

Islamic University-Gaza
Faculty of Engineering
Architecture Department



**Principles of Architectural and Environmental
Design
EARC 2417**

**LECTURE 4
OPENINGS & ORGANIZATION
OF FORM AND SPACE**

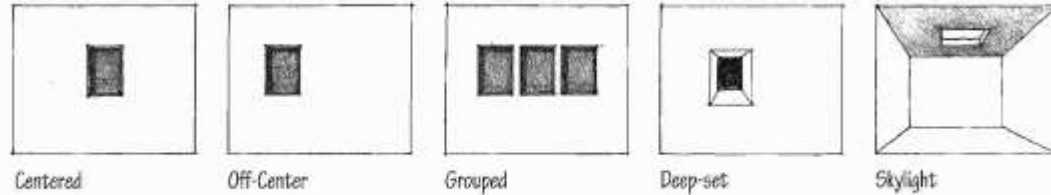
Instructor: Dr. Suheir Ammar
2015

1. OPENINGS IN SPACE DEFINING ELEMENTS

Use of Openings

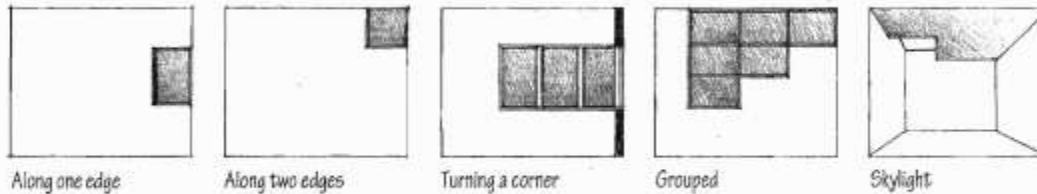
- For spatial or visual continuity with adjacent spaces
- Doors offer entry and influence the patterns of movement and use within a space.
- Windows allow light, offer views, establish visual relationships between adjacent spaces, and provide natural ventilation
- Openings can weaken the enclosure of the space depending on their size, number, and location.

Openings in Planes



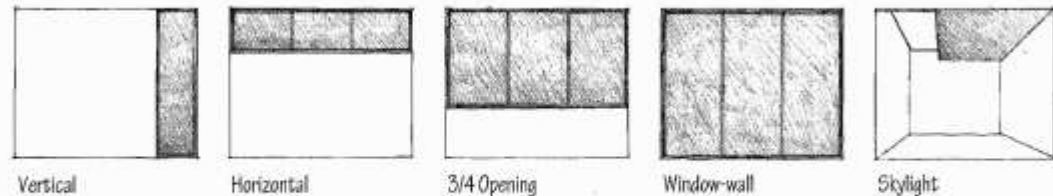
Within Planes

An opening can be located wholly within a wall or ceiling plane and be surrounded on all sides by the surface of the plane.



At Corners

An opening can be located along one edge or at a corner of a wall or ceiling plane. In either case, the opening will be at a corner of a space.

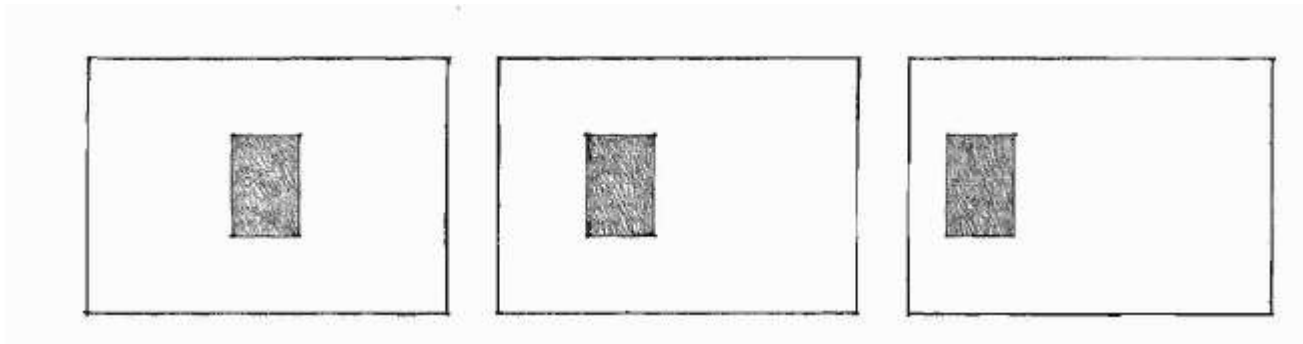


Between Planes

An opening can extend vertically between the floor and ceiling planes or horizontally between two wall planes. It can grow in size to occupy an entire wall of a space.

Openings in Planes

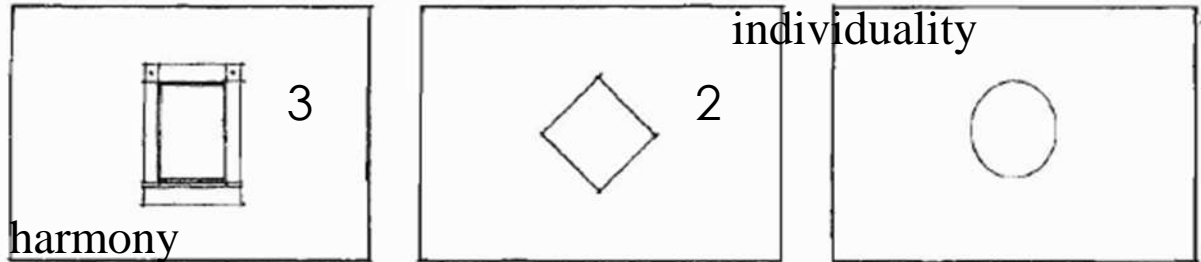
- ❖ If opening is cantered within the plane, the opening will appear stable and visually organize the surface around it.
- ❖ Moving the opening off centre will create a degree of visual tension between the opening and the edges of the plane toward which it is moved



stable

visual tension

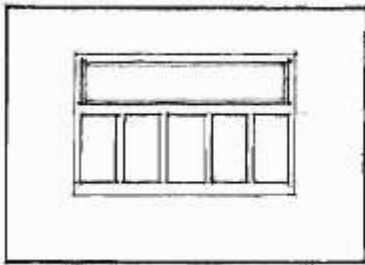
Openings in Planes



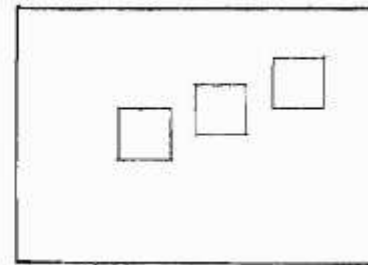
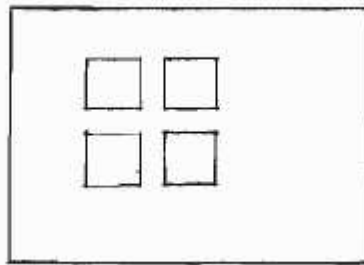
- ❖ If the shape of the opening similar to the shape of the plane, it will create a harmony compositional pattern.
- ❖ If its orientation contrast with the enclosing plane (1 & 2), it emphasizes its individuality as a figure.
- ❖ The singularity of the opening may be **visually reinforced with a heavy frame (3)**

Openings in Planes

- ❖ Multiple openings may be clustered to form a unified composition within a plane, or be staggered or dispersed to create visual movement along the surface of the plane.

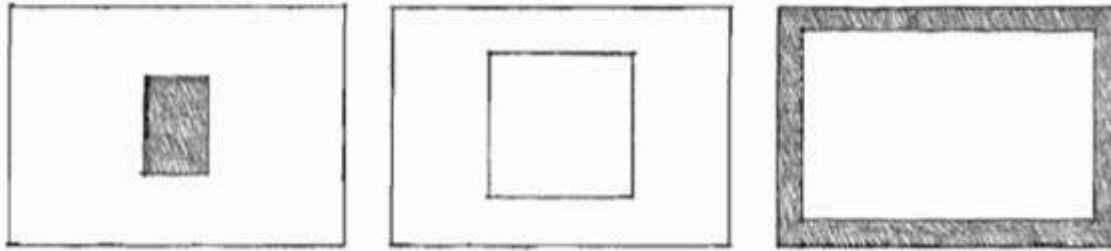


unified composition



visual movement

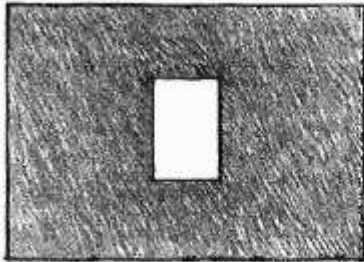
Openings in Planes



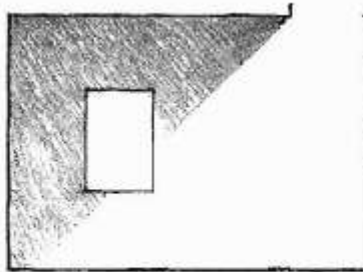
A Figure with heavy frame

- ❖ As an opening within a plane increases in size, it will at some point cease to be a figure within an enclosing field and become instead a positive element in itself, a transparent plane bounded by a heavy frame.

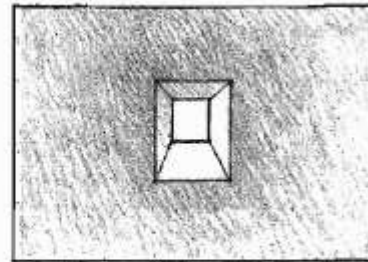
Strong contrast



a second light source

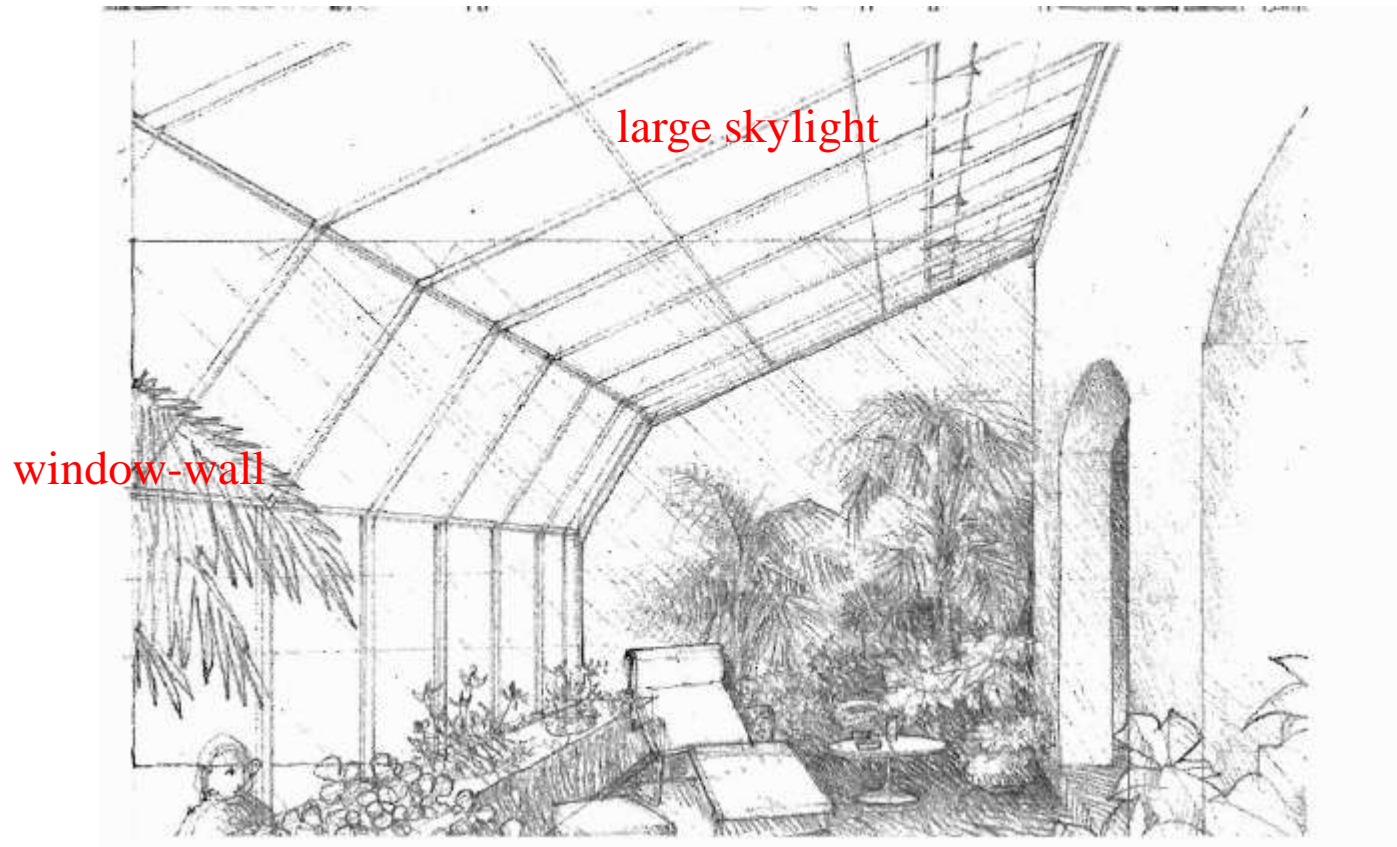


deep-set opening



Openings within planes naturally appear brighter than their adjacent surfaces.

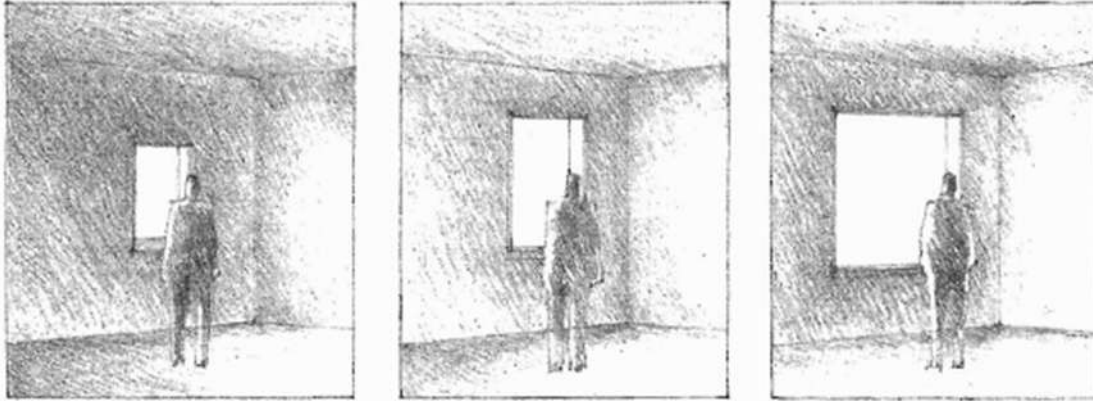
1. If the contrast in brightness along the edges of the openings becomes excessive,
2. the surfaces can be illuminated by a second light source from within the space,
3. or a deep-set opening can be formed to create illuminated surfaces between the opening and the surrounding plane.



large skylight

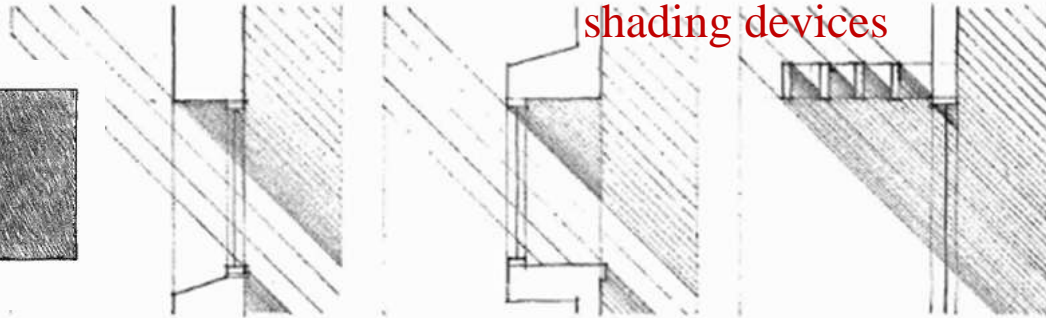
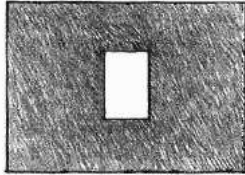
window-wall

Combining a window-wall with a large skylight overhead creates a sun room or green house space



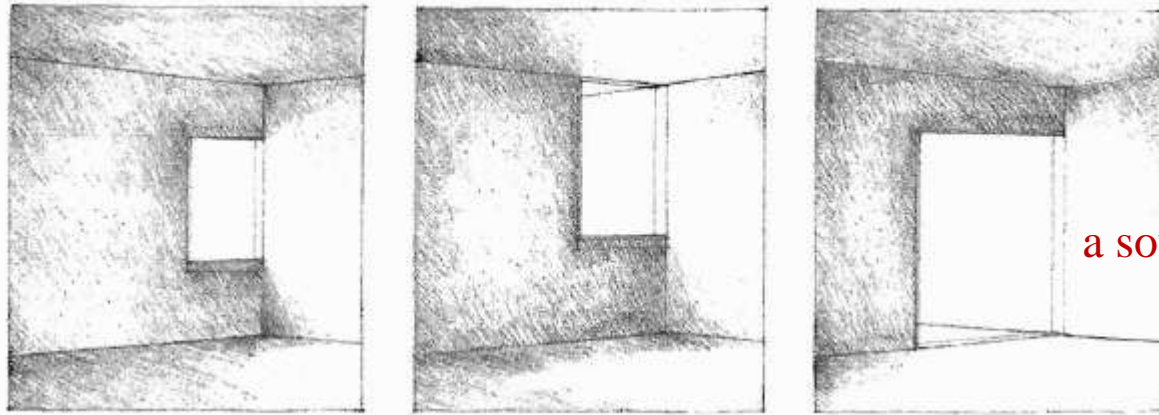
- The size of a window or skylight controls the amount of daylight a room receives.
- The size of an opening is affected by requirements for lighting, views, visual privacy, ventilation, the desired degree of enclosure for the space, and the effect of openings on the exterior form of a building.
- The location and orientation of a window or skylight, therefore, it can be more important than its size in determining the quality of daylight a room receives.

light and dark-



shading devices

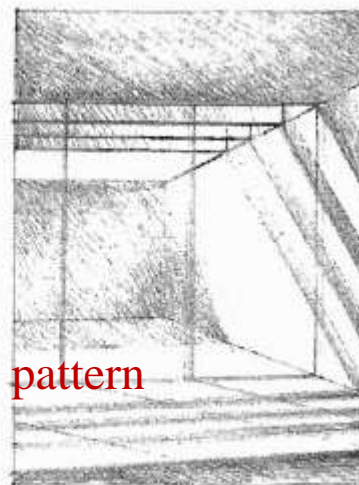
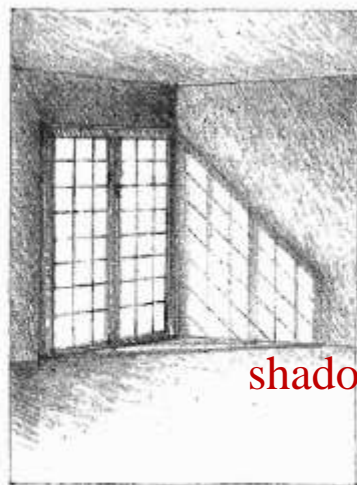
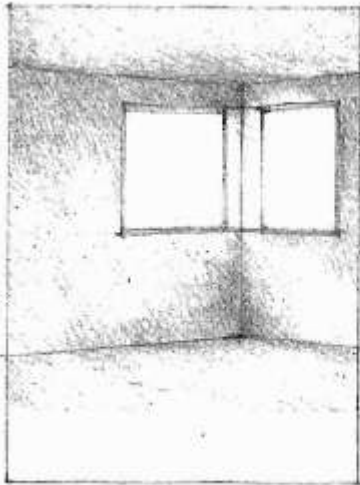
- An opening can be oriented to receive direct sunlight during certain portions of the day.
- Direct sunlight provides a high degree of illumination that is especially intense during midday hours. It creates sharp patterns of -light and dark- on the surfaces of a room and articulates the forms within the space
- Possible detrimental effects of direct sunlight, such as glare and excessive heat gain, can be controlled by shading devices built into the form of the opening or provided by the foliage of nearby trees or adjacent structures.



a source of light

- When an opening is located along the edge of a wall or at the corner of a room, the daylight entering through it will wash the surface of the wall adjacent and perpendicular to the plane of the opening.
- This illuminated surface itself becomes a source of light and enhances the light level within the space.

- ❖ The quality of light within a room is affected by the shape and articulation of an opening.
- ❖ This is reflected in the shadow pattern cast by sunlight on the forms and surfaces of the room.
- ❖ The color and texture of these forms and surfaces, affect their reflectivity and the light level within the space.



shadow pattern



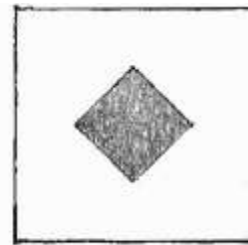
2. ORGANIZATION OF SPACES

ORGANIZATION OF SPACES

A. Spatial Relationships of two spaces

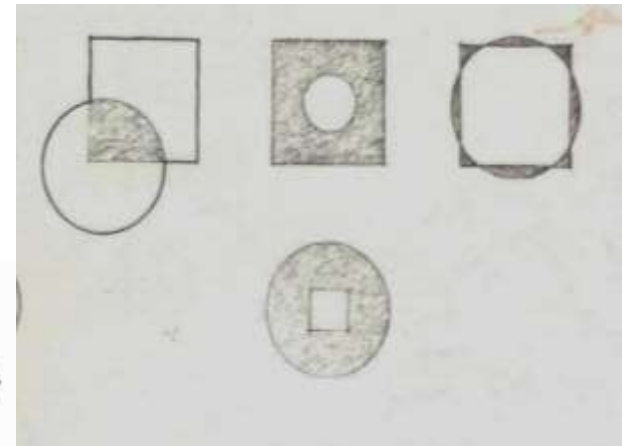
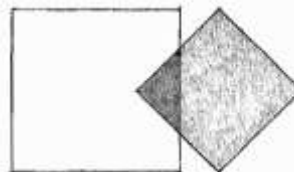
1. A space within a space

A space may be contained within the volume of a larger space.



2. Interlocking spaces

The field of a space may overlap the volume of an other space.



Additive Forms

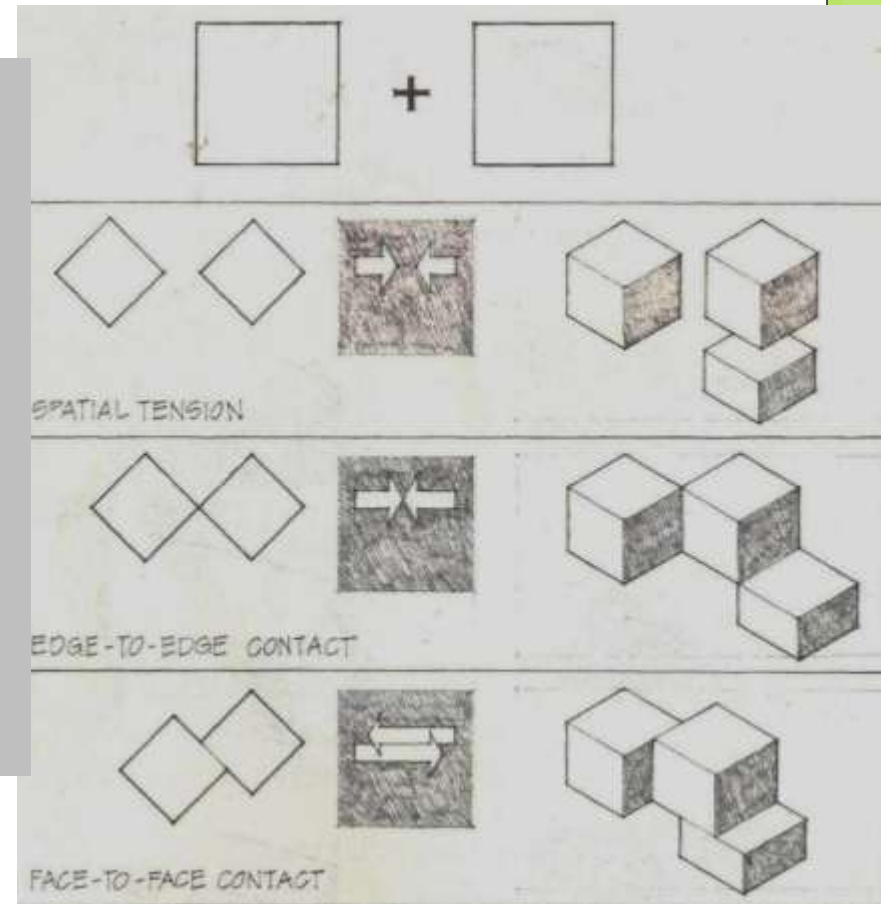
Basic possibilities to group two forms

3- Spatial Tension: Require forms to:

- **close** to each other
- **Share a common visual** feature (shape-material- color)

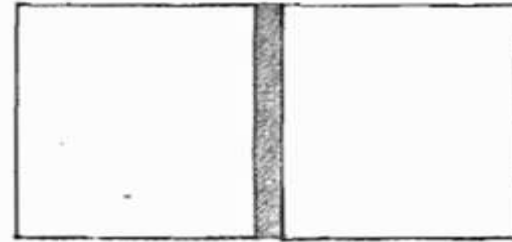
4- Edge to Edge Contact: mention

Two forms share a common edge



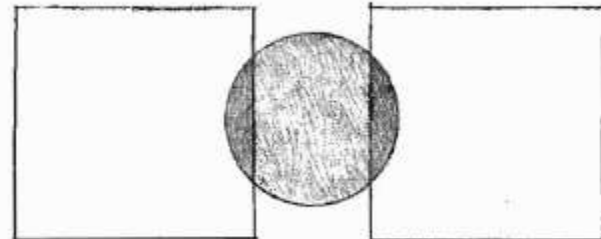
5. Adjacent spaces/ Face To Face Contact

Two spaces may abut each other or share a common border.



6. Spaces Linked by a common Space

Two spaces may rely on an intermediary space for their relationship.



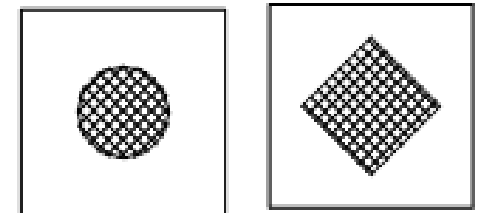
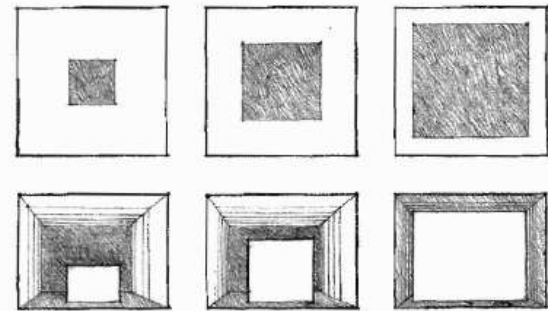
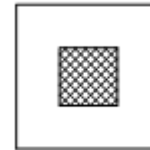
1- Space within Space.

Large space can envelop a smaller one.

- Visual and Spatial continuity can be easily accommodated. Relationship between the smaller one and the outdoor space depends on the nature of the larger one.
- Differentiation in size is necessary to consider this relationship.

When the small space grows to a degree that the larger one represents a thin layer, the original notion (Space within a space) will be destroyed.

- To increase the attention value, the smaller can be oriented in a different manner or differentiated by form representing functional difference or symbolic importance



2- Interlocking Spaces.

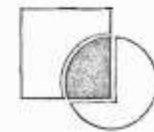
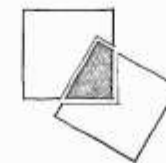
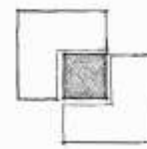
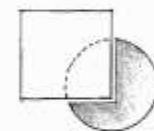
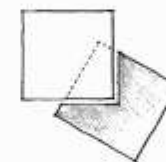
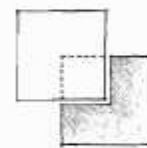
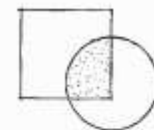
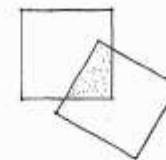
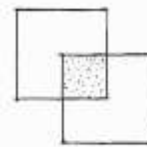
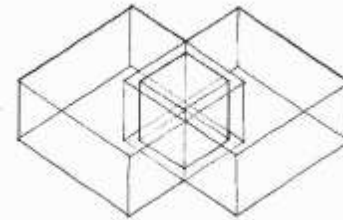
Two spaces whose fields overlap,
Each retains its identity,

- Possibilities of interlocking: the interlocking portion can be:

1- Shared equally by each space.

2- Merge with one of the spaces.

3- Developed as a separate space that serves to link the two original spaces.



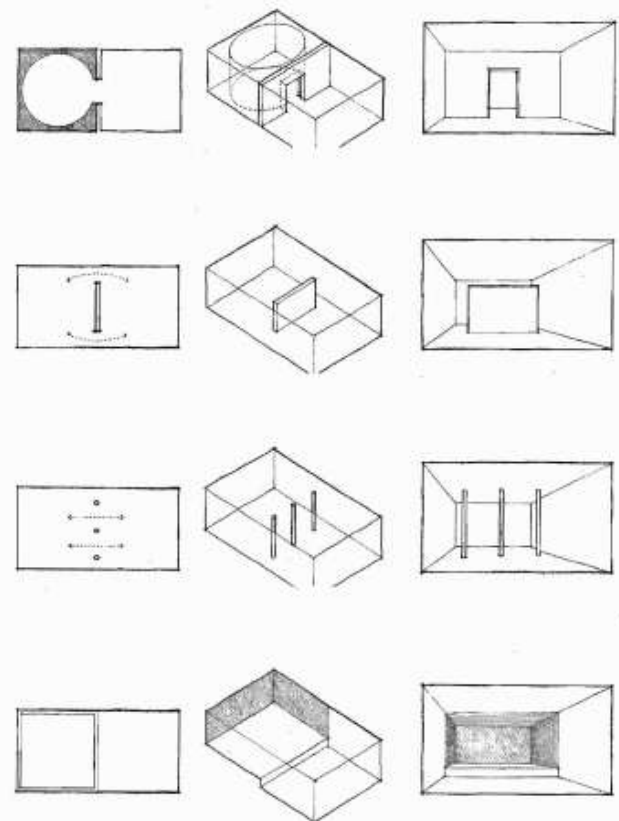
5. Adjacent Spaces.

It is the most common type.

Each space has its own definition (functional and symbolic requirements)

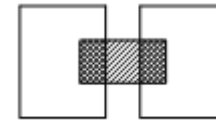
The two spaces are separated by a plane, which may:

1. Limit visual and physical movement from one to the other.
2. Appear as a free-standing plane or a row of columns in a single volume of space.
3. Be defined by vertical or horizontal elements.
4. A change in level or a contrast in surface material or texture between the two spaces.

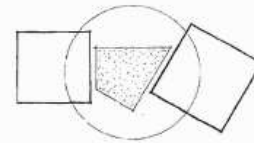


6. Spaces linked by a common space

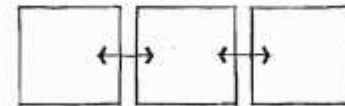
- The relationship between the two spaces depends on the third one (the linking one).
- The third space form may be determined by the form and orientation of the two spaces **or** differ in form or orientation to express its linking function.
- Linear sequence of spaces may result if the third one is equivalent in shape and size.
- The third can be:
 1. So long, it can join a series of spaces that have no direct relationship to one another
 2. large enough, become the dominant space.



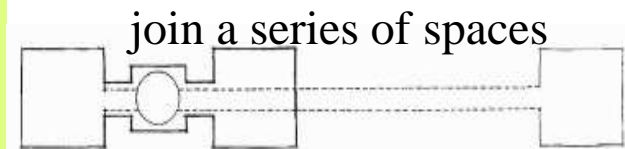
Same form



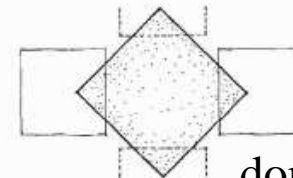
different form



equivalent

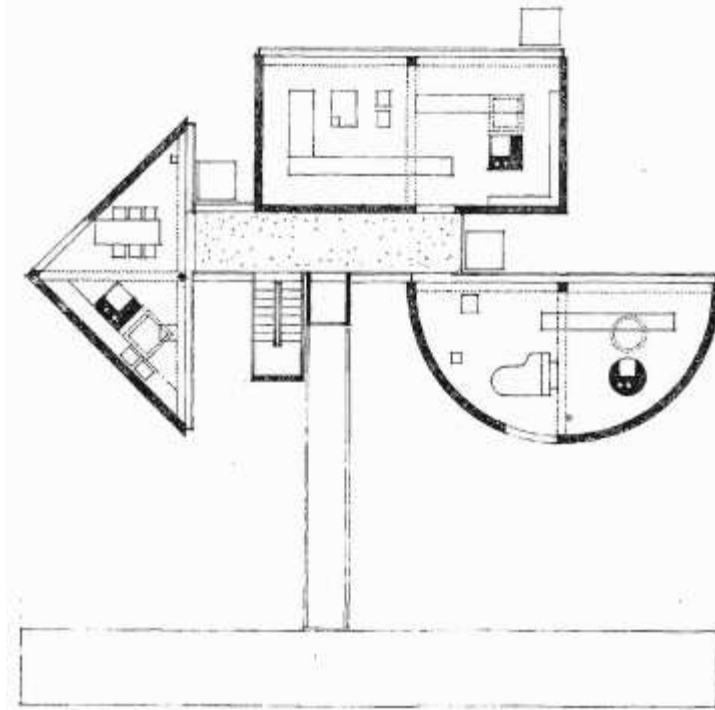


join a series of spaces



dominant space.

Spaces Linked by a Common Space



The basic ways of arranging and organizing spaces of a building

- In a typical building program, there are usually requirements for various kinds of spaces, there may be requirements for spaces that:
 1. Have specific function or require specific forms ***or***
 2. Flexible in use and can be freely manipulated.
 3. Functionally singular and unique in their function or significance to the building organization -- surgical operation rooms
 4. Have similar functions (grouped together) -- classes
 5. Require relationship with the exterior – living rooms
 6. Required to be segregated for privacy -- bedrooms
 7. Required to be easily accessible – guest rooms

The basic ways of arranging and organizing spaces of a building

The decision as to what type of spaces' organization to use in a specific situation will depend on:

1. The building program such as:

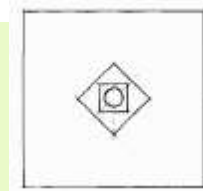
- Functional relationships.
- Dimensional requirements.
- Hierarchical classification of spaces.
- Requirements for access ,light, or view

2 Exterior conditions of the site that might limit the organization's form or growth. Or that might encourage the organization to address certain features of its site.

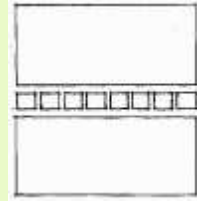
ORGANIZATION OF SPACES

B. Types of Spatial Organizations

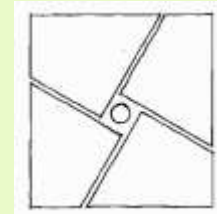
➤ **Centralized Organization**



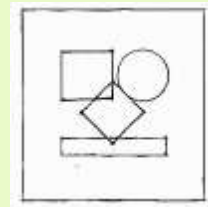
➤ **Linear Organization**



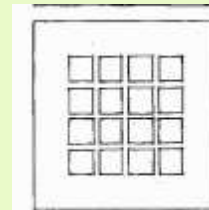
➤ **Radial Organization**



➤ **Clustered Organization**



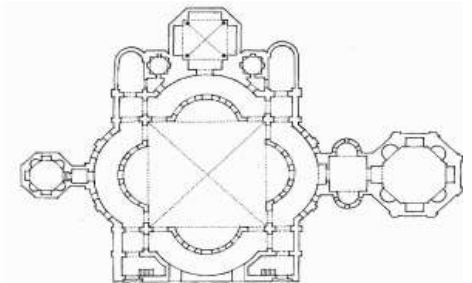
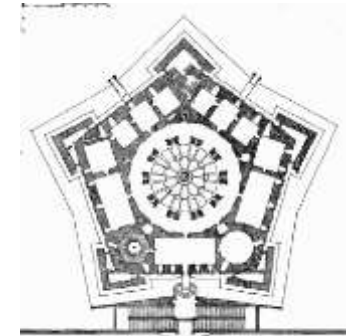
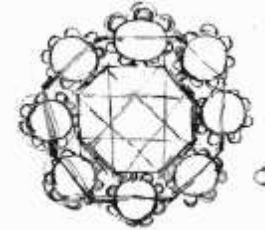
➤ **Grid Organization**



Kinds of Spatial Organizations

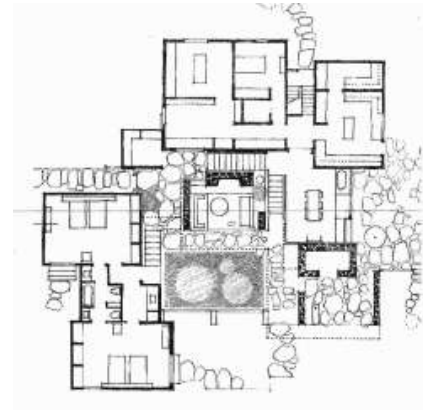
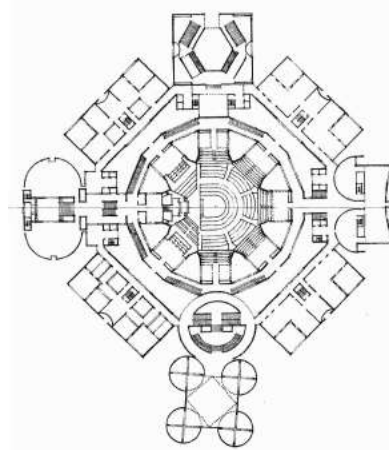
1. Centralized Organizations

- A number of secondary spaces are grouped around a large, regular dominant, central space.
- The centralized organization is non-directional.
- To show its direction, one of the secondary spaces must be specified.



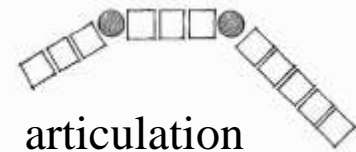
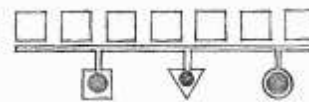
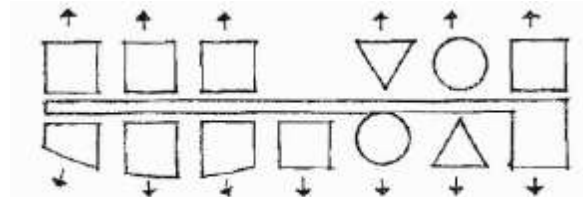
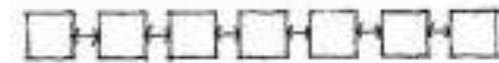
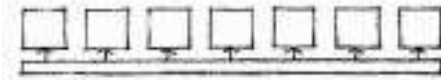
1. Centralized Organizations

- The secondary spaces **may be equivalent** to one another in function, form and size creating an overall regular and symmetrical about two or more axes.
- The secondary spaces **may differ** according to their individual requirements of function and context.



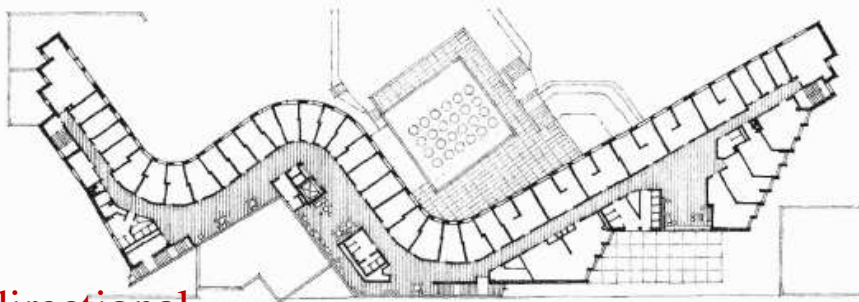
2. Linear Organizations

- Consists of a series of spaces.
- It can also consist of a linear space that organizes along its length different spaces that differs in size, form or function.
- Specific spaces along the series can be articulated by form, size or location.

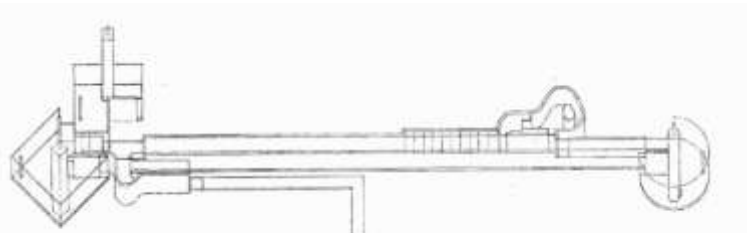


2. Linear Organizations

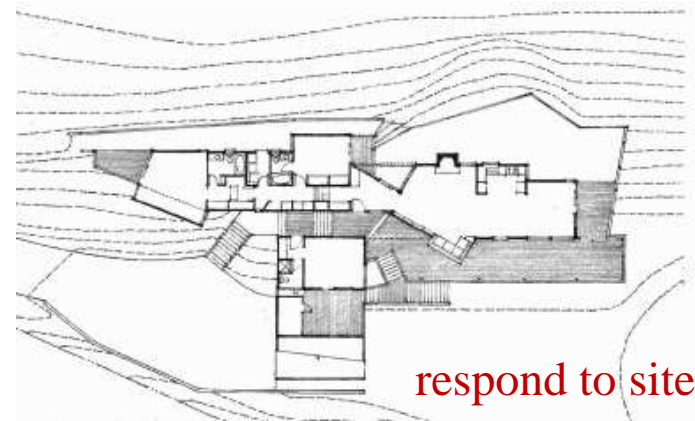
- The linear organization is directional and signifies movement, extension and growth.
- To limit its growth, distinct space can terminate the organization.
- The linear organization can easily respond to site conditions.



directional



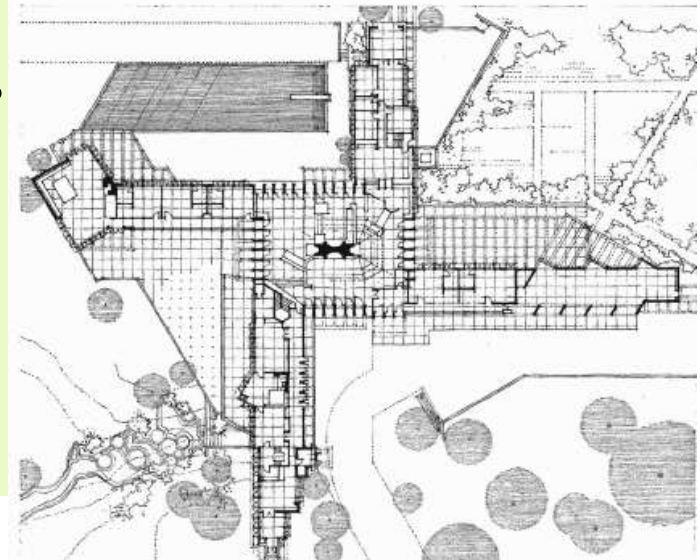
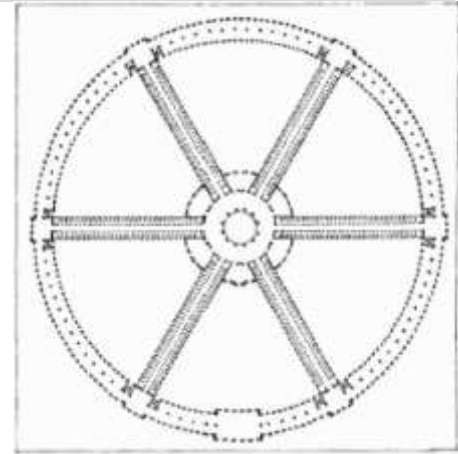
distinct space can make end



respond to site

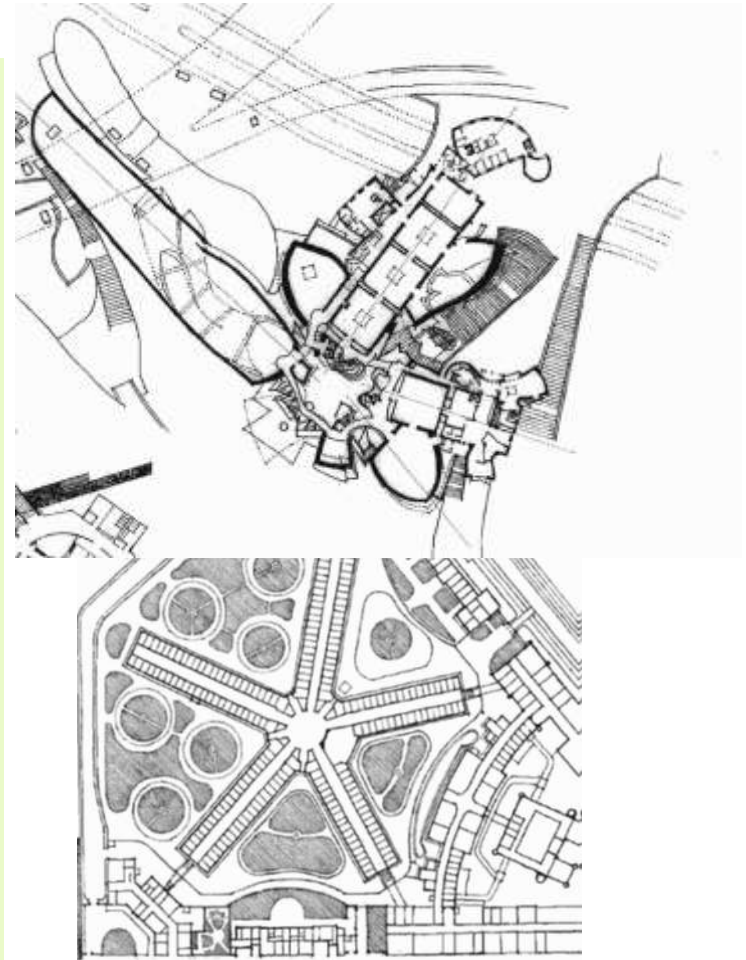
3. Radial Organizations

- The radial organization combines elements of both centralized and linear organizations.
- The central space represents the centralized organization with its different characteristics.
- Each linear arm represents the linear organization with its different characteristics



3. Radial Organizations

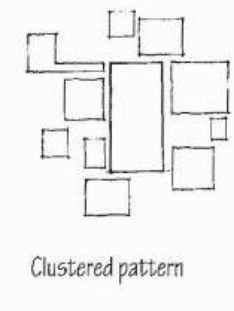
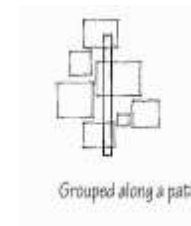
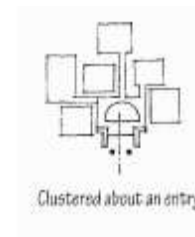
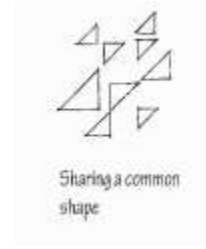
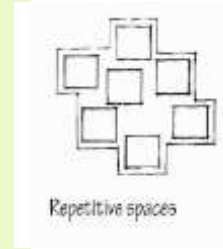
- These arms may differ from each other in function, form and size.
- At the same time, they may be similar in form and length, and maintain the regularity of the overall form.



4. Clustered Organizations

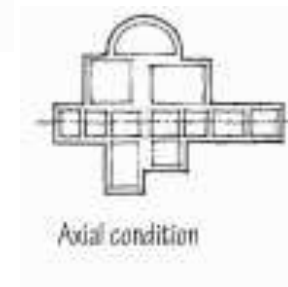
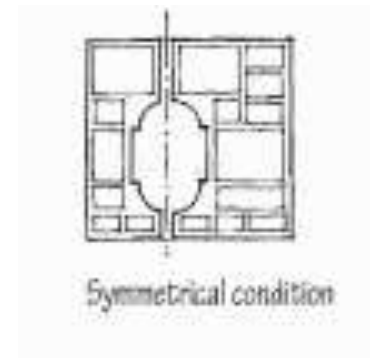
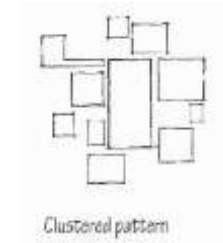
- The clustered organization often consists of either:
 - ❖ Repetitive spaces.
 - ❖ Spaces that share a common shape.
 - ❖ Spaces that share a common orientation.
 - ❖ Spaces that relate to one another by proximity or through an axis.

- Clustered spaces can be organized
 - ❖ About a point of entry.
 - ❖ Along a path of movement.
 - ❖ About a large defined field of space.
This pattern is similar to that of a centralized organization, but it lacks the latter's compactness and geometrical regularity

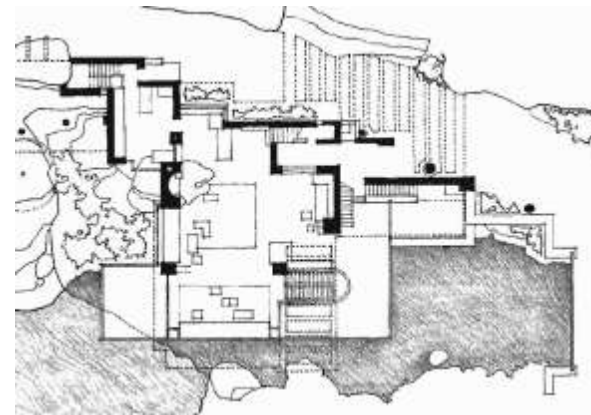
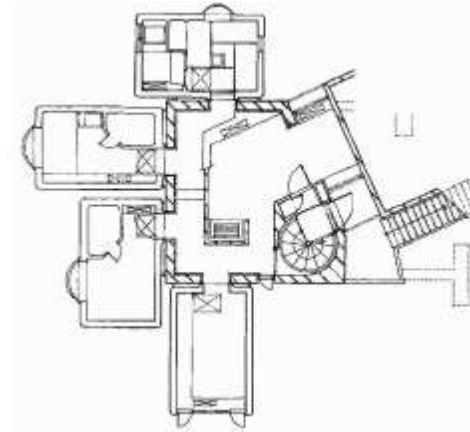
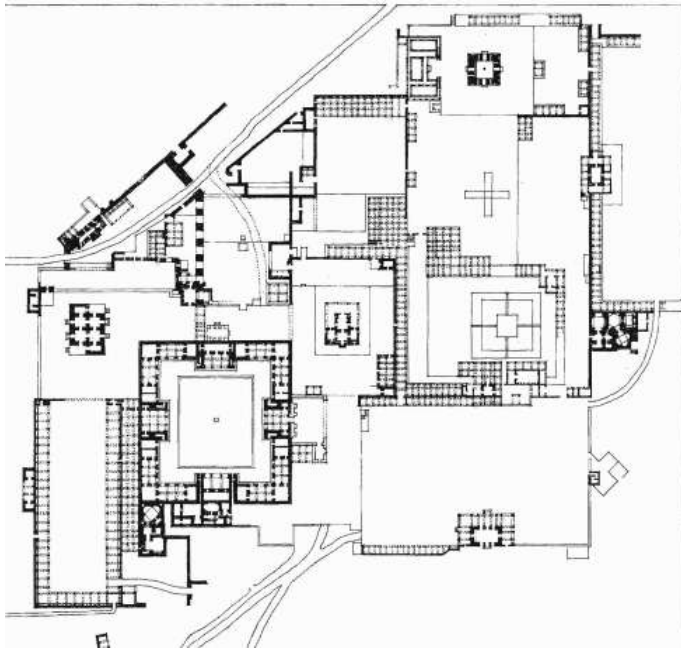


4. Clustered Organizations

- ❖ The form of a clustered organization is flexible and can accept growth and change readily without affecting its character.
- ❖ The importance of a space in this organization can be achieved by changing its size, form, or orientation within the pattern.
- ❖ Portions of a clustered organization can be strengthened by symmetry or axial condition.

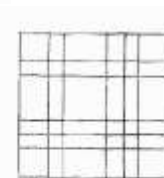
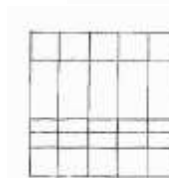
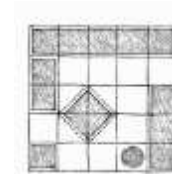
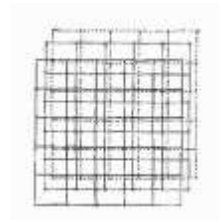
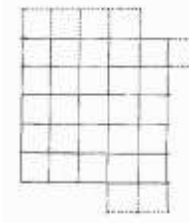
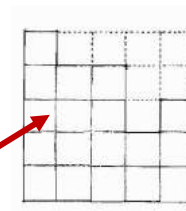


4. Clustered Organizations



5. Grid Organizations

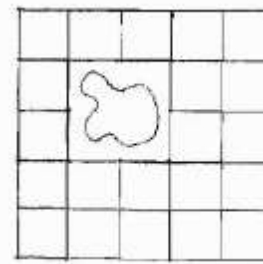
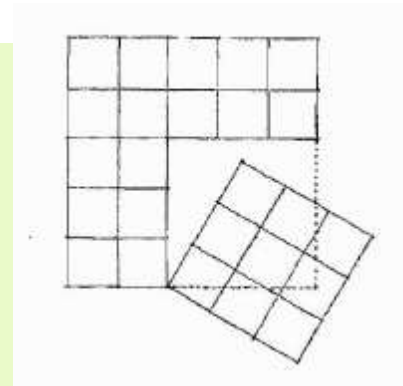
- Spaces are regulated by a three-dimensional grid pattern or field.
- Grid is created by establishing a regular pattern of points, which situated on equal distances.
- A grid is usually established by a skeletal structural system of columns and beams.
- It can be subtracted from, added to or layered and, at the same time, retain its identity as a grid with the ability to organize spaces.
- Within the field of this grid, spaces can occur as isolated events or as repetitions of the grid module.
- A grid can be made irregular in one or two directions.



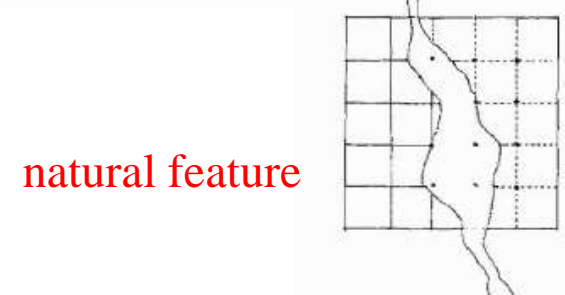
irregular

5. Grid Organizations

- To accommodate distinct requirements:
 - A portion of the grid can be rotated.
 - A grid pattern can be interrupted to define a major space or to accommodate a natural feature.

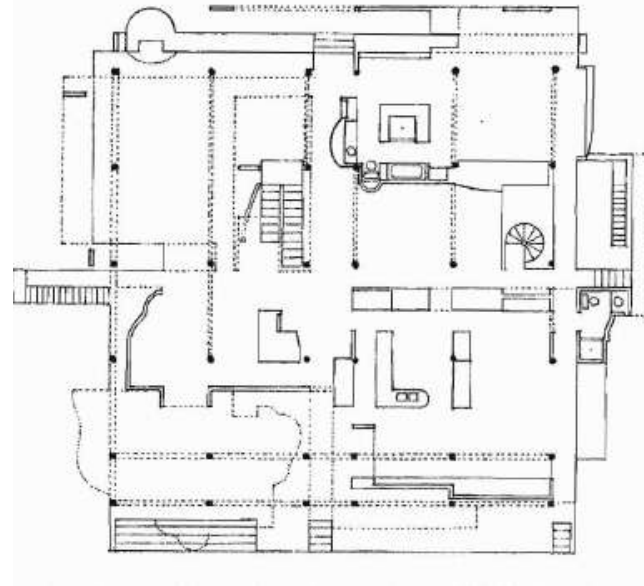
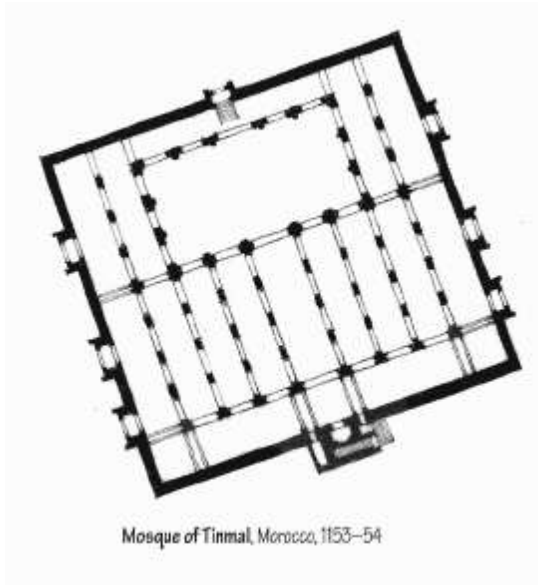


a major space



natural feature

5. Grid Organizations



Reference:

Ching, F. D. K. (2007). Architecture: Form, Space, and Order (3rd Edition ed.): John Wiley & Sons, Inc.

Thank you