3D DESIGN METHOD

Design of Experience

Dr.Dalia El-Dardiry

2010

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PREFACE

The basic component of college of architecture & planning and college of design is the design studio. It is the place where students learn how to design. The students work on a given design problem under the guidance of a studio instructor, they produce drawings and models to develop their design concepts.

The three dimensional design methods course is a teaching / learning activity in which design students are engaged in designing and building 3D compositions. This is one of a series of studio problems the students have to tackle in an introductory design course in order to learn the fundamentals of design. The strength of this course is that students learn design through doing it—a "learning by doing" approach.

The course development will emphasis on understanding functional and formal relationship in internal and external spaces, structure, environmental factors and all technical aspects of the assembly of the space.

This course provides an introduction to generic product design and development processes; covering aspects of research, concept/idea generation, concept development and the documentation/delivery of design outcomes. Design principles and basic engineering principles relevant to products will also be explored. Design briefs will be used as parameters for project based learning.

This manual therefore would become the guide to architecture and design students, and it does try to clarify the way designers can design in a proper way.

I wish that it enrich the experience in designing the perception of the designs. And I would like help all the architecture and design students to understand and involve with the three dimensional design concepts by dealing with the different three dimensional design methods.

To the ones who loved me more than their selves my parents and to my beloved husband and my sons Mohammed and Mahmoud. I respectfully dedicate this work.

ACKNOWLEDGMENT

First and foremost, praise is due to **ALLAH** the Almighty. He is the first to be thanked and acknowledged.

I would like to express my gratitude to many people throughout world, who had helped me to make this work possible. This includes my assistants; *Arch. Naila khan*, *Arch. Summaia Aljasser* and my students as well, in both the College of Architecture & Planning and the College of Design, University of Dammam, Saudi Arabia, who had presented their works here, and those who kindly submitted schemes that we were regretfully unable to include for variety of reasons.

I am especially indebted to *Dr. Hala Alwakeel* for her support and the enormous materials she brought to me, which helped me to produce this handout.

I would like to thank *Dr. Heba Mansour* for helping me in designing the cover of this handout.

Thanks also to *Mrs. Zainab Elshazly* for the dedication in typing and arranging the manuscripts.

Finally, I hope that **ALLAH** may accept this work purely for His sake.

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Psychological Aspects of Designing

"Important skills for everyone to have in the next decade and beyond are those that will allow us to create valuable, compelling, and empowering information and experiences for others. To do this, we must learn existing ways of organizing and presenting data and information and develop new ones. Whether our communication tools are traditional print products, electronic products, broadcast programming, interactive experiences, or live performances makes little difference. Nor does it matter if we are employing physical or electronic devices or our own bodies and voices. The process of creating is roughly the same in any medium."

Sensorial design to enhance participants' experience

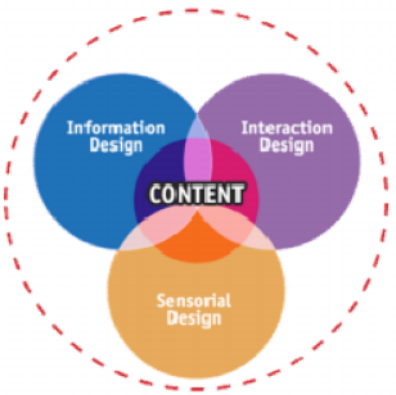


Figure 1-1: Sensorial design to enhance participants' experience. Source: Nathan Shedroff (1994).

Information Interaction Design is the intersection of the disciplines of Information Design, Interaction Design, and Sensorial Design. The goal of all of these processes is clear communication in appropriate forms.

Information design

Information Design is an approach to designing clear, understandable communications by giving care to structure, context, and presentation of data and information.

Its roots are in publishing and graphic design, and it addresses the organization and presentation of data: its transformation into valuable, meaningful information.

Interaction design

Interaction Design is an approach to designing interactive experiences (in any medium) which is concerned with the participant's experience flow through time.

Interaction Design, which is essentially story-creating and telling, is at once both an ancient art and a new technology. Media have always effected the telling of stories and the creation of experiences, but currently new media offer capabilities and

opportunities not yet addressed in the history of interaction and performance. How these skills are expressed through interactive technologies and what demands and interests audiences will have for these remains to be understood.

Sensorial design

Sensorial Design is a term used to include the presentation of an experience in all senses (visual, hearing, touch, smell, and taste). It is simply the employment of all techniques with which we communicate to others through our senses.

After writing, visual design techniques in disciplines such as graphic design, video graphic, cinematography, typography, illustration, and photography are usually the first to be recognized and employed, but the disciplines that communicate through other senses are just as important. Sound design and engineering and vocal performance are also useful in the appropriate circumstances.

The suitable levels of understanding are significant because they define the boundaries with which we can create and communicate.

Experience design

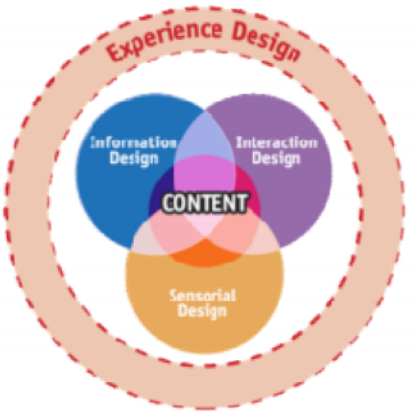


Figure 1-2: Experience design contains the three disciplines as a whole new discipline.
Source: Nathan Shedroff (1994).

Experience design is an approach to creating successful experiences for people in any medium. Includes consideration and design in all 3 spatial dimensions, over time, all 5 common senses, and interactivity, as well as customer value, personal meaning, and emotional context.

The elements that contribute to superior experiences are knowable and reproducible, which make them designable. Successful experiences are obtained by an appropriate interplay of the Information, Interaction, and Sensorial Design disciplines previously mentioned. This interplay is what is defined as Experience Design.

Many see Experience Design only as a field for digital media, while others view it in broader terms that encompass traditional, established, and other such diverse disciplines as theater, graphic design, storytelling, exhibit design, theme-park design, online design, game design, interior design, architecture, and so forth.

"The most important concept to grasp is that all experiences are important and that we can learn from them whether they are traditional, physical, offline experiences or whether they are digital, online, or other technological experiences....What these solutions require is for their developers to understand what makes a good experience first, and then to translate these principles, as well as possible, into the desired media without the technology dictating the form of the experience." [Shedroff, 1994]

The fundamentals are classified as the basic Elements of aesthetics, the Principles generated by these elements, and the Theories formed by an amalgamation of these principles.

ELEMENTS OF DESIGN

ELEMENTS OF DESIGN

Aesthetics in design

The issue of aesthetics in Design basically concerns with philosophical difference between following two sentences:

- Spaces in Design.
- Design in the spaces.

The very criteria, which differentiates the meaning of these two sentences, is actually the aesthetics of the design.

Beginners might get thoroughly confused, with the introduction of the word "art" as equal to the meaning of Design.

- The word "art" seems to have been derived from the Latin language. Ars, In the ancient Latin language means "skill" or "craft".
- Until the 17th-century, the word Ars (plural of which is artes) was used as the mastery over carpentry, pottery and the skills of metalwork. Later in the 18th-century, it was used to describe the mastery over the literary skills, like grammar and the art of expression etc.
- Around the 19th-century, the term aesthetics has emerged and the word art is being used to describe something which gives you an aesthetic experience.

Elements and principles of design are the building blocks used to create a work of art.

The fundamentals are classified as the basic **elements** of aesthetics, the **principles** generated by these elements, and the **theories** formed by an amalgamation of these principles.

