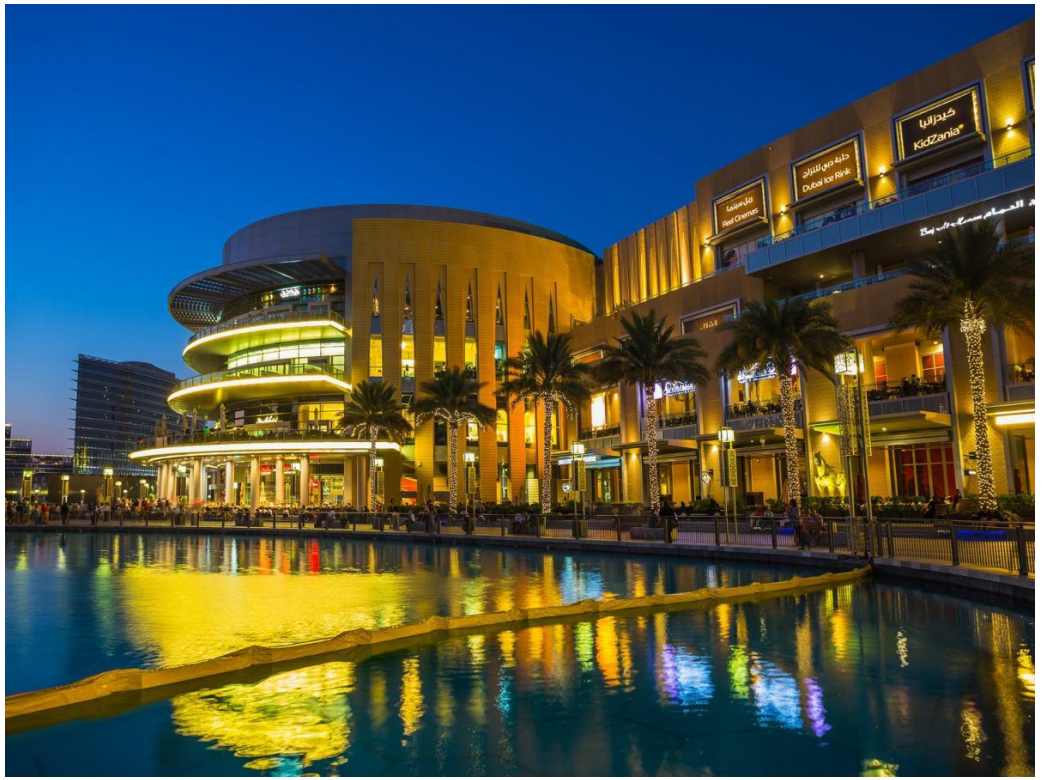
-Report 2011

“The culture of each society is identified through its manifestations such as language art, and architecture, and analysis in the field of culture related to the study of cultural manifestations (ettehad et al., 2014) ”

A Culture will evolve over time and the architecture reflects this change.

So when you see in a society the most famous buildings are libraries, museums and universities while in other societies the most famous buildings are shopping malls you can get an indication of the culture of the society.

In one hand architecture is a reflection of city culture and in another hand architecture can change our culture



- Religion
- Identity
- Social Life
- Politics
- Globalization

FACTORS THAT AFFECT A SOCIETY/ CULTURE

Recommended Reading

Unit 1 &3 – Form Space and Order by D.K Ching

Unit 2 - Understanding Architecture: Its Elements, History, and Meaning

QUESTIONS?

THE SIX DETERMINANTS OF ARCHITECTURAL FORM

By **PAUL RUDOLPH**

Illustrations from the author's collection, with his captions

Identical units made palatable by manipulation of space between them

THE EARLY THEORY of modern architecture focused on a very limited area. Many architectural problems were largely ignored, brushed aside as if they didn't even exist; disciplines gave way to worship of one god and then another. This limited approach, coupled with search for excitement, produced some very ungainly buildings, for surely mankind has never built such dry, timid, monotonous, modish structures as we do today. The general disorder has even been said by some to be "human," and anything else is termed pretentious, regimented, intellectual, dictatorial.

One of the most serious charges against modern architecture is its failure to produce understandable theories about the relationship of one building to another. The Ecole des Beaux Arts was actually very rich in this aspect while modern architects tend, even today, merely to admire some "human" square, preferably one located as remotely as possible, and proclaim that "we must make our squares more human." This plea is of course admirable, but it still leaves us with acres of cars and buildings casting shadows a quarter-of-a-mile long. The quickly moving vehicle and unprecedented requirements of sheer bulk have given us new dimensions of scale. Human scale must be coupled to the scale given by a quickly moving vehicle. The Ecole des Beaux Art created inhuman squares, boulevards, plazas, etc. when there were no automobiles. It is a paradox that our revolt against them has been so strong that we ignore the scale of vehicular traffic. One sees six-story high cottages on one hand and cottages utilizing skyscraper disciplines on the other. A flea is not designed like an elephant.

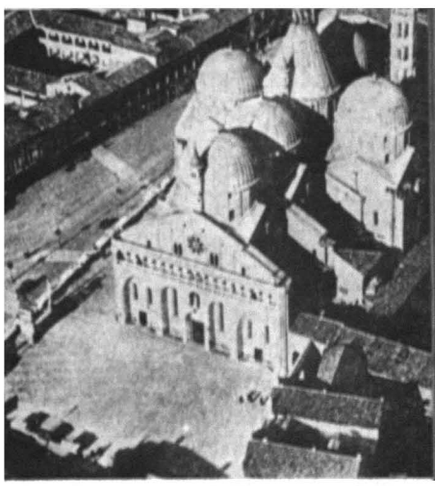
If we are concerned with new problems of scale and human response, we should also heed some older ones. Monumentality, symbolism, decoration, and so on — age-old human needs — are among the architectural challenges that modern theory has brushed aside. Possibly the extremes are illustrated by the so-called Bay Region style and Mies van der Rohe. The Bay Region style has validity in terms of cottages, but it has made little progress in showing us how to humanize buildings which involve large bulk.

Nikolaus Pevsner writing in the *Architectural Review* of April, 1954, explains that: "The qualities of the modern movement were not developed to please the eye, but because without them no workable, no functioning, no functional architecture is possible in our age." But surely he was reporting the attitudes of the thirties, not those of today. We no longer think that when the problems of function have been solved the exterior form will be found crystallized. As Matthew Nowicki warned us in his famous article "Function and Form," we cannot keep on pretending that we solve our problems without precedent in form.

Many of our difficulties stem from the concept of functionalism as the prime or only determinant of form. There are certainly as many as six determinants of architectural form, and though their relative importance varies with the individual problem, each is important, each must be heeded.

The first determinant is the environment of the building, its relationship to other buildings and the site. As stated above, modern architecture has been particularly weak in this respect and indeed even negative,

Relationship of a Building to its Neighbors



Church is given emphasis by coherent space around it, but in America our buildings are not well related

The Ecole des Beaux Arts was actually very rich in the handling of relationships between buildings

ignoring especially the relationship of the building to the sky. We usually say that our buildings are related to others by contrast, but this excuse is adequate only occasionally. Of course, the danger in respecting too literally the earlier architecture, which is usually eclectic in character in this country, is that we may create a new eclecticism, i.e., one approach to creating harmony with Gothic, another to early New England, another to Georgian, etc.

A truly successful building must be related to its neighbors in terms of scale, proportions, and the space created between the buildings. Most important of all, it must define and render eloquent its role in the whole city scheme. Buildings such as governmental structures, religious buildings, palaces devoted to entertainment, gateways to the city, should serve as focal points in our cities and could undoubtedly indulge in certain excesses, while buildings for commerce, housing, finance, administration should not dominate our environment.

Just as the 19th century architects showed so little regard for construction, we 20th century architects tend to disregard our role in the city scape.

One enjoys sensing the complete dimensions of a building from one point of view

The second determinant of form is the functional aspects. I will not discuss this except to say that most of our buildings look like assemblages of workable parts from Sweet's Catalog, with little regard for the whole, the idea expressed, or the human response. This is not to say one is not passionately concerned with how the building works.

The third determinant of form is the particular region, climate, landscape and natural lighting conditions with which one is confronted. The great architectural movements of the past have been precisely formulated in a given area, then adapted and spread to other regions, suiting themselves more or less to the particular way of life of the new area.

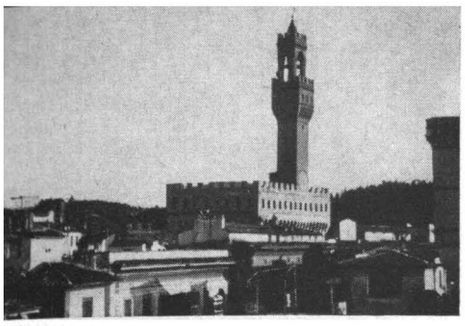
We now face a period of such development. If adaptation, enlargement and enrichment of basic principles of 20th century architecture were carried out, related always to the main stream of architecture and the particular region, the world would again be able to create magnificent cities. Unfortunately, little progress has yet been seen. We continue to ignore the particular. Henry Russell Hitchcock has pointed out that "the utilitarian language of modern architecture as used throughout the world tends to have something of the thinness and lack of color of basic English. We do not want a uniformity of architecture which might tend to confuse a muddled traveler into attempting to enter a house identical to his own, not just in the wrong street, not even in the wrong city, but actually in the wrong country or the wrong hemisphere."

There are several conditions which tend to limit regional expression. First there is industrialization; second, ease of travel and communication; third, the rising cost of traditional materials and skilled labor; fourth, the influence of the architectural press; fifth, the worship of that which is popular and our desire to conform; sixth, the "do it yourself" "according to the manufacturer's instruction" movement; and seventh, the abstract qualities inherent in the new concept of space.

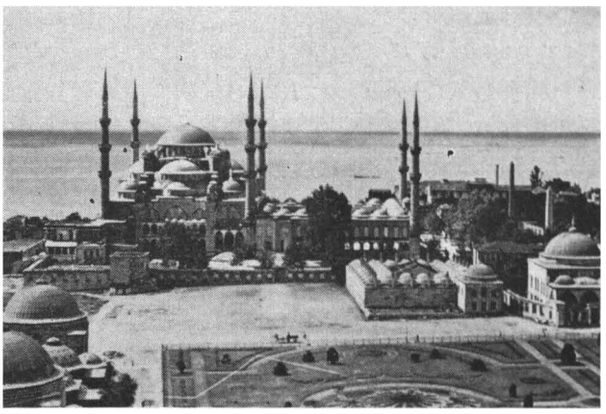
The podium method

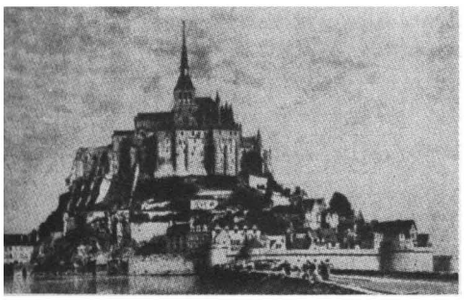
The fourth determinant of form is the particular materials which one uses. Each material has its own potential, and one seeks the most eloquent expression possible. We are currently going through a structural exhibitionism stage, but this will pass. The vitality of structural forms has beguiled architects into thinking that the dramatic use of structure could make great architecture. In fact there has been a very real misuse of structure and the formal qualities of architecture are still being ignored. Buckminster Fuller domes, the latest space frames, the newest plastics, etc., are only new kinds of bricks which broaden our means of expression.

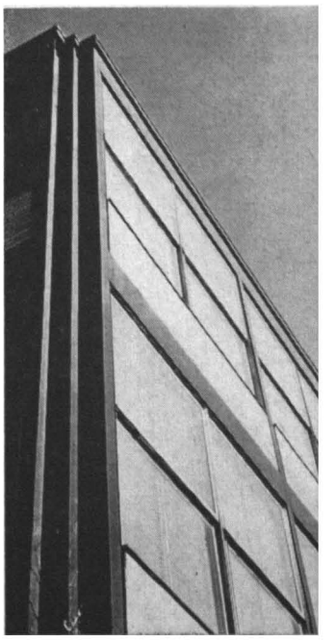
Another building as a base



The role of the various buildings is clear, primarily because of the relationship to the sky





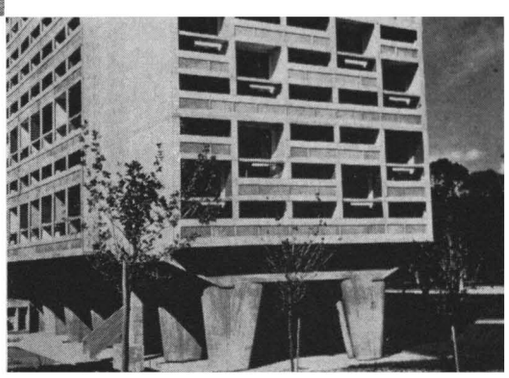


The corners are important

Relationship of Building to Sky

Relationship of Building to Ground

Water can be effective

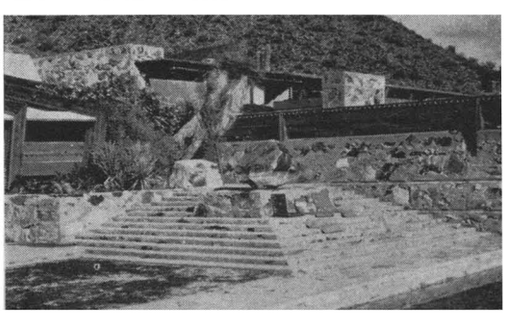


The familiar pilotis

Walls adapted to the terrain

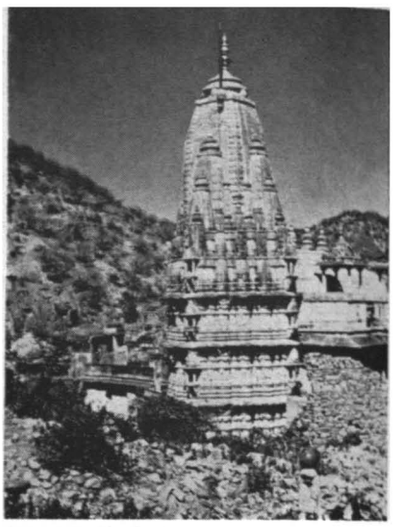
Platform supported by columns

The use of terraces



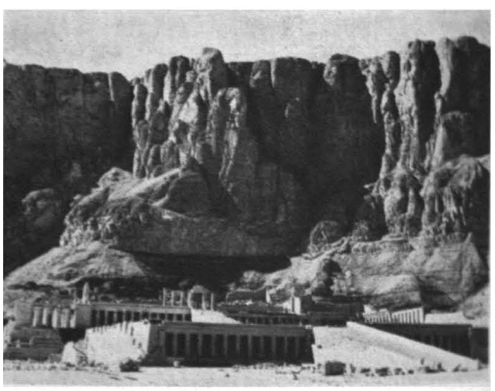
Only buildings which need great visual emphasis should utilize such devices, and structure should always remain merely a means to an end. Many younger architects fail to appreciate this basic principle. However, regular structural systems are usually a better method of organizing our designs than the axial arrangement of much traditional architecture.

The fifth determinant of form is the peculiar psychological demands of the building or place. Such necessities are met primarily through the manipulation of space and the use of symbols. We are particularly unsure in this aspect, partly because the revolution threw out much which still has validity. We must learn anew the meaning of monumentality. We must learn how to create a place of worship and inspiration; how to make quiet, enclosed, isolated spaces; spaces full of hustling, bustling activities pungent with vitality; dignified, vast, sumptuous, even awe-inspiring spaces; mysterious spaces; transition spaces which define, separate, and yet join juxtaposed spaces of contrasting character. We need sequences of space which arouse one's curiosity, give a sense of anticipation, beckon and impel us to rush forward to find that releasing space which dominates, which promises a climax and therefore gives direction.



The monument

The sixth and last determinant of form is concerned with the spirit of the times. This one is perhaps the most difficult of all; here is the call to genius. Sir Geoffrey Scott in *The Architecture of Humanism* says: "The men of the Renaissance evolved a certain architectural style because they liked certain forms of a certain kind. These forms, as such, they preferred, irrespective of their relation to the mechanical means by which they were produced, irrespective of the materials out of which they were constructed, irrespective sometimes even of the actual purposes they were to serve. They had an immediate preference for certain combinations of mass and void, of light and shade, and, compared with this, all other motives in the formation of their distinctive style were insignificant." We need not be ashamed of our own passion for certain forms today, although the layman does not always share our enthusiasm. Interestingly enough, the layman usually reacts favorably to that which is truly great.



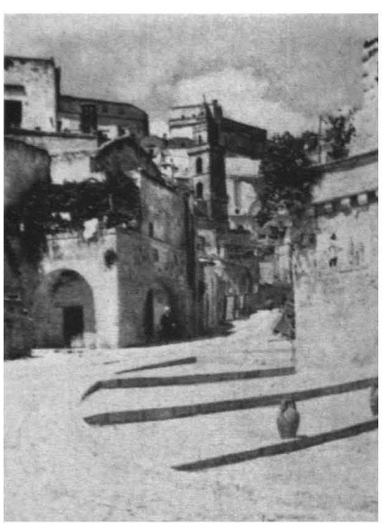
The awe-inspiring place

These six determinants of architectural form might lead toward richer architectural expression. At the same time one cries for greater expressiveness one must also heed Rudolph Whitkower. He said, "When architects depend on their sensibility and imagination architecture has always gone downhill." There are few geniuses and most of us need guidance and discipline. Our architectural schools are more interested in appearing avant garde than making principles clear.

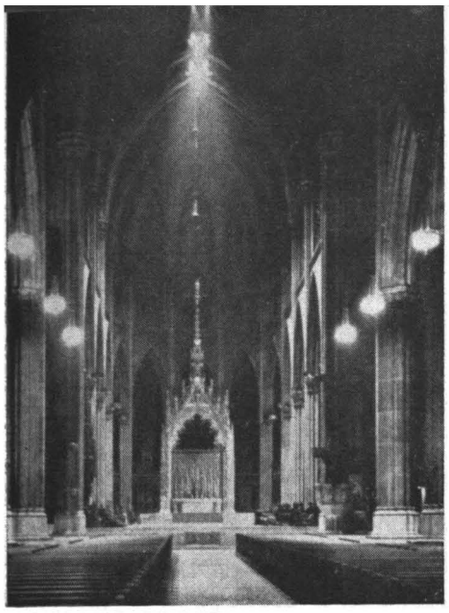
Isn't it true, however, that as younger architects acquire maturity they begin to feel the need for some of the disciplines they might have been given in school?

A few months ago there appeared in the *Architectural Review* a brilliant article by J. M. Richards entitled "In Defense of the Cliché." He said, "In the fine arts it may be necessary for each man to create his own revolution and thereby justify himself as having something personal to say. But in architecture what the architect has personally to say must, in most cases, be subservient to what the building has to do and the part it has to play in the larger prospect — for example, in the design of a town, which is the sum of many architects' buildings. In normal times that goes without saying. But at this moment architecture so sorely needs its plagiarists that the value of not being a genius needs stating afresh.

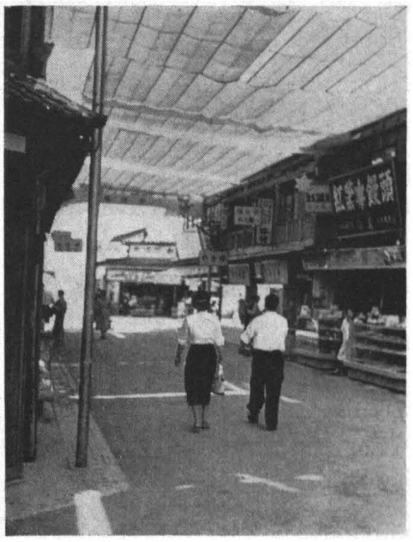
"Architecture cannot progress by the fits and starts that a succession of revolutionary ideas involves. Modern architecture brought release from the restrictions of an archaic ready-made style. But the freedom it also brought — freedom to plan in all three dimensions and to create new



One is drawn forward



The place of worship



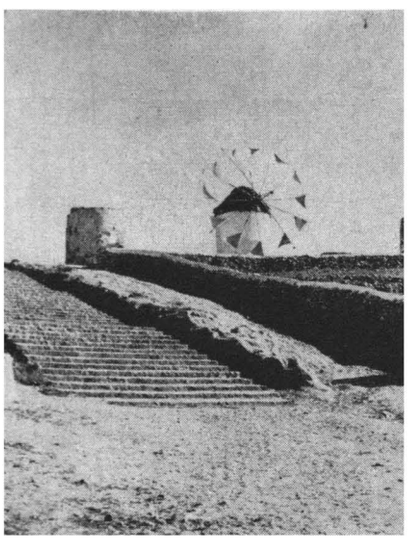
The sense of protection

Edward Ratcliffe, courtesy Rockefeller Center, Inc.

The interest of activity

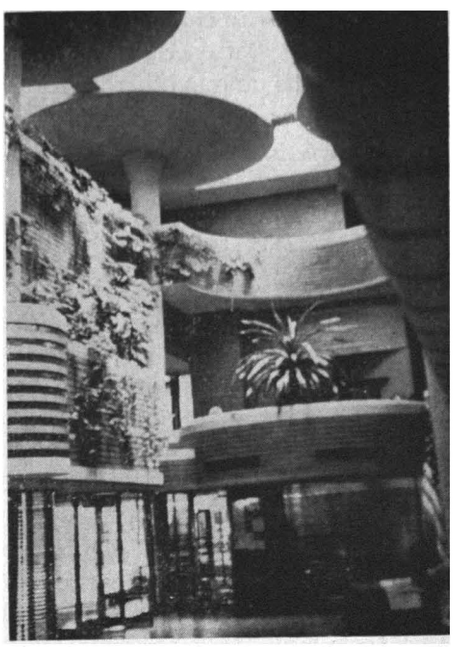
The sense of quiet repose

Psychological Demands



Anticipation

The haven



Wright was born knowing how to manipulate natural light (sometimes without full regard for the use to be made of it). Some other architects have been a long time learning

esthetic values from the exploitation of new techniques — though a source of inspiration to the imaginative design, left most architects up in the air. Design of this kind looked easy to do; but just because of the absence of rules it was particularly difficult to do well. Suddenly, anything was possible; and quality in modern architecture suffered accordingly."

In one sense any classical building with its columns, capitols, porticoes and window architraves is a collection of clichés. The cantilever, the superstructure perched on pilotis, the glass enclosed staircase tower, the ribbon window, are legitimate expressions of our structural methods that in the last thirty years added so much to the architect's repertoire.

The clichés, in their proper role, are not merely a means of appearing up-to-date, but a means of insuring a civilized standard of design — even in the absence of genius — by providing the architect with a range of well-tried, culturally vital forms and motifs to convert the passive act of plagiarism into the creative act of building up and systematically enriching an architectural language appropriate to our times.

"Cliché" is perhaps not the right word for the enrichments we need. It has too much suggestion of contempt; there is a connotation of superficiality. To provide enrichment a form or motif needs something of real value in a common situation, some quality of lasting validity. Perhaps "standard" is a better term.

Last year I had occasion to analyze the 33 premiated designs from a broad awards program; I found them an interesting barometer to current preferences in forms, motifs, devices, or "esthetics."

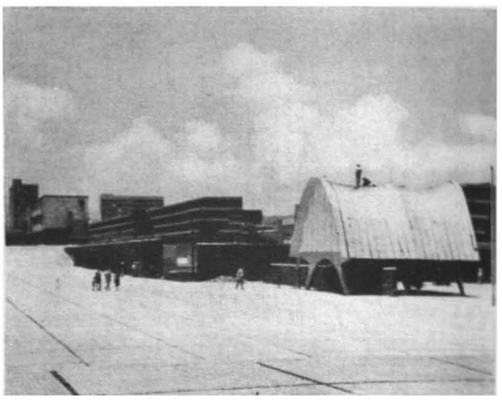
If those designs are symptomatic of our present-day attitudes, then one concludes that a new tradition has indeed been established. There were striking similarities in spirit and intent in almost all the buildings selected. For example, 95 per cent utilized regularly spaced structural systems, thereby freeing the interior arrangement. The linear qualities inherent in such cage-like construction were usually emphasized, and were largely the means of organizing and disciplining the design.

It is worth noting that a recreation building, a residence and a war memorial were symmetrically organized; the remainder asymmetrically. One notes that the regular bay system seems more successful when the bay is wide enough to accommodate subsidiary divisions. No new light was shed on the problem of starting and stopping such bay-disciplined designs; they often resembled sliced loaves of bread with no beginning nor end.

Twenty-two per cent of the buildings were to be raised above the ground on pilotis, and another 25 per cent undertook to gain that effect by having the lower floor completely filled with glass enclosing walls. One-half were related to the ground by slab construction; only two were to rest on pedestals.

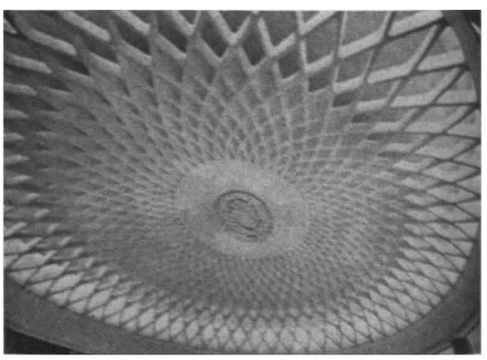
One of modern architecture's greatest failings has been its lack of interest in the relationship of the building to the sky. Ninety per cent utilized flat roofs; the remainder were to be pitched. Here is a slight cause for concern, for there are many design problems where the silhouette is of the utmost importance. One doubts that a poem was ever written to a flat-roofed building silhouetted against the setting sun. And what about its appearance on a misty, foggy day? The insistence on flat roofs also tends all too often to make modern architecture have the appearance of a dog-house, when juxtaposed against the high ceiling pitched roofs of much earlier architecture. With one exception water appeared to be mysteriously drained from all roofs. Traditional methods of water shedding created real drama, and one longs for the modern equivalents.

Rather surprisingly two-thirds of the architects turned the corners of their buildings by carrying the glass to the corners, with the return wall solid. This desire to reveal the essentially planear aspect of our construction reflected itself in almost all of the plans as well as in the elevations by

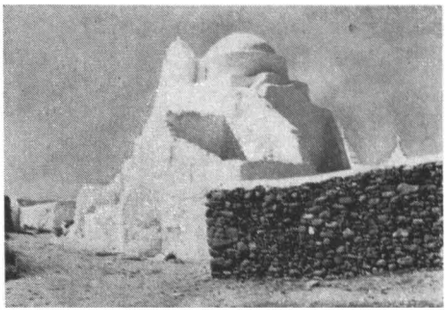


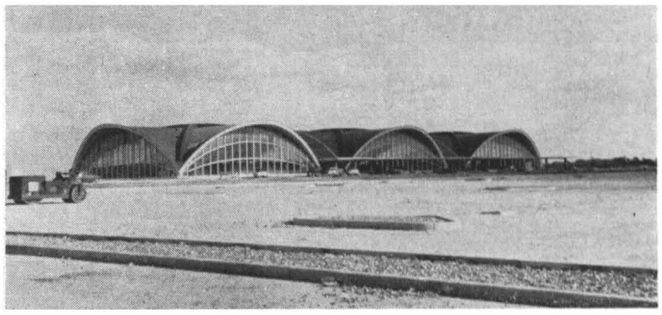
The cute and seductive building tends to dominate, even though it merely houses a machine

We should find ways of seeing our buildings above the automobiles



Elaborate form work is possible where labor costs are low. A hypothesis: labor-material ratios cause national differences, but true regionalism comes through form, not materials

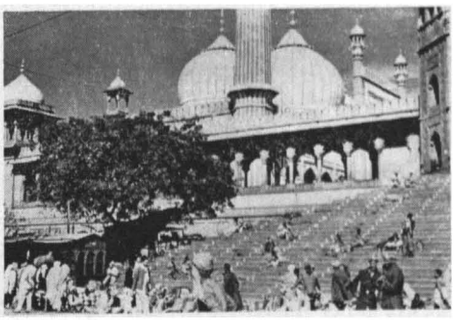




Hellmuth, Yamasaki & Leinweber, Architects

Plasticity should be reserved for "governmental structures, religious buildings, gateways to the city and palaces of entertainment." This gateway to the city (St. Louis airport) is properly plastic and its role in the city scape is thereby rendered eloquent. It is the only airport worthy of the name

The continual thinking in terms of individual buildings as unrelated gems is disastrous; buildings tend to brutalize rather than to refine



They did it better in Delhi than they did in San Francisco

Environmental Factors

Some Comments on Regionalism

Victorian architecture produced some fine regional examples such as this house at Veradero Beach, Cuba, with raised living quarters, precision in proportioning supporting members, and various light-catching details

Mies' apartments symbolize perhaps better than any other multi-storied structure America's industrialized techniques, and in that sense they are peculiarly American

This house design originated in Cambridge, but it moved to Australia without change

reducing all wall divisions to a series of rectangles. These modular constructions are undoubtedly expressions of industrialized component parts, although paradoxedly most of them undoubtedly will actually be constructed by essentially handicraft methods.

Sixty-five per cent utilized uniform ceiling heights, 25 per cent allowed the ceilings to follow the slope of the pitched roof, while only 10 per cent varied the ceiling heights in any way. This self-imposed uniform ceiling height limitation is difficult to understand when one considers the importance of the psychological effect of varying ceiling heights. To a degree this spatial characteristic is compensated for by the courtyard completely within the building, a device to be utilized by 45 per cent. Twenty per cent of the designers created outer defined courtyards and patios by extending walls out into space.

However, the paucity and limitation of spatial concepts to be utilized are extremely disappointing. Laymen almost never demand that their structure be clearly expressed, but they often describe in eloquent terms architectural space and particular psychological implications desired. The laymen seem more knowing about those matters. This current architectural limitation is evidenced by the lack of interest in the handling of natural light. There are all too often interior spaces which are merely flooded with light without any consideration of psychological or physical effects.

We all recognize that strict functionalism does not satisfy the need for the "sense of symbolism, the lasting monument, the vital ideas and shared emotions that is part of architecture's historical function to perform." In the design awards one finds symbols used three times (it was always a cross) while two designs incorporated sculpture, and two painting. One understands the difficulties, but it is undoubtedly up to the architect to lead the way.

Perhaps the most important single aspect of those designs as a group is the apparent lack of interest in the environment in which the building is placed and the particular role it plays in the city as a whole. Only 15 per cent, as presented, indicated anything at all of the character of the surrounding structures. The continual thinking in terms of individual buildings as gems unrelated to earlier works is disastrous, creating cities whose buildings tend to brutalize, rather than refine.

The lack of interest in how our buildings actually appear is also indicated by the fact that only four of the thirty-three designs indicated any lettering or signs, and only about one-third indicated any comprehensive landscaping treatment.

Every building, no matter how large or small, is a part of a greater whole; and the architect perforce participates in planning. Park Avenue, like every corner cross-road in the land, is being rebuilt in a fragmented way. Indeed at least one intersection of Park Avenue will shortly have four unrelated buildings, one on each corner, with all-glass façades. It will be interesting to see glass buildings reflecting each other. Much of the esthetic enjoyment of a glass building is its mirroring of earlier and contrasting architecture.

In every cultural effort of each generation it is the very disciplines which we so anxiously want to cross out that help us find and determine our basic values. These of course change with each generation because society is dynamic. But for the clarity of its dynamic force it needs discipline. Otherwise it becomes chaotic.

Great architectural precepts — still valid — would surely suggest other determinants of form than the fashionable or the functional. Perhaps they would suggest also some disciplines, to keep us from being carried away by our new freedoms. Modern architects fought hard against the restraints of outworn styles; the day is won; but the visual disorder of our cities still abounds. Can we enlarge our vision sufficiently to meet this challenge? It is the architect's responsibility.

The Spirit of the Times

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SCHOOL OF BUILDING AND ENVIRONMENT

DEPARTMENT OF ARCHITECTURE

UNIT – IV – WORKS OF MODERN & POST-MODERN ARCHITECTS– SARA 1202

THEORY OF ARCHITECTURE-II

Louis Henry Sullivan (September 3, 1856 – April 14, 1924)was an American architect, and has been called a *"father of skyscrapers"* and *"father of modernism"*.

He was an influential architect of the Chicago School, a mentor to Frank Lloyd Wright, and an inspiration to the Chicago group of architects who have come to be known as the Prairie School

The phrase

"form follows function"

is attributed to him,

although he credited the concept to ancient Roman architect Vitruvius

Form follows function is a principle of design associated with late 19th and early 20th century architecture and industrial design in general, which states that

the shape of a building or object should primarily relate to its intended function or purpose

William LeBaron Jenney, a Chicago architect, designed the first skyscraper in 1884.

Nine stories high, the Home Life Insurance Building was the first structure whose entire weight, including the exterior walls, was supported on an iron frame.

Monadnok Building
(Burnham & Root / 1891

Guaranty Building
(Sullivan & Adler / 1894

Prior to the late nineteenth century, the weight of a multi-story building had to be supported principally by the strength of its walls. The taller the building, the more strain this placed on the lower sections of the building; since there were clear engineering limits to the weight such "load-bearing" walls could sustain, tall designs meant massively thick walls on the ground floors, and definite limits on the building's height.

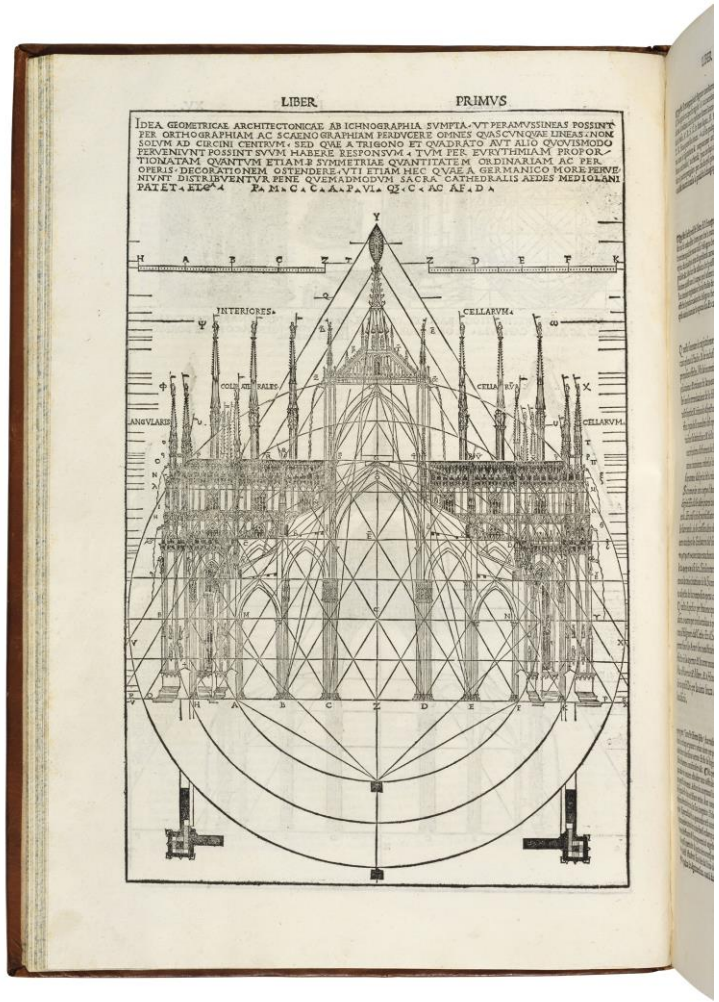
The development of cheap, versatile steel in the second half of the nineteenth century changed those rules. America was in the midst of rapid social and economic growth that made for great opportunities in architectural design. A much more urbanized society was forming and the society called out for new, larger buildings. The mass production of steel was the main driving force behind the ability to build skyscrapers during the mid-1880s. By assembling a framework of steel girders, architects and builders could create tall, slender buildings with a strong and relatively lightweight steel skeleton. The rest of the building elements—walls, floors, ceilings, and windows—were suspended from the skeleton, which carried the weight. This new way of constructing buildings, so-called "column-frame" construction, pushed them up rather than out. The steel weight-bearing frame allowed not just taller buildings, but permitted much larger windows, which meant more daylight reaching interior spaces. Interior walls became thinner, which created more usable (and rentable) floor space.

Wainwright Building
(Sullivan & Adler)

In 1896, Louis Sullivan wrote:

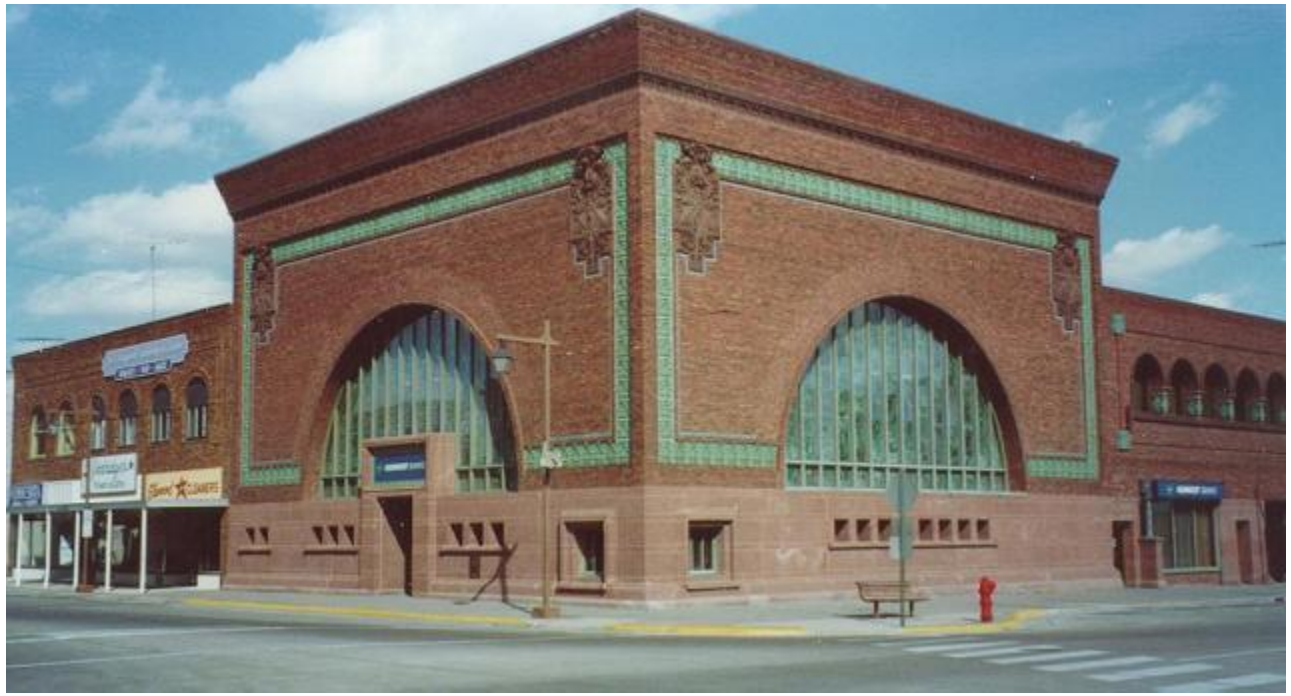
It is the pervading law of all things organic and inorganic, of all things physical and metaphysical, of all things human, and all things super-human, of all true manifestations of the head, of the heart, of the soul, that the life is recognizable in its expression,

that form ever follows function. *This is the law.* (italics in original)



"Form follows function" would become one of the prevailing tenets of modern architects.

Sullivan attributed the concept to Marcus Vitruvius Pollio, the Roman architect, engineer, and author, who first asserted in his book, *De architectura (On architecture)*, that a structure must exhibit the three qualities of *firmitas, utilitas, venustas* – that is, it must be "**solid, useful, beautiful."**



National Farmer's Bank of Owatonna

This credo, which placed the demands of practical use above aesthetics, later would be taken by influential designers to imply that decorative elements, which architects call "ornament", were superfluous in modern buildings, but Sullivan neither thought nor designed along such dogmatic lines during the peak of his career

While his buildings could be spare and crisp in their principal masses, he often punctuated their plain surfaces with eruptions of lush Art Nouveau or Celtic Revival decorations, usually cast in iron or terra cotta, and ranging from organic forms, such as vines and ivy, to more geometric designs and interlace, inspired by his Irish design heritage.

The most famous example of ornament used by Sullivan is the writhing green ironwork that covers the entrance canopies of the Carson Pirie Scott store on south State Street.

Guaranty Building

Because Sullivan's remarkable accomplishments in design and construction occurred at such a critical time in architectural history, he often has been described as the "father" of the American skyscraper. But many architects had been building skyscrapers before or as contemporaries of Sullivan; they were designed as an expression of new technology.

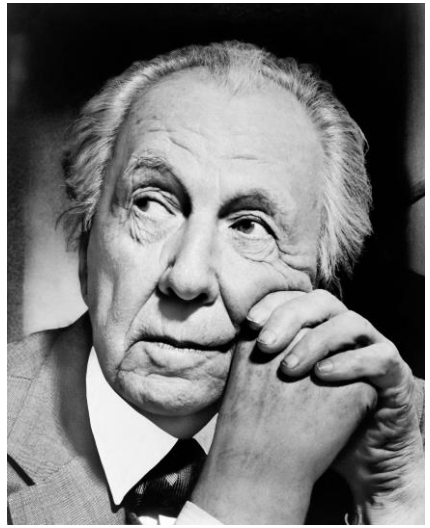
Chicago was replete with extraordinary designers and builders in the late years of the nineteenth century, including Sullivan's partner, Dankmar Adler, as well as Daniel Burnham and John Wellborn Root. Root was one of the builders of the Monadnock. That and another Root design, the Masonic Temple Tower (both in Chicago), are cited by many as the originators of skyscraper aesthetics of bearing wall and column-frame construction, respectively.

Wainwright Building

visibly divided into three "zones" of design:

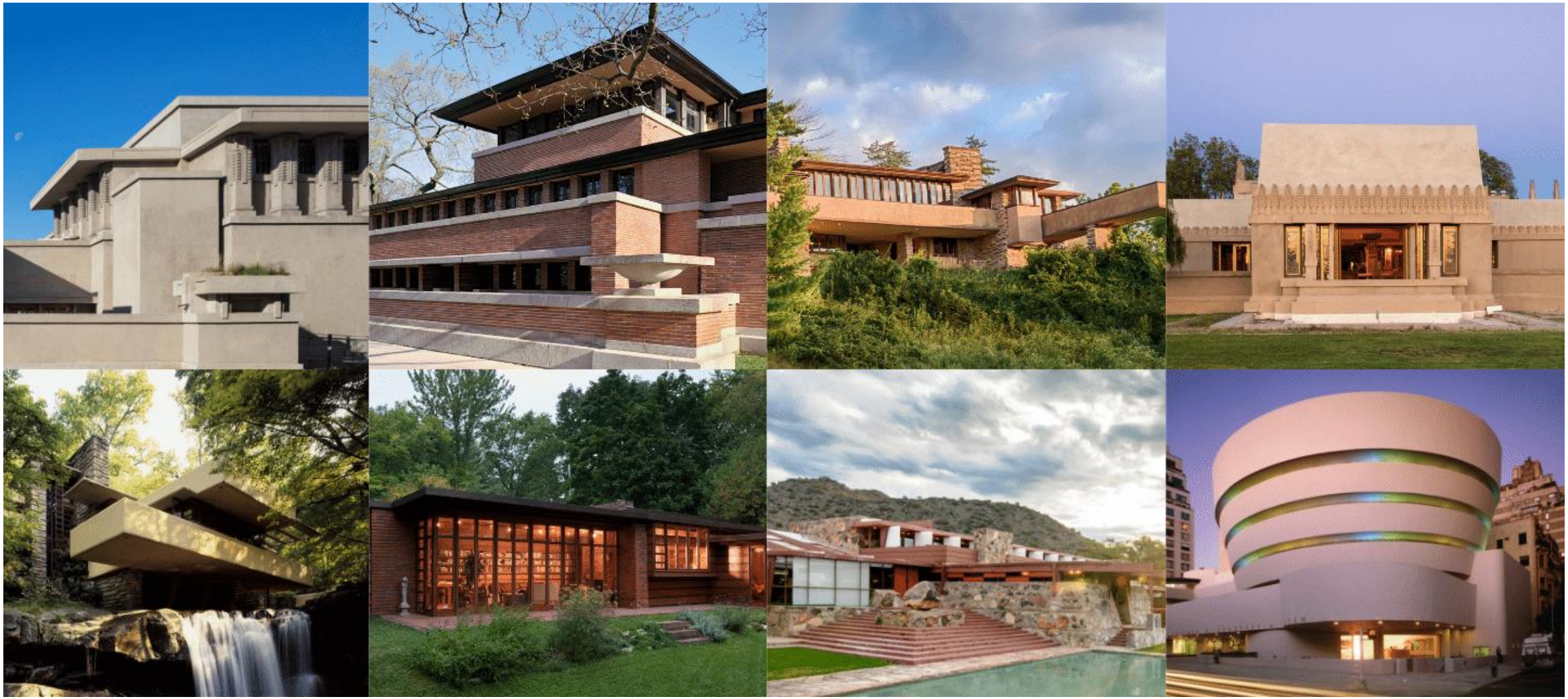
- a plain, wide-windowed base for the ground-level shops;
- the main office block, with vertical ribbons of masonry rising unimpeded across nine upper floors to emphasize the building's height;
- and an ornamented cornice perforated by round windows at the roof level, where the building's mechanical units (such as the elevator motors) were housed.

The cornice is covered by Sullivan's trademark Art Nouveau vines and each ground-floor entrance is topped by a semi-circular arch.



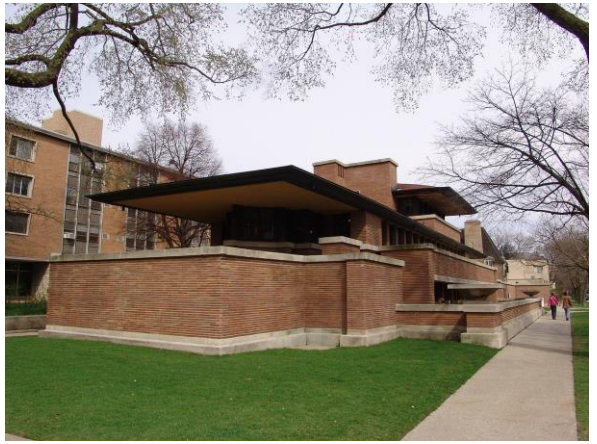
Frank Lloyd Wright was an American architect, designer, writer, and educator. He designed more than 1,000 structures over a creative period of 70 years.

Wright played a key role in the architectural movements of the twentieth century, influencing generations of architects worldwide through his works.



Wright believed in designing in harmony with humanity and the environment, a philosophy he called organic architecture. This philosophy was exemplified in Fallingwater (1935), which has been called "the best all-time work of American architecture.“

Harold C. Bradley House, Madison, Wisconsin, by Louis Sullivan and George Grant Elmslie



Robie House, 1910 by FLW

Gordon House by FLW

Wright was the pioneer of what came to be called the Prairie School movement of architecture and also developed the concept of the Usonian home in Broadacre City, his vision for urban planning in the United States. He also designed original and innovative offices, churches, schools, skyscrapers, hotels, museums, and other commercial projects. Wright-designed interior elements (including leaded glass windows, floors, furniture and even tableware) were integrated into these structures.

Early work showing evolution of the organic style by FLW

Organic architecture is a philosophy of **architecture** which promotes harmony between human habitation and the natural world. A belief that the natural life that exists in a space should flow into, peacefully coexist with and benefit from whatever is constructed there

architect and planner David Pearson proposed a list of rules towards the design of organic architecture. These rules are known as the *Gaia Charter* for organic architecture and design.

It reads:
"Let the design:
be inspired by nature and be sustainable, healthy, conserving, and diverse.
unfold, like an organism, from the seed within.
exist in the "continuous present" and "begin again and again".
follow the flows and be flexible and adaptable.
satisfy social, physical, and spiritual needs.
"grow out of the site" and be unique.
celebrate the spirit of youth, play and surprise.
express the rhythm of music and the power of dance."

Eric Corey Freed takes a more seminal approach in making his description:

"Using Nature as our basis for design, a building or design must grow, as Nature grows, from the inside out. Most architects design their buildings as a shell and force their way inside. Nature grows from the idea of a seed and reaches out to its surroundings. A building thus, is akin to an organism and mirrors the beauty and complexity of Nature."

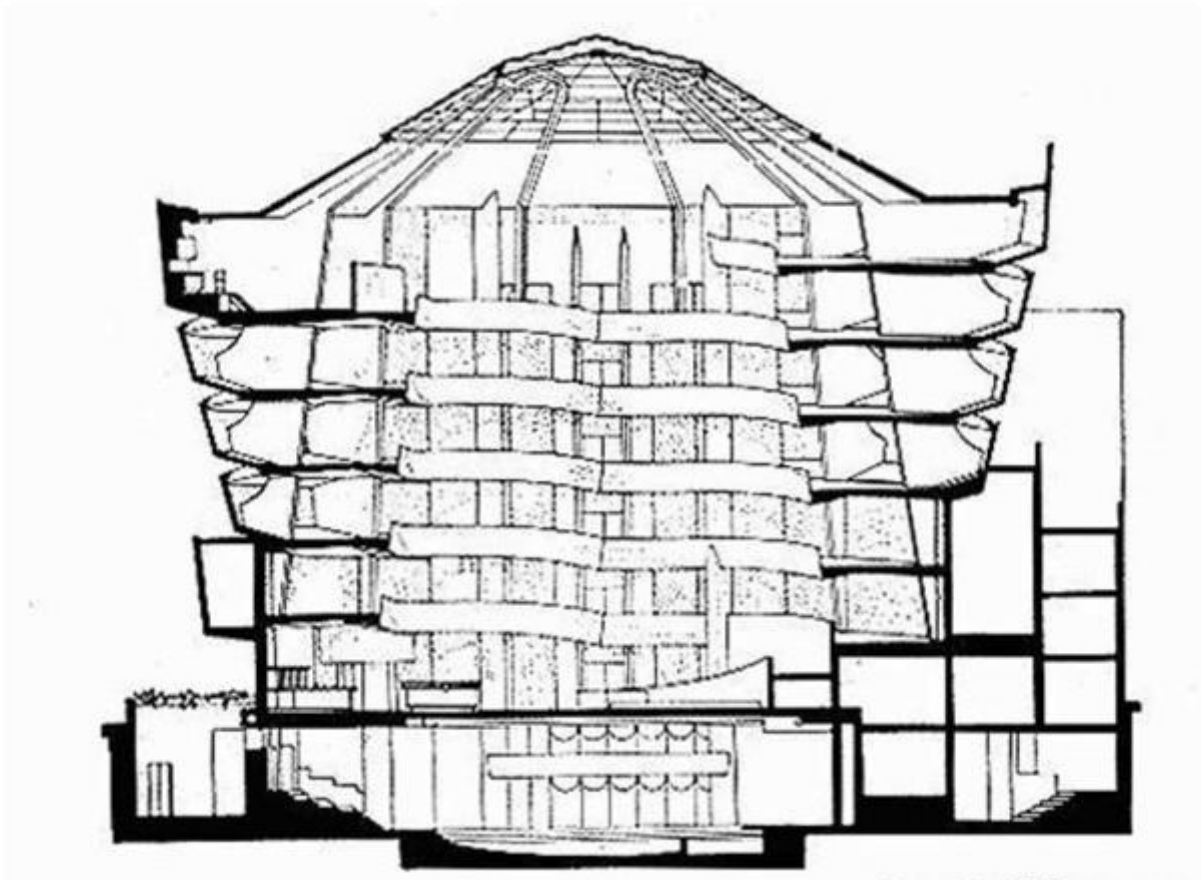
https://youtu.be/D9jz3bRSsgc

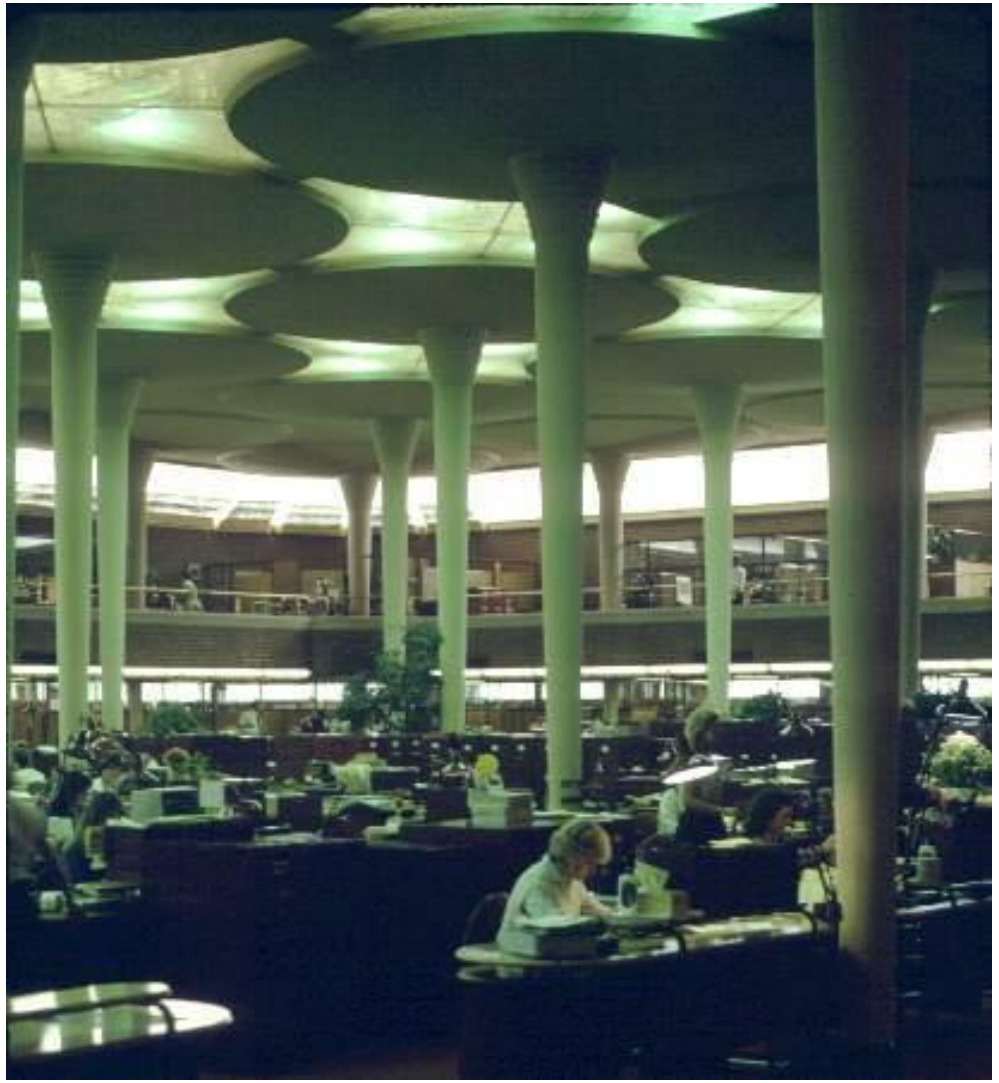
'Usonian' is a term usually referring to a group of approximately sixty middle-income family homes designed by Frank Lloyd Wright beginning in 1936 with the Jacobs House. The "Usonian Homes" were typically small, single-story dwellings without a garage or much storage, L-shaped to fit around a garden terrace on odd (and cheap) lots, with native materials, flat roofs and large cantilevered overhangs for passive solar heating and natural cooling, natural lighting with clerestory windows, and radiant-floor heating. A strong visual c

USONIAN HOUSE

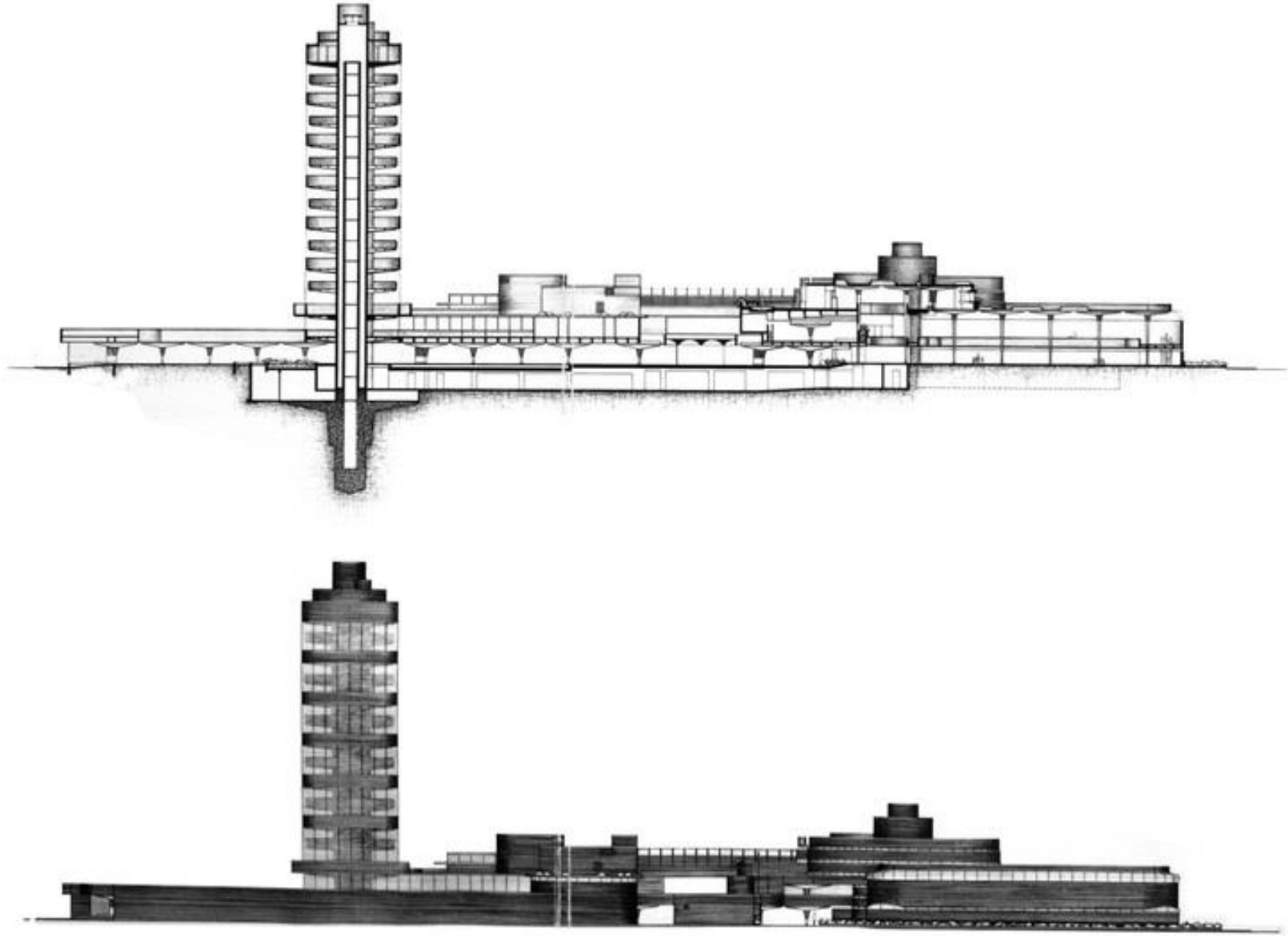
USONIAN HOUSE

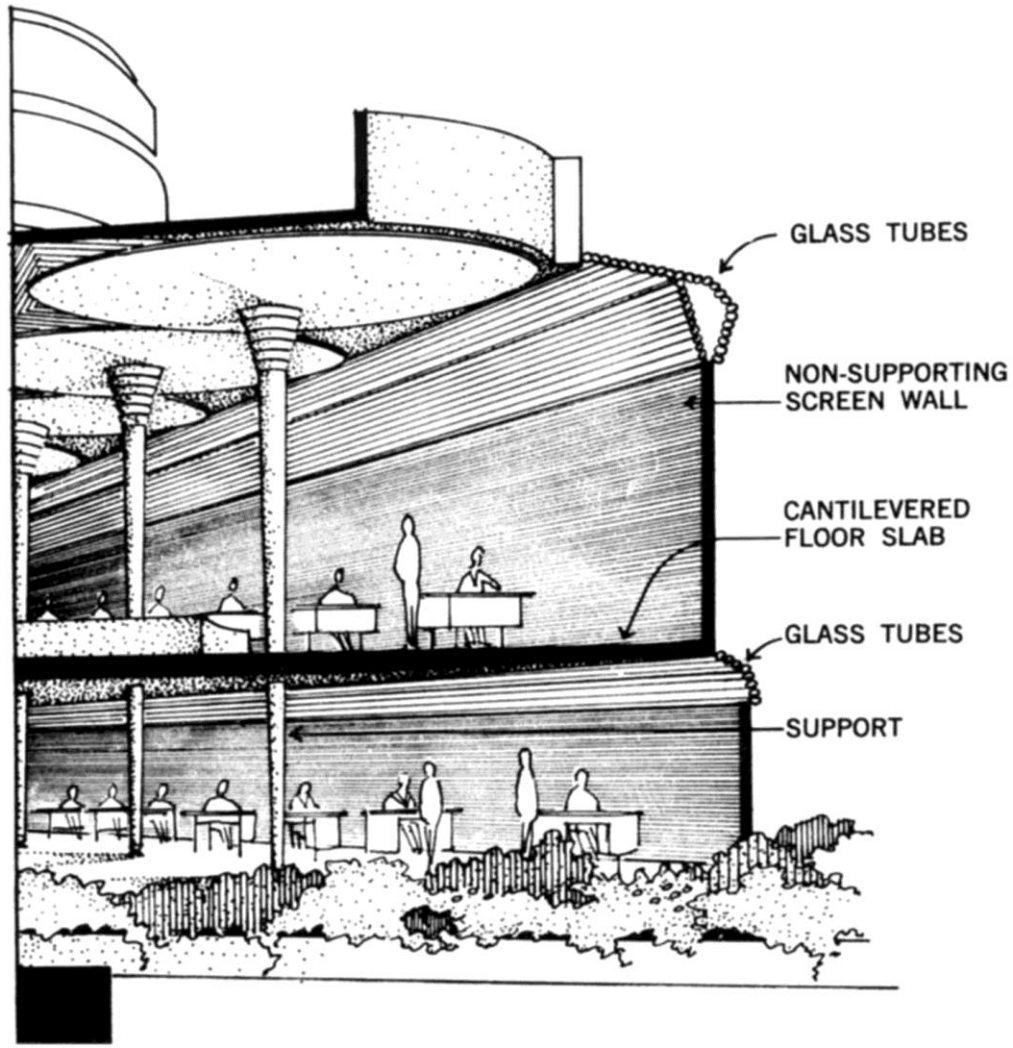
https://youtu.be/kPcDdNF1mj4

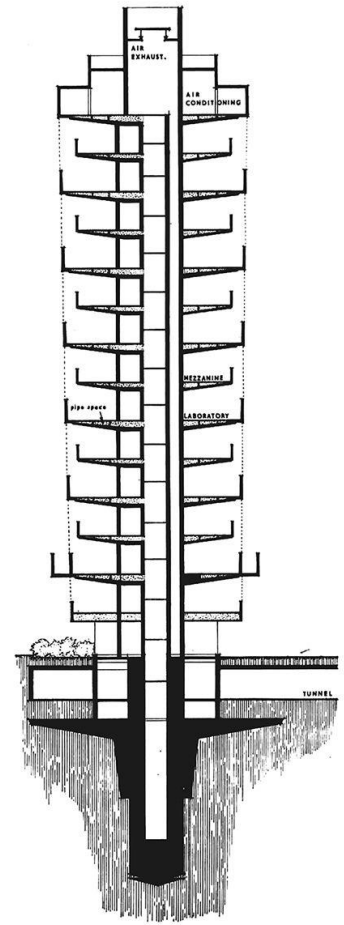


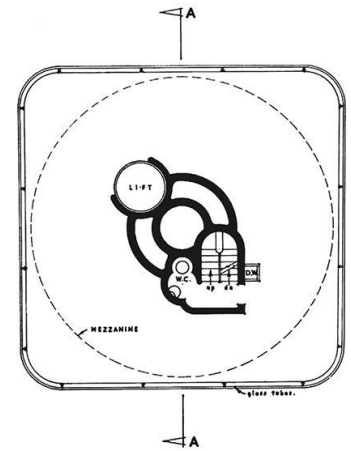


JOHNSON WAX BUILDING









Plan of the laboratory tower, showing how the lift, stairs, cloakrooms and all services are concentrated in the centre, leaving the entire floor area free.

Section A—A through the laboratory. The structure—trunk, branches, root—has a masterly simplicity, yet this is surely the first time such a natural form has made a building,

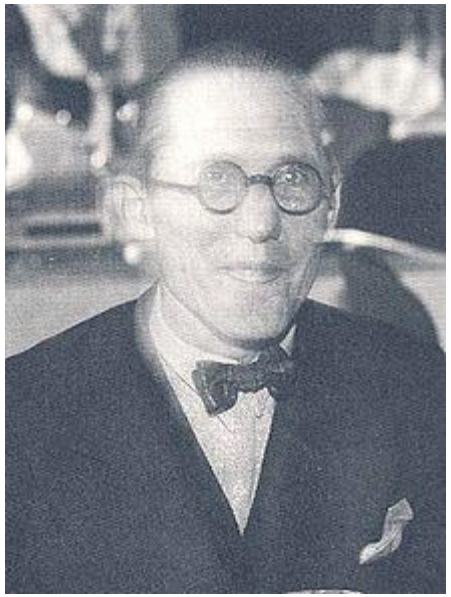
PRAIRIE HOUSES

FL WRIGHTS OWN OFFICE

Frank Lloyd Wright is known for effortlessly blending interiors and exteriors through his architectural designs, using principles of organic architecture. Wright also used the natural environment to his advantage by implementing basic design principles that make the most of the elements and the climate. In this edition of ***Living with Nature: Sustainable Practices from the Frank Lloyd Wright Foundation***, we're focusing on the topic of passive energy techniques.

https://franklloydwright.org/living-with-nature-passive-energy-techniques/

WORK OF NARI GANDHI (INDIAN ARCHITECT)



Charles-Édouard Jeanneret, better known as October 6, 1887 – August 27, 1965), was an architect, designer, urbanist and writer, famous for being one of the pioneers of what is now called modern architecture. He was born in Switzerland and became a French citizen in 1930. His career spanned five decades, with his buildings constructed throughout Europe, India and America.

He was a pioneer in studies of modern high design and was dedicated to providing better living conditions for the residents of crowded cities.

Le Corbusier adopted his pseudonym in the 1920s, allegedly deriving it in part from the name of a distant ancestor, "Lecorbésier."

Le Corbusier was heavily influenced by problems he saw in industrial cities at the turn of the 19th to 20th century (that is, from the 19th to the 20th century). He thought that industrial housing techniques led to crowding, dirtiness, and a lack of a moral landscape.

He was a leader of the modernist movement to create better living conditions and a better society through housing concepts. Ebenezer Howard's *Garden Cities of Tomorrow* heavily influenced Le Corbusier and his contemporaries.

The **Ville Contemporaine** (*Contemporary City*) was an unrealised project to house three million inhabitants designed by the French-Swiss architect Le Corbusier in 1922.

The centerpiece of this plan was a group of sixty-story cruciform skyscrapers built on steel frames and encased in curtain walls of glass. The skyscrapers housed both offices and the flats of the most wealthy inhabitants· These skyscrapers were set within large, rectangular park-like green spaces.

At the center of the planned city was a transportation center which housed depots for buses and trains as well as highway intersections and at the top, an airport.

Le Corbusier segregated the pedestrian circulation paths from the roadways, and glorified the use of the automobile as a means of transportation. As one moved out from the central skyscrapers, smaller multi-story zigzag blocks set in green space and set far back from the street housed the proletarian workers.

https://youtu.be/usdUcwP9lT0

Unite d’habitation

The first and most famous of these buildings, also known as *Cité radieuse* (radiant city) is located in Marseille, France, built 1947-1952. One of Le Corbusiers's most famous works, it proved enormously influential and is often cited as the initial inspiration of the Brutalist architectural style and philosophy.

The Marseille building, developed with Corbusier's designers Shadrach Woods and George Candilis, comprises 337 apartments arranged over twelve stories, all suspended on large *piloti*. The building also incorporates shops with architectural bookshop,sporting, medical and educational facilities, a hotel which is open to the public,and a gastronomic restaurant, *Le Ventre de l'Architecte* ("The Architect's Belly"). The flat roof is designed as a communal terrace with sculptural ventilation stacks, a running track, and a shallow paddling pool for children. The roof, where a number of theatrical performances have taken place, underwent renovation in 2010. It has unobstructed views of the Mediterranean and Marseille.

Inside, corridors run through the centre of the long axis of every third floor of the building, with each apartment lying on two levels, and stretching from one side of the building to the other, with a balcony. Unlike many of the inferior system-built blocks it inspired, which lack the original's generous proportions, communal facilities and parkland setting, the Unité is popular with its residents and is now mainly occupied by upper middle-class professionals.

https://youtu.be/40I7y-3Wvcg

VILLA SAVOYE

First, Le Corbusier lifted the bulk of the structure off the ground,supporting it by ***pilotis*** – reinforced concrete stilts. These *pilotis*, in providing the structural support for the house, allowed him to elucidate his next two points: **a free façade**, meaning non-supporting walls that could be designed as the architect wished, and **an open floor plan**, meaning that the floor space was free to be configured into rooms without concern for supporting walls. The second floor of the Villa Savoye includes **long strips of ribbon windows** that allow unencumbered views of the large surrounding yard, and which constitute the fourth point of his system. The fifth point was the **roof garden** to compensate for the green area consumed by the building and replacing it on the roof.

A ramp rising from ground level to the third floor roof terrace allows for an architectural promenade through the structure. The white tubular railing recalls the industrial "ocean-liner" aesthetic that Le Corbusier much admired. As if to put an exclamation mark after Le Corbusier's homage to modern industry, the driveway around the ground floor, with its semicircular path, measures the exact turning radius of a 1927 Citroën automobile.

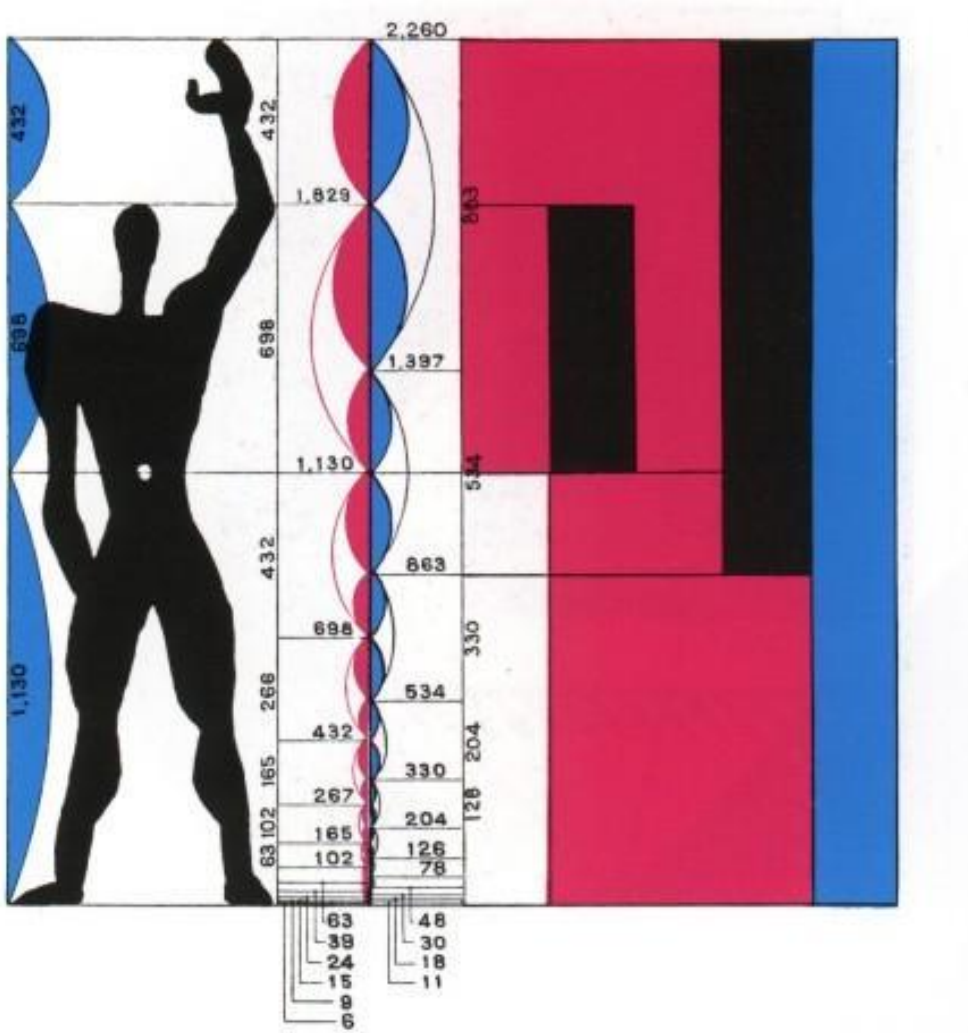
https://youtu.be/f1womjgDI_I

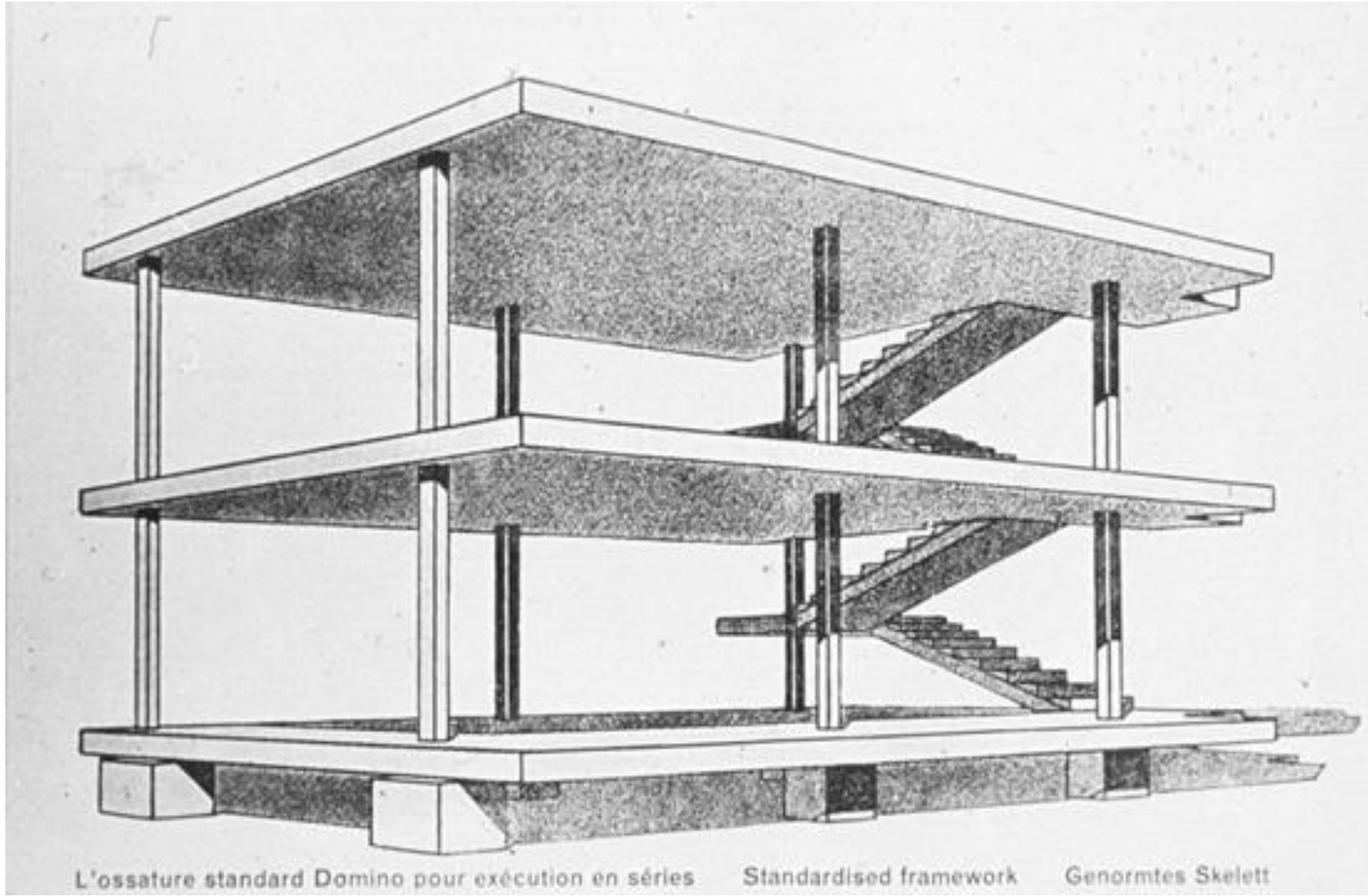
The Villa Savoye is probably Corbusier's best known building from the 1920s, it had enormous influence on international modernism.It was designed addressing his emblematic "Five Points", the basic tenets in his new architectural aesthetic:

•Support of ground-level pilotis, elevating the building from the earth and allowed an extended continuity of the garden beneath.
•Functional roof, serving as a garden and terrace, reclaiming for nature the land occupied by the building.
•Free floor plan, relieved of load-bearing walls, allowing walls to be placed freely and only where aesthetically needed.
•Long horizontal windows, providing illumination and ventilation.
•Freely-designed facades, serving only as a skin of the wall and windows and unconstrained by load-bearing considerations.

Le Corbusier explicitly used the golden ratio in his Modulor system for the scale of architectural proportion. He saw this system as a continuation of the long tradition of Vitruvius, Leonardo da Vinci's "Vitruvian Man", the work of Leon Battista Alberti, and others who used the proportions of the human body to improve the appearance and function of architecture. In addition to the golden ratio, Le Corbusier based the system on human measurements, Fibonacci numbers, and the double unit.

He took Leonardo's suggestion of the golden ratio in human proportions to an extreme: he sectioned his model human body's height at the navel with the two sections in golden ratio, then subdivided those sections in golden ratio at the knees and throat; he used these golden ratio proportions in the Modulor system.





L'ossature standard Domino pour exécution en séries Standardised framework Genormtes Skelett

https://youtu.be/hEkQvR-el3M

RONCHAMP CHAPEL

LEGISLATIVE BUILDING / / CHANDIGARH

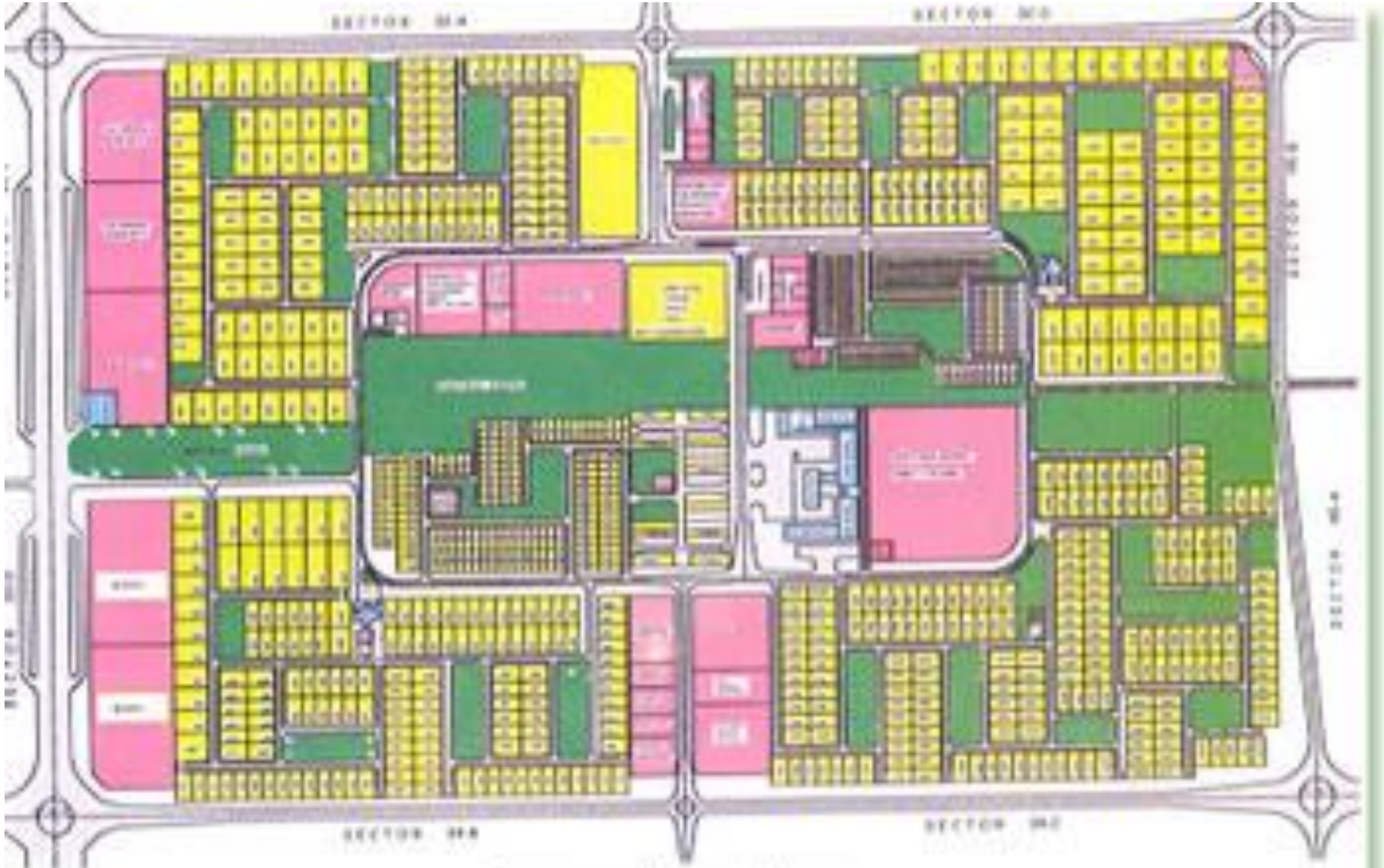
HIGH COURT//CHANDIGARH

LEGISLATIVE ASSEMBLY // CHANDIGARH

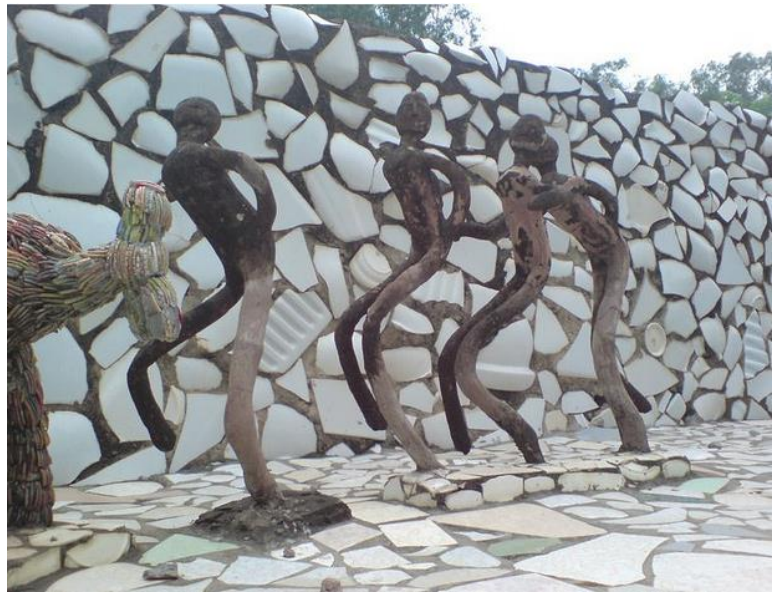
The Assembly Hall

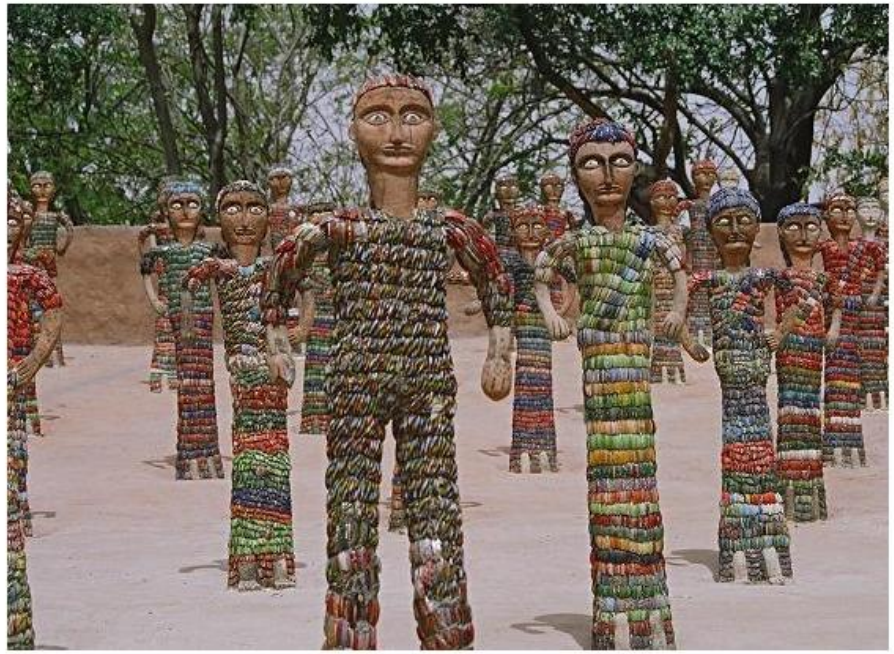

KAJHOLA
KHUDA ALI SHER
OPEN HAND MONUMENT
SUKHNA LAKE
KISHANGARH
ROCK GARDEN
BOUGAINVILLEA GARDEN
MANI MAJRA
KHUDA LAHORA
KHUDA JASSU
CITY MUSEUM
ART GALLERY
MADHYA MARG
P.G.I
CITY CENTRE
ROSE GARDEN
SHAKTI
BUS TERMINUS
PANJAB UNIVERSITY
DHANAS
RAILWAY STATION
DARIA
JAMALI
INDUSTRIAL AREA I
INDUSTRIAL AREA II
CHANDIGARH
SUKHNA
DAKSHIN MARG
HALLO MAJRA
DADU-MAJRA
TOPIARY PARK
TERRACED GARDEN
BEHLANA
AIR PORT
DEFENCE AREA
MAULOYA
PATIALA KI RAO
INTERNATIONAL BOUNDARY
LEISURE VALLEY


CHANDIGARH



Layout plan of a Sector

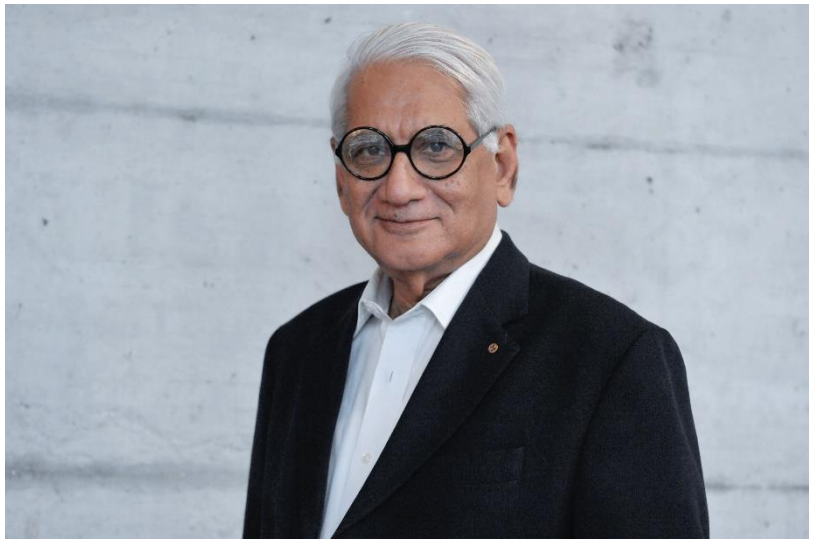




Rock Garden by Nek Chand

Mill owners buillding

The Open Hand (La Main Ouverte) is a recurring motif in Le Corbusier's architecture, a sign for him of "peace and reconciliation. It is open to give and open to receive." The largest of the many Open Hand sculptures that Le Corbusier created is a 28 meter high version in Chandigarh, India.

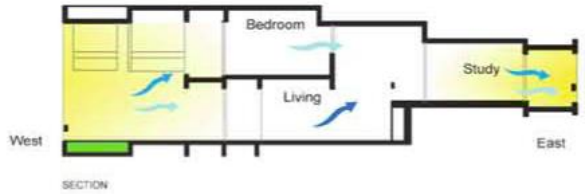


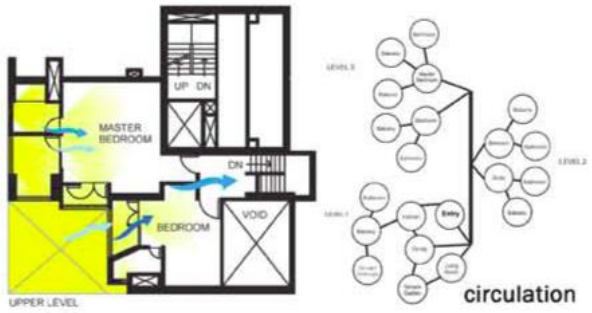
Charles Mark Correa (1 September 1930 – 16 June 2015) was an Indian architect and urban planner. Credited with the creation of modern architecture in post-Independent India, he was celebrated for his sensitivity to the needs of the urban poor and for his use of traditional methods and materials.

Charles Correa designed almost 100 buildings in India, from low-income housing to luxury condos. He rejected the glass-and-steel approach of some post-modernist buildings, and focused on designs deeply rooted in local cultures, all the while providing modern structural solutions under his creative designs. His style was also focused on reintroducing outdoor spaces and terraces

https://youtu.be/uzK86VPXUs8

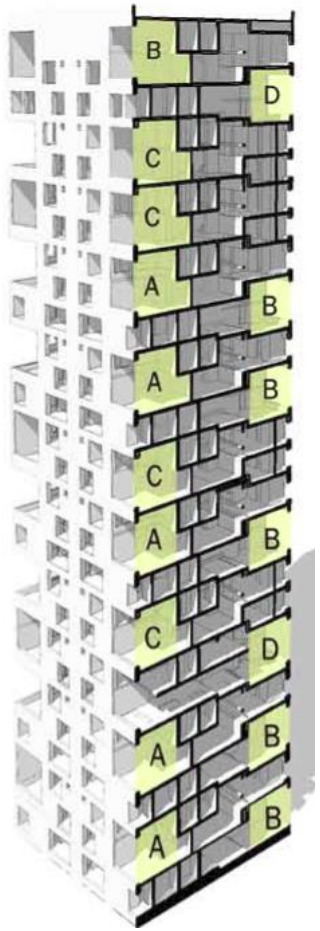
ORGANIZATION OF SPACE &
NATURAL SOURCES



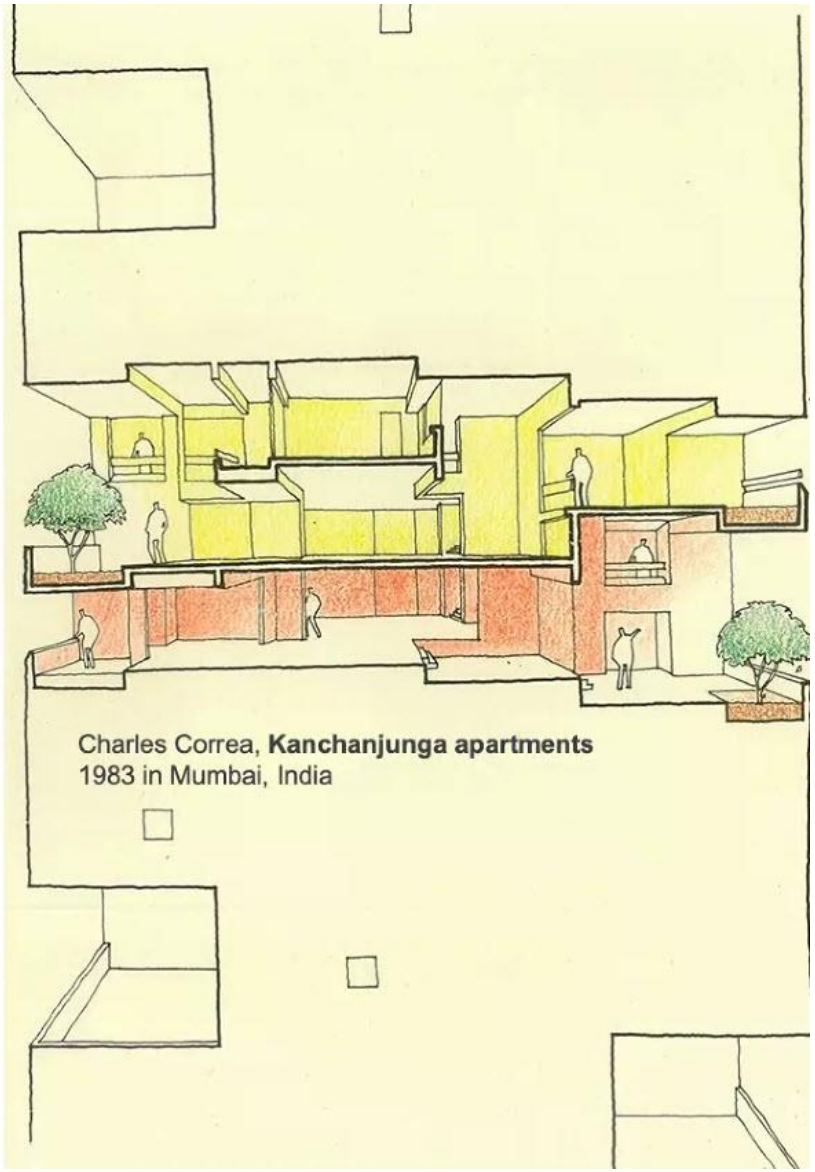


type A
daylight
breeze

MODULARITY



KANCHENJUNGA APARTMENTS



Charles Correa, **Kanchanjunga apartments**
1983 in Mumbai, India

BRITISH COUNCIL BUILDING//JAWAHAR KALA KENDRA

MIT SCIENCE BUILDING

CHAMPLIMAUD CENTRE

Elements :
Pergolas | Frames and Portals |Orthogonal Geometry

https://youtu.be/EpkixBvOrgU