Elements of design

- Line
- Shape
- Space
- Value
- Color
- Texture
- Form

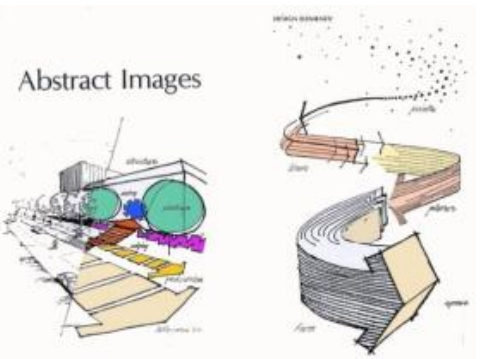


Figure 2-1: Elements of Design

(1) Line

A line is a form with width and length, but no depth. Artists use lines to create edges, the outlines of objects. A line is created by the movement of the designer's pen. Lines used to

follow the edges of forms are called contour drawings.

Types of line

1. **Outlines:** Lines made by the edge of an object or its shadow.
2. **Contour Lines:** Lines that describe the shape of an object and the interior detail.
3. **Gesture Lines** Line that are energetic and catch the movement and gestures of an active figure.

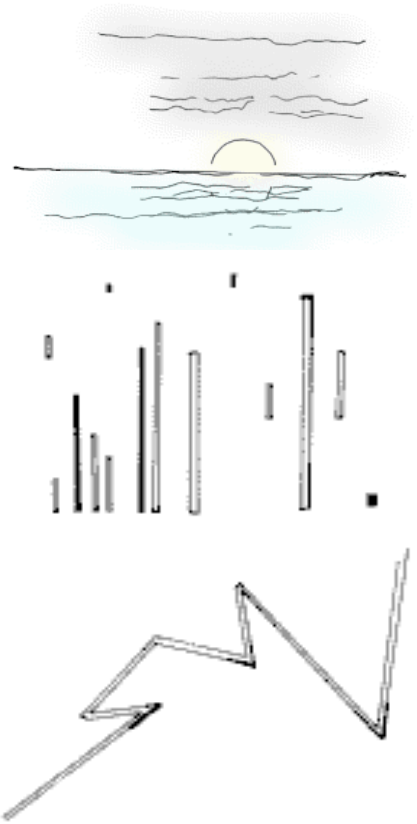


Figure 2-2: Types of Line.

4. **Sketch Lines:** Lines that captures the appearance of an object or impression of a place.

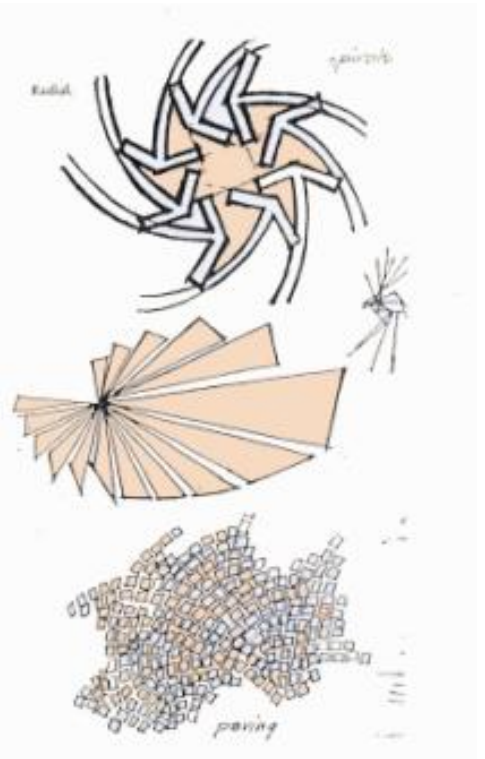


Figure 2-3: Sketch line.

5. **Calligraphic Lines:** Greek word meaning "beautiful writing". Precise, elegant handwriting or lettering done by hand. Also artwork that has flowing lines like an elegant handwriting.
6. **Implied Line:** Lines that are not actually drawn but created by a group of objects seen from a distance .The direction an object is pointing to, or the direction a person is looking at.

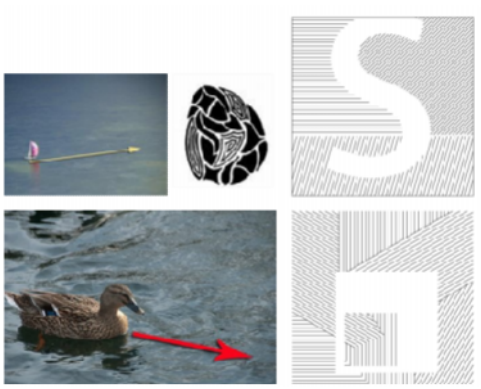


Figure 2-4: Implied line.

Linear perspective

Linear perspective is based on the idea that all lines will converge on a common point on the horizon called the vanishing point. You have observed linear perspective when you notice that the lines on the highway appear to meet at a point in the distance.

Figure 2-5: Linear perspective.

(2) Shape

- A shape is an enclosed object. Shapes can be created by line, or by color and value changes which define their edges.
- A shape is a self contained defined area of geometric or organic form. A positive shape in a painting automatically creates a negative shape.
- A shape is considered to be a two-dimensional element, while three-dimensional elements have volume or mass.

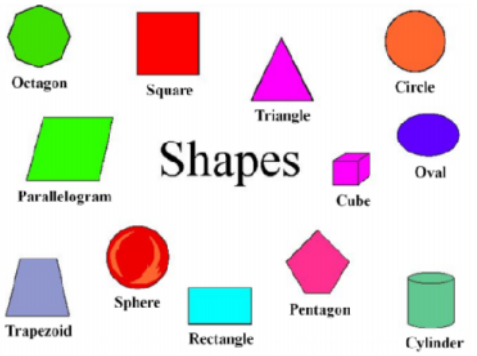


Figure 2-6: Shapes.

Categories of shapes

- **Geometric Shapes**: Circles, Squares, rectangles and triangles. We see them in architecture and manufactured items.
- **Organic Shapes:** Leaf, seashells, flowers. We see them in nature and with characteristics that are free flowing, informal and irregular.
- **Positive Shapes:** In a drawing or painting positive shapes are the solid forms in a design such as a bowl of fruit. In a sculpture it is the solid form of the sculpture.
- **Negative Shapes:** In a drawing it is the space around the positive shape or the shape around the bowl of fruit. In

sculpture it is the empty shape around and between the sculptures.

Figure 2-7: Organic shapes.

Figure 2-8: Positive and negative shape.

➥ **Static Shape:** Shapes that appears stable and resting.

Figure 2-9: Static shape.

➥ **Dynamic shape:** Shapes that appears moving and active. The architect needs to take a sociological approach towards design problems, in order to understand the problem from a perceiver's point of view and deal with it adequately.

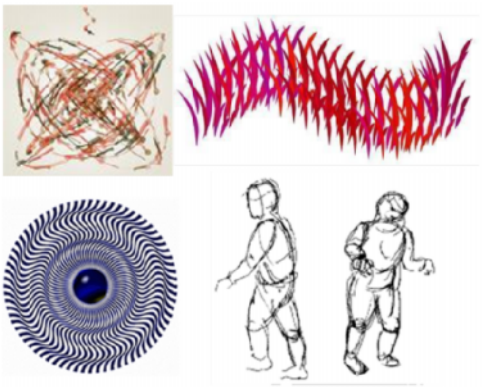


Figure 2-10: Dynamic shape.

(3) Space

Space is the three-dimensionality of a sculpture. With a sculpture or architecture you can walk around them, look above them, and enter them. A three-dimensional object will have height, width, and depth.

Figure 2-11: Space.

Space in a two-dimensional drawing or painting refers to the arrangement of objects on the picture plane. The picture plane is the surface of your drawing paper or canvas. A two-dimensional piece of art has heights and width but no depth. The illusion of depth can be achieved by using perspective. This is the technique used to have your picture look likes it is moving to the distance like a landscape.

Categories of space

- **Positive space**: Like in positive shape it is the actual sculpture or building.
- **Negative space**: Also like negative shape it is the space around the sculpture or building.
- **Picture Plane** is the flat surface of your drawing paper or canvas.
- **Composition** is the organization and placement of the elements on your picture plane.
- **Focal Point** is the object or area you want the viewer to look at first.

(4) Value

Value is the range of lightness and darkness within a picture. Value is created by a light source that shines on an object creating highlights and shadows. It also illuminates the local or actual color of the subject. Value creates depth within a picture making an object look three dimensional with highlights and cast shadows, or in a landscape where it gets lighter in value as it recedes to the background giving the illusion of depth.

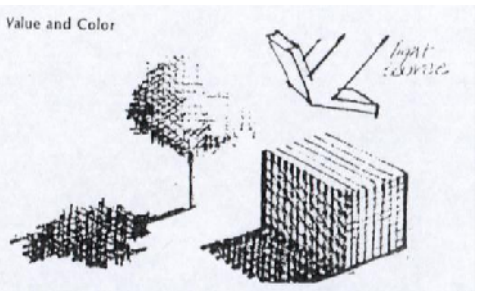


Figure 2-12: Value.

Categories of values

- **Shade** is adding black to paint to create dark values such as dark blue or dark red.
- **Tint** is adding white to color paint to create lighter values such as light blue or pink.
- **High-key** is where the picture is all light values.

Figure 2-13: High key value.

➥ **Low-key** is where the picture is all dark values.

Figure 2-14: Low key value.

➥ **Value contrast** is where light values are placed next to dark values to create contrast or strong differences.

Figure 2-15: Value contrast.

➥ **Value scale** is a scale that shows the gradual change in value from its lightest value, white to its darkest value black.

Figure 2-16: Value scale.

(5) Color

Color comes from light; if it weren't for light we would have no color. Light rays move in a straight path from a light source.Within this light rays are all the rays of colors in the

spectrum or rainbow. Shining a light into a prism will create a rainbow of colors because it separates the color of the spectrum. When the light rays hits an object our eyes responds to the light that is bounced back and we see that color. For example a red ball reflects all the red light rays. As artist we use pigments in the form of powder or liquid paints to create color.

Figure 2-17: Color.

Categories of color

Color Wheels a tool used to organize color. It is made up of:

- **Primary colors:** Red, Yellow, Blue these color cannot be mixed, they must be bought in some form.
- **Secondary color:** Orange, Violet, Green, these colors are created by mixing two primaries.
- **Intermediate colors:** Red Orange, Yellow Green, Blue Violet, etc.; mixing a primary with a secondary creates these colors.
- **Complementary colors:** Are colors that are opposite each other on the color wheel. When placed next to each other they look bright and when mixed together they neutralize each other.

Figure 2-18: Categories of color.

Color harmonies

Color Harmonies is when an artist uses certain combinations of colors that create different looks or feelings.

- **Analogous colors** are colors that are next to each other on the color wheel for example red, red orange, and orange are analogous colors.
- **Triadic harmony** is where three equally spaced colors on the color wheel are used for example, yellow, Red, Blue is a triadic harmony color scheme.
- **Monochromatic** is where one color is used but in different values and intensity.
- **Warm colors** are on one side of the color wheel and they

give the feeling of warmth for example red, orange and yellow are the color of fire and feel warm.

- **Cool colors** are on the other side of the color wheel and they give the feeling of coolness for example blue, violet, are the color of water, and green are the color of cool grass.

(6) Texture

Texture is the surface quality of an object. A rock may be rough and jagged. A piece of silk may be soft and smooth and your desk may feel hard and smooth. Texture also refers to the way a picture is made to look rough or smooth.

Surface texture is the combination of fairly short wavelength deviations of a surface from the nominal surface. Texture includes roughness, waviness, and lay.

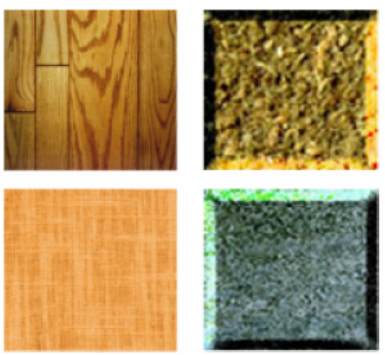


Figure 2-19: Texture.

Categories of texture

- Real Texture is the actual texture of an object. Artist may create real texture in art to give it visual interest or evoke a feeling. A piece of pottery may have a rough texture so that it will look like it came from nature or a smooth texture to make it look like it is machine made .
- Implied Texture is the where a two-dimensional piece of art is made to look like a certain texture but in fact is just a smooth piece of paper. Like a drawing of a tree trunk may look rough but in fact it is just a smooth piece of paper.

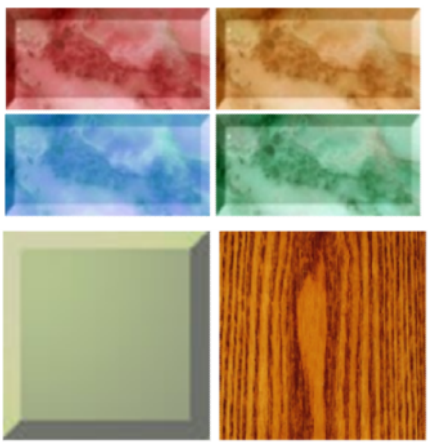


Figure 2-20: Soft surfaces.

Figure 2-21: Rough surfaces.

(7) Form

Form is the three-dimensionality of an object. Shape is only two-dimensional; form is three-dimensional. You can hold a form; walk around a form and in some cases walk inside a form. In drawing or painting using value can imply form. Shading a circle in a certain manner can turn it into a sphere.

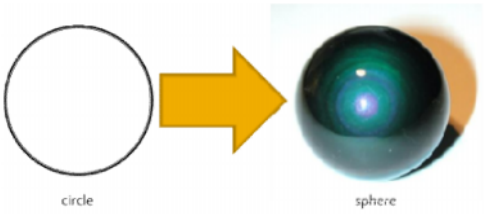


Figure 2-22: Form.

Types of form

The four basic Forms are:

- Cube
- Cylinder
- Cone
- Sphere

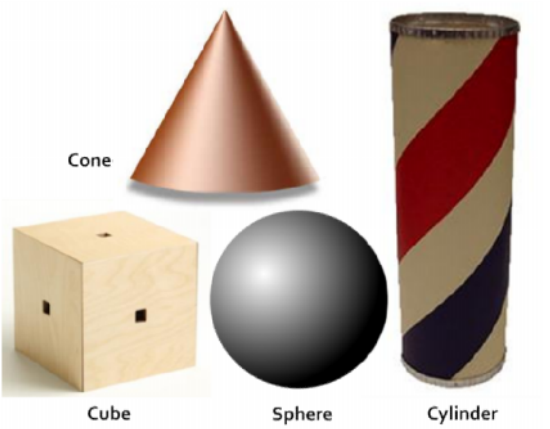


Figure 2-23: Types of form.

PRINCIPLES OF DESIGN

PRINCIPLES OF DESIGN

In nature as well as in our built environment, in our art forms, we find reflections of the various aesthetic fundamentals.

Principles of design

- Focal Point
- Repetition
- Sequence
- Rhythm
- Balance
- Movement & Radiation
- Sense of Direction
- Background – Foreground
- Symmetry - Asymmetry

(1) Focal point

The square and the rectangle are the central favorite formats, as their tensions do not overpower the drama of points, lines, shapes and colors that is to take place within their boundaries. Circles, triangle and rhomboids are difficult formats, because they are commanding in their own right as shapes.

The perceptual forces in the neutral shapes like the square and the rectangle run from top to bottom and from side to side at right angles to each other, and from corner to corner diagonally through the centre of the format, where all tensions cross.

However, our eye tends to seek an area just above this actual centre, and this is the visual centre or focal point of the format.

Figure 3-1: Focal point.

In realistic art the focal point is usually quite easy to spot. Larger figures, usually found in the foreground, provide a focal point. Even in non-realistic art, it is usually easy to spot the focal point. If most of the figures are horizontal, a vertical element will stand out as a focal point.

Emphasis by contrast

If the rest of the elements are irregular, a geometric shape will stand out.

If most of the elements are dark, a splash of light color will catch the eye.

Figure 3-2: Emphasis by contrast.

Emphasis by isolation

If most of the elements in a work of art are grouped closely together, an object by itself stands out as a focal point.

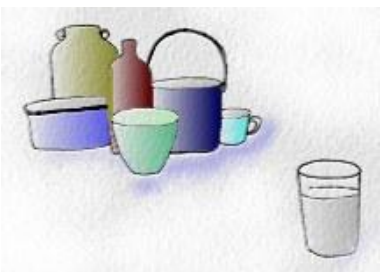


Figure 3-3: Emphasis by isolation.

Emphasis by placement

An object placed in the center will often be perceived as a focal point. If all eyes in the painting look at one object, or if an object is placed at the center of the lines of perspective, that object will be perceived as the focus of the work.

Figure 3-4: Emphasis by placement.

This painting (Figure 3-4) by John Trumbull, entitled The Surrender of Lord Cornwallis, shows how a focal point can be emphasized both by placement and by eye direction.

(2) Repetition

Figure 3-5: Repetition.

Even a simple composition comprising points and lines would reflect the fundamental considerations in design: position and repetition. Position is relative - points and lines must relate to other points and lines, and to other elements (if any), and more importantly, to the intervals of space between and around them.

The arrangement of points and lines in variously related positions gives rise to some kind of repetition.

(3) Sequence

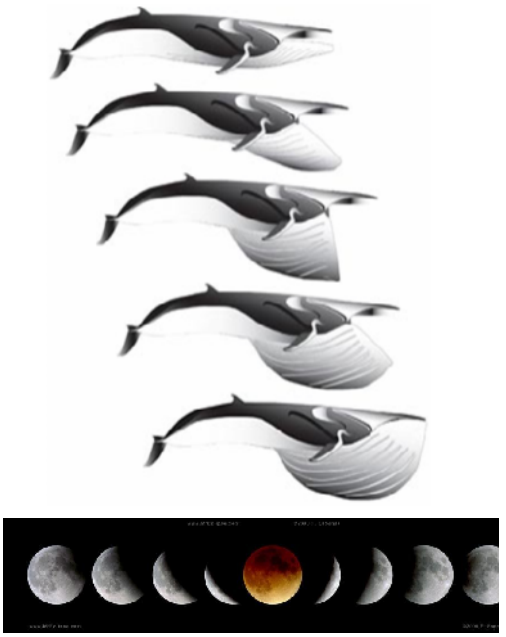


Figure 3-6: Sequence.

The simplest type of repetition is a Sequence, in which points, lines, shapes or forms are repeated at regular intervals, as in a row of buttons on a shirt. Designers of printed fabric, wallpaper, wrapping paper, tile or mosaic figurations have to decide on a different, more continuous scheme of repetition.

Complex patterns use motifs, the complexity increasing as we use two or more motifs, or invert alternate motifs. Intricate motifs or interlocking geometric motifs make it necessary to explore other plane-filling systems.

(4) Rhythm

Figure 3-7: Rhythm.

Rhythm consists of a directional movement created by patterns having strong and weak pulsations. Rhythm, in music, is a constituent of time and movement. There is rhythm in the seasons, in the phases of the moon and the tides of the seas, in the chirping of birds and insects, in the voices of animals and in the

movement patterns of snakes and crabs. There is rhythm in man - in his walking, running, and breathing, and in his speech.

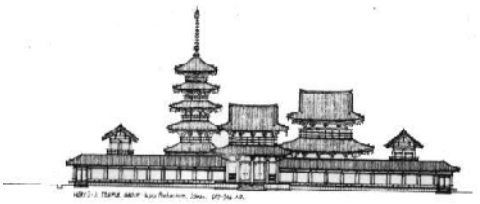


Figure 3-8: Building rhythm.

Rhythm refers to the way your eye moves throughout a picture. Some pictures move you throughout in a connected, flowing way much like a slow, stately rhythm in music. Other pictures move you from one place to another in an abrupt, dynamic way much like a fast, staccato rhythm in music will give you the impression of movement. **Rhythm in art is created by the repetition of elements**. Similarity of elements, or flowing, circular elements will give a more connected flowing rhythm to a picture, while jagged, or unrelated elements will create a more unsettling, dynamic picture.

Figure 3-9: Sky line rhythm.

(5) Balance

Figure 3-10: Balance.

Axis

A line established by two points in space, and about which forms and spaces can be arranged.

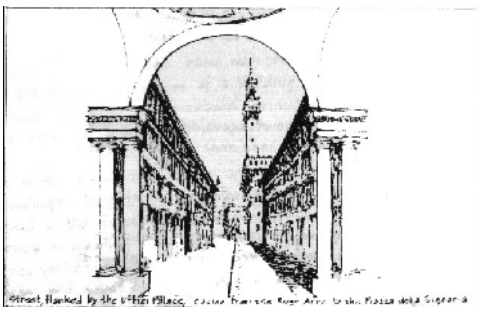


Figure 3-11: Axis.

Balance by eye direction

Your eye can be led to a certain point in a picture depending on how the elements are arranged. If the people in a picture are looking in a certain direction, your eye will be led there as well.

Elements in a picture, such as triangles or arrows, will also lead your eye to look to a certain point and maintain the balance of a picture. Look how the eye

direction of the dancers and musicians in this painting by Seurat lead your eye to the small gaslights which provide a focal point in this painting.

Figure 3-12: Balance by eye direction.

(6) Movement and radiation

Figure 3-13: Movement and radiation.

Fuzzy outlines

When figures move past us at very high speeds, we perceive that figure as somewhat blurry. This experience leads us to interpret blurry or indistinct outlines as conveying motion.

Figure 3-14: Fuzzy outlines.

Anticipated movement

Live figures portrayed in unstable body positions cause us to feel that motion is imminent. We know from past experience with these positions that some kind of movement will occur. This heightens the feeling of motion.

Figure 3-15: Anticipated movement.

Optical movement

In optical movement, the eye is forced to move around the picture dynamically in order to see all the different elements. Optical movement can be enhanced by curved forms that keep your eyes moving in a circular pattern throughout the picture.

Figure 3-16: Optical movement.

Multiple image

Similarly, showing multiple overlapping images gives us the impression of motion. We can see that the person or figure has moved through a series of poses.

Figure 3-17: Multiple image.

Optical illusions

Certain optical illusions based on the repetition of geometric forms will cause your eye to produce motion where none is present. This picture really seems to move, doesn't it?

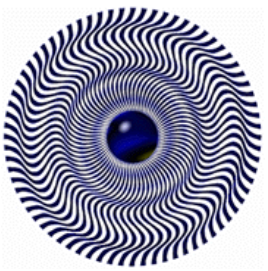


Figure 3-18: Optical illusions"1".

Look at the two images below. The painting by Matisse is full of sweeping circular areas which move your eye around the picture (it is a good example of optical movement). The elements are flowing and circular and give you the impression of a calm quiet rhythm. The line drawing is more dynamic due to its incomplete nature and the feeling of motion is much more evident.

Figure 3-18: Optical illusions"2".

(7) Sense of direction

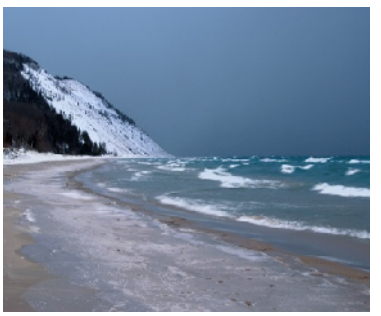


Figure 3-19: Sense of direction"2".

A single point tends to be static; but a series of points, a broken line or a line is perceived (by the eye) as a movement in a particular direction. Since we are psychologically tuned from the left to right trajectory, even a straight line drawn on a paper is perceived as going from left to right probably because most people also write and draw in the same fashion. It would be interesting to observe the drawing instinct of people who, as children, have first learnt such languages as Urdu or Chinese, which are not written in the standard left to right pattern.

Figure 3-20: Sense of direction"2".

In a composition, direction and focal point are seen in conjunction with each other, and enhancing each other. In architecture too, some elements are used to give a sense of direction. While friezes, bands and borders lend horizontality; minarets, cones and pyramids lead the eye upwards, highlighting verticality.

(8) Background – foreground

This explains how we use elements of the scene which are similar in appearance and shape and group them together as a whole. Similar elements (figure) are contrasted with dissimilar elements (ground) to give the impression of a whole. The lighthouse stands out as the figure, while the horizontal blue lines are perceived as ground.

Escher often designed art which played around with figure and ground in interesting ways. Look at how figure and ground interchange in this print.

Figure 3-21: Background – foreground.

A breakdown of figure and ground occurs with camouflage,

where the objective is to make the figure so much like the ground that it disappears from view. Notice the painting of the bird below. Only with great difficulty can you separate the bird from the log it is perched on. Figure and ground have merged together.

(9) Symmetry - asymmetry

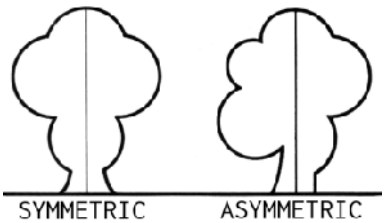


Figure 3-22: Symmetry – asymmetry.

Stabilized repetition is balance - it restrains movement and organizes weights around a centre of gravity. A pull in one direction is counteracted by a pull in its opposite direction - and this balance when encountered in art and design can only be perceived by the observer.

Visual balance can be achieved by using pleasing proportions of positive and negative spaces - when one area of visual dominance in the composition is combined with other areas taking on a subordinate role. So, a small positive area may visually balance a negative area of a much larger physical size.

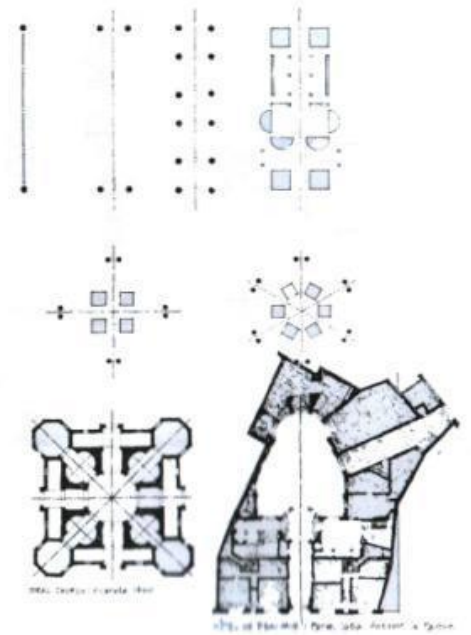


Figure 3-23: Symmetry – asymmetry.

SERIAL PLANES

THREE DIMENSIONAL DESIGN METHOD

Serial Planes

- Points determine a line. Lines determine a plane. Planes determine a volume.
- A line can be represented by a series of points.
- A plane can be represented by a series of lines.
- A volume can be represented by a series of planes.
- When a volume is represented by a series of planes, each plane is a cross section of the volume.

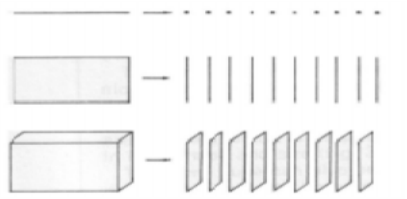


Figure 4-1: Serial planes.
Source: Wucius Wong

- Each serial plane can be considered as a unit form which may be used either in repetition or in gradation.
- Repetition refers to repeating both shape and size of the unit forms.

Figure 4-2: Repetition of planes.
Source: ibid

- Gradation refers to gradual variation of the unit form, and it can be used in three different ways:
  - Gradation of size but repetition of shape.
  - Gradation of shape but repetition of size.
  - Gradation of both shape and size.

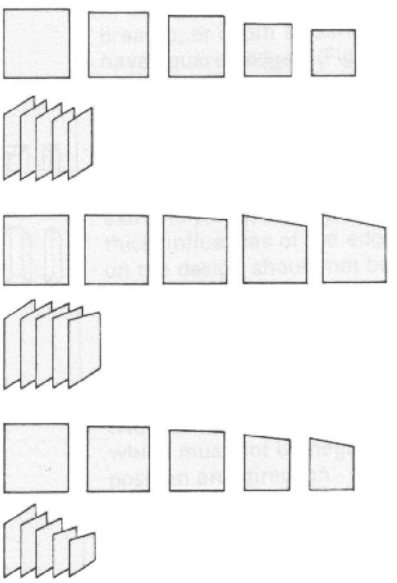


Figure 4-3: Gradation.
Source: ibid

Dissection of a cube

- Dissect along the length, breadth, or depth, in parallel layers. As a result, a number of serial planes are obtained which are repeats in both shape and size.

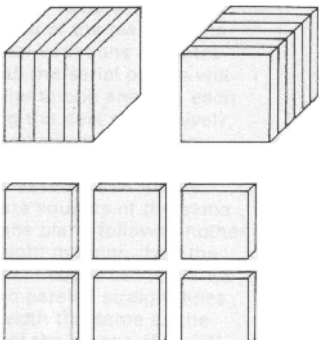


Figure 4-4: Dissection of a cube.
Source: ibid

➥ The same cube can also be dissected diagonally. There are many ways to do this. The result is serial planes with gradation of shape and size. The height remains constant, but the breadth increases or decreases gradually.

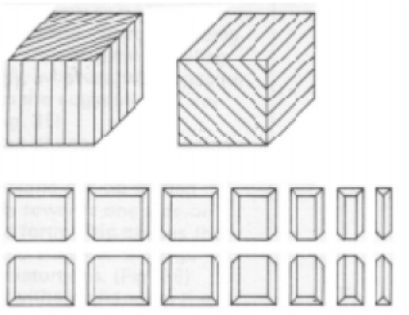


Figure 4-5: Squared edges.
Source: ibid

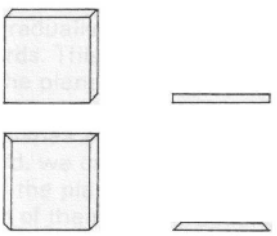


Figure 4-6: beveled edges.
Source: ibid

➥ In arranging serial planes, the relational elements should be taken into consideration. The two main relational elements which must not be neglected are position and direction.
  ➥ Positional variations.
  ➥ Directional variations.

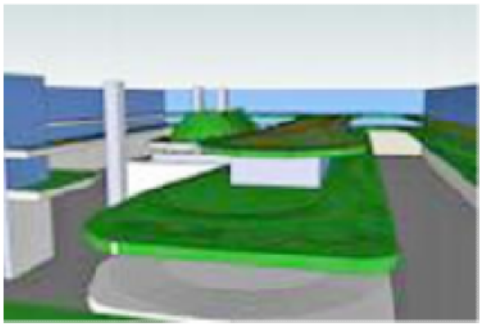


Figure 4-7: Arranging serial planes.
Source: ibid

Positional variations

➥ Assume that all the planes are squares of the same size. If one plane follows another in a straight manner, then the two vertical edges of the planes trace two parallel straight lines, with a width the same as the breadth of the planes.
➥ Narrow spacing gives the form a greater feeling of solidity, whereas wide spacing weakness the suggestion of volume.
➥ Without changing the spacing between the planes, the position of each plane can be shifted gradually towards one side or back and forth. This

causes the volumetric shape to undergo various distortions.

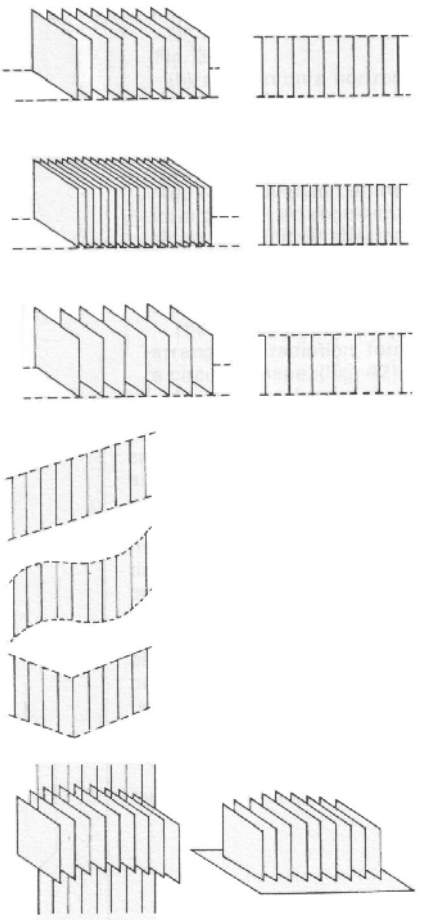


Figure 4-8: Positional variations.
Source: ibid

Directional variations

Direction of the planes can be varied in three different ways:

- ➥ Rotation in a vertical axis.
- ➥ Rotation in a horizontal axis.
- ➥ Rotation on its own plane.

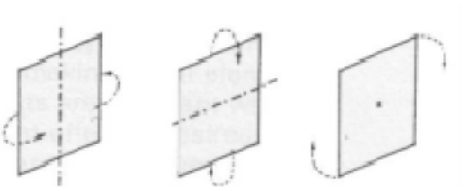


Figure 4-9: Directional variations.
Source: ibid

1) Rotation in a vertical axis

- ➥ Forming a circular shape
- ➥ Forming a shape with curves left and right

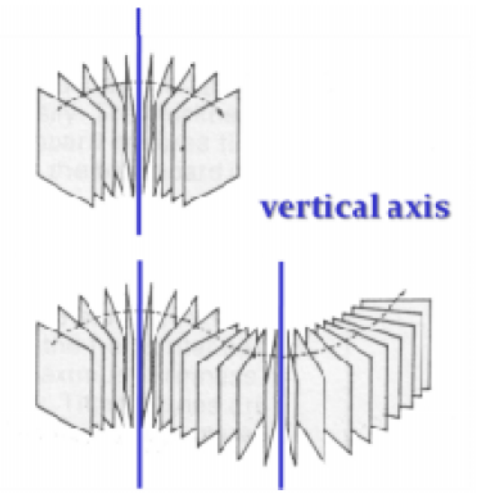


Figure 4-10: Rotation in a vertical axis.

(2) Rotation in a horizontal axis

- ➥ Rotation on a horizontal axis cannot be done if the planes are fixed on a horizontal baseboard.
- ➥ If they are fixed on a vertical baseboard, their rotation on a horizontal axis would be essentially the same as the rotation on a vertical axis.

(3) Rotation on its own plane

- Rotation on its own plane means that the corners or edges of each plane are moved from one position to another without affecting the basic direction of the plane itself.
- This results in a spirally twisted shape.
- The planes can be physically curled or bent if desired.

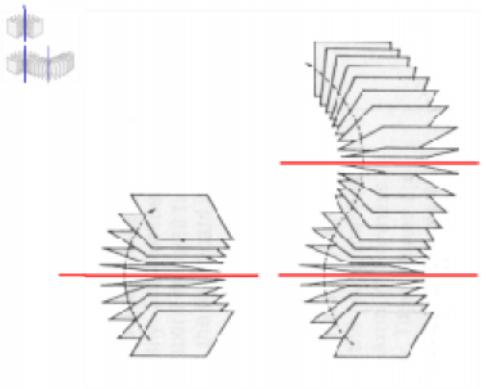


Figure 4-11: Rotation in horizontal axis.

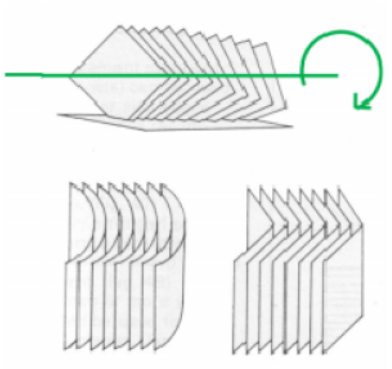


Figure 4-12: Rotation in its own plane.

Construction Techniques

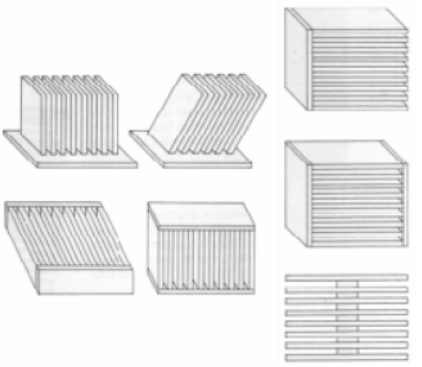


Figure 4-13: Construction techniques.
Source: Wucius Wong

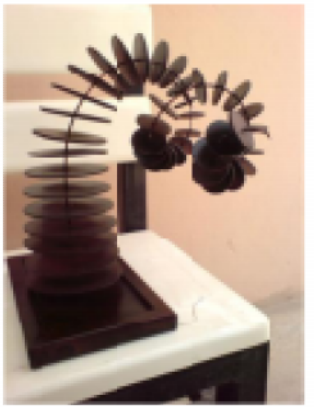
Visual form

A close surface defines a volume. The surface may be curved or faceted, or a combination of curves and facets.

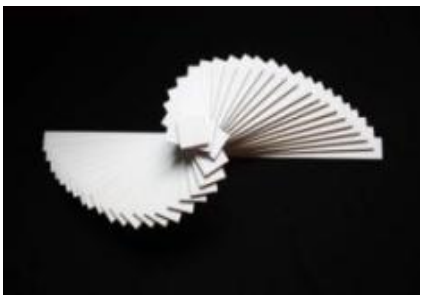
Volumes enclosed by faceted surfaces are called polyhedrons (i.e. Platonic solids, spherical polyhedrons). Volumes enclosed by continuously curving surfaces are integrate volumes (i.e. organic volumes, spheroids).

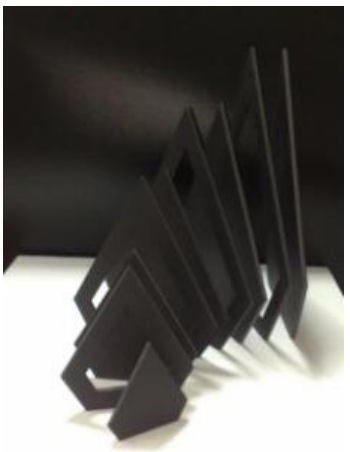
Methods to generate integrate volumes using planar segments are cross-sectional construction and stacking. Interlinking lines in space is a method to obtain 3-dimensional surfaces that can be use to define a volume.

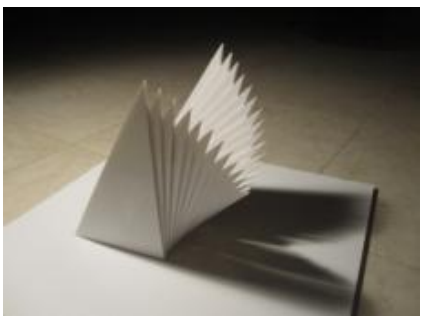
Students' projects, Interior Design Department, College of Arch. & Planning, University of Dammam

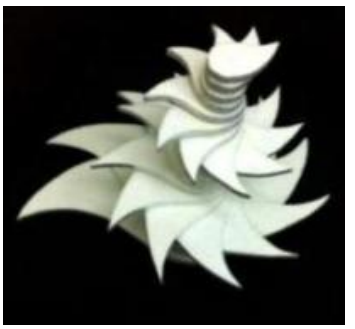


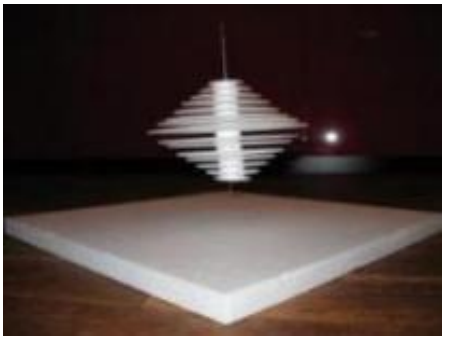
Students' projects, Second year, College of Design, University of Dammam

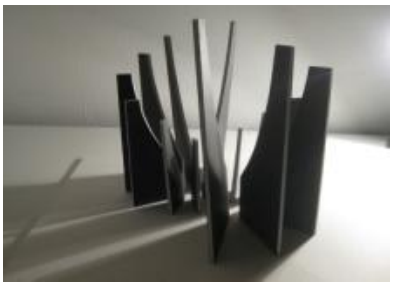


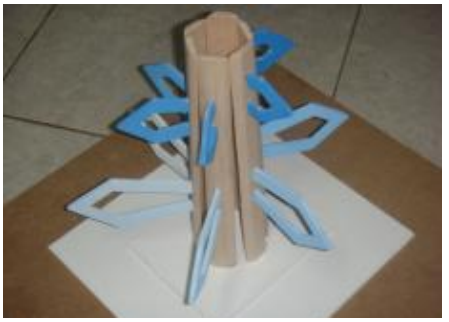


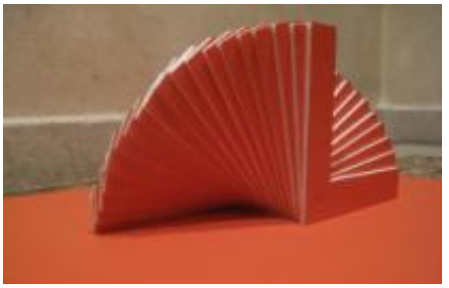


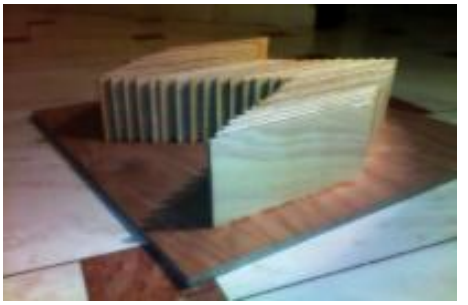


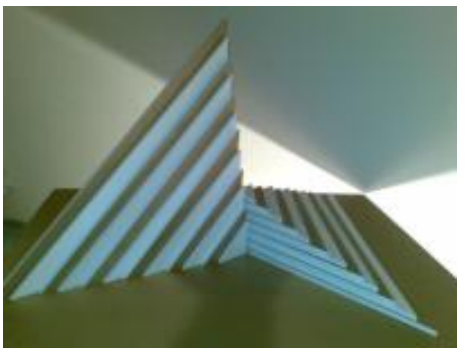












WALL STRUCTURES

THREE DIMENSIONAL DESIGN METHOD

Wall Structures

Cube, column, and wall

- Starting with a cube, we can place a second cube above and a third cube below it. It can be extended in either direction to include any desired number of cubes.
- The column can be repeated left and right to have a wall. The wall structure is basically two-dimensional. The cube has been repeated in two direction; vertical and horizontal.

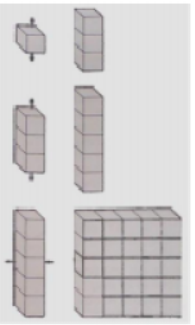


Figure 5-1: Cube, column and wall.
Source: Wucius Wong

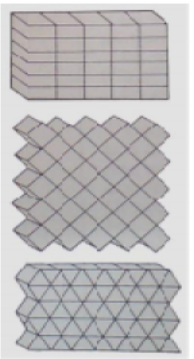


Figure 5-2: Cube, column and wall.
Source: ibid

- All formal – two dimensional structures can become wall structures with the addition of some depth, and their structural sub-divisions can be made into spatial cells.

Walls

Walls are essential architectural elements of any building.

Figure 5-3: Walls.

Stone: (interior and exterior walls)

- Comes in many colors and textures.
- Good insulator.

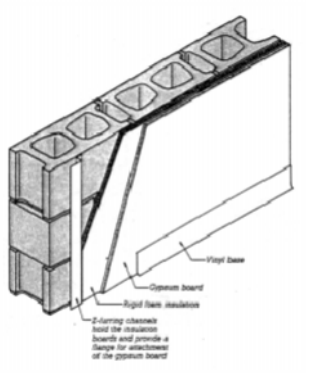
Figure 5-4: Stone wall.

Bricks and concrete blocks (interior and exterior walls)

- Comes in a variety of shapes, sizes and colors.
- Good insulator.

Physical characteristics of walls

- Size.
- Movement.
- Privacy.
- Views.
- Separators
- Background.
- Support.
- Emphasize.



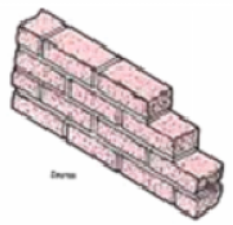


Figure 5-5: Bricks and concrete blocks.

Figure 5-6: Physical characteristics of walls.

Basic functions of walls

- Provide structural support.
- Create a sense of enclosed space.
- Control heat flow and airflow.
- Provide space and support for services (pipes, cables).
- Resist movement of water (rain, snow).
- Control light and solar radiation.
- Control sound and vibration levels.
- Provide security and privacy.

Spatial cells and unit forms

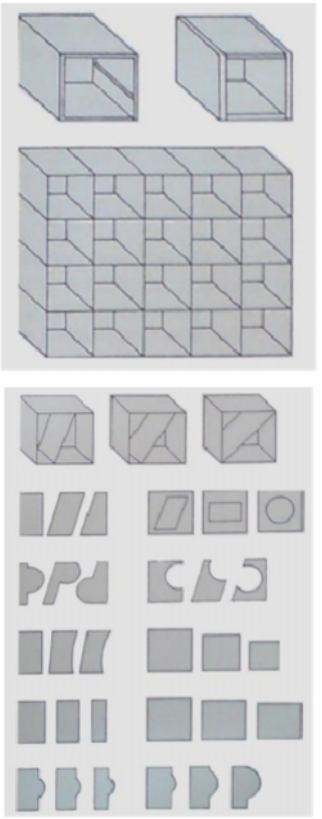


Figure 5-7: Spatial cells and unit forms.

Positional variations of unit forms

Variations of positioning of the unit forms can be accomplished by:

- ➥ Moving the shape forward or backward.
- ➥ Moving the shape up or down.
- ➥ Moving the shape left or right.
- ➥ Reducing the height or width of the shape to suggest the feeling of its sinking into one of the enclosing planes.

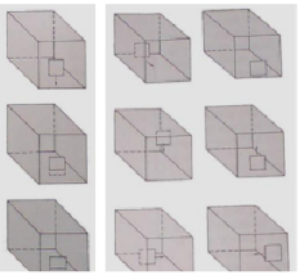


Figure 5-8: Positional variations of unit forms.

Directional variations of unit forms

Front, side, plane

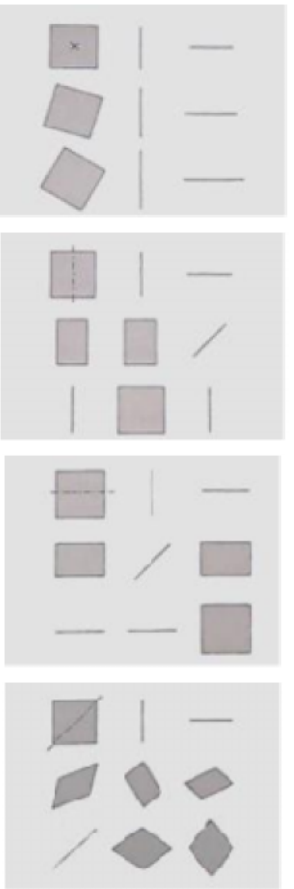


Figure 5-9: Directional variations of unit forms.

Inside each spatial cell, the unit form can be rotated in any direction desired. During each step of rotation, it will be seen differently from the front.

Unit forms as distorted planes

If greater three dimensional effects are desirable, unit forms can depart from the characteristics of a flat plane. Two or more flat planes can be used for the construction of one unit form, or a simple flat plane can be treated in the following ways to become a unit form:

- By curling.
- By bending along one or more straight lines.
- By bending along one or more curved lines.
- By cutting and curling.
- By cutting and bending.

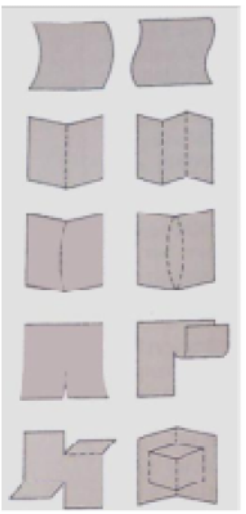


Figure 5-10: Unit forms as distorted planes.

Wall structures not remaining flat

Directional variation in the arrangement of the spatial cells is possible but must be done with care, as too much rotation may make the side planes of the spatial cells too prominent.

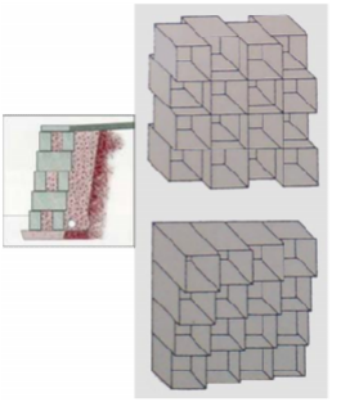


Figure 5-11: Wall structures not remaining flat.

Modifications of spatial cells

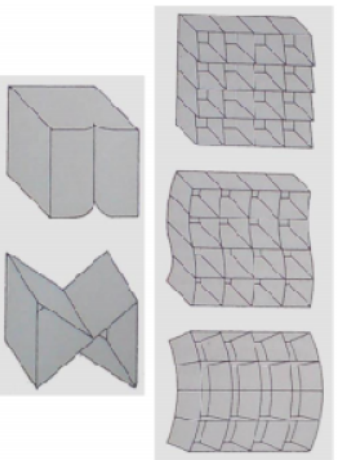
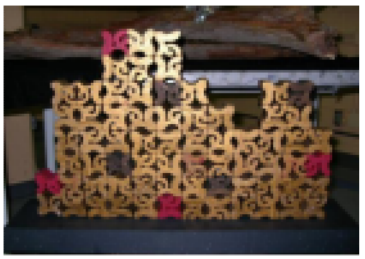
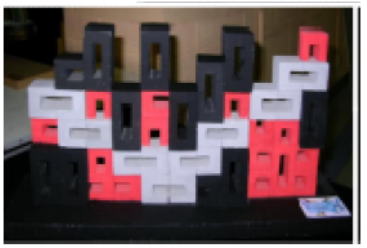
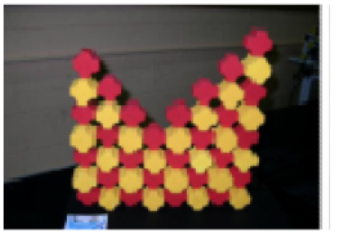


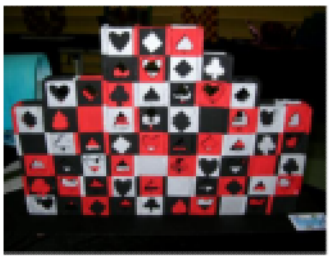
Figure 5-12: Modifications of spatial cells.

Students' projects, Interior Design Department, College of Arch. & Planning, University of Dammam

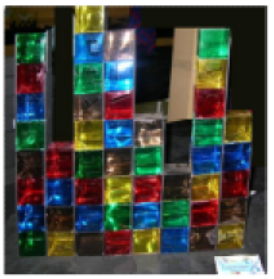
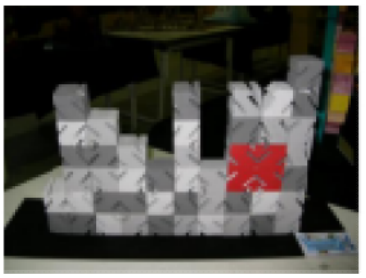


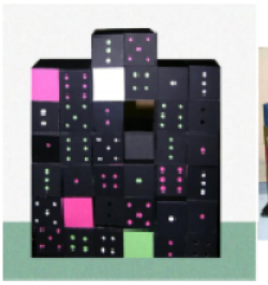



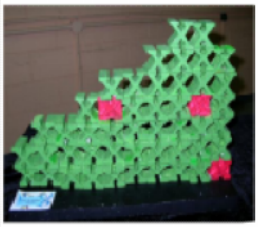
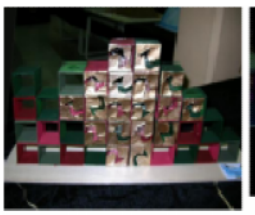



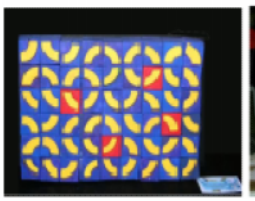



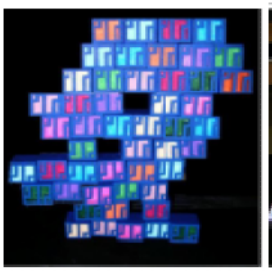







PRISMS AND CYLINDERS

THREE DIMENSIONAL DESIGN METHOD

Prisms and Cylinders

From the basic prism, the following variations can be developed:

A prism is a form with ends which are similar, equal, and parallel rectilinear figures, and with sides which are rectangles or parallelograms.

- The square ends can be changed to triangular, polygonal, or irregularly-shaped ends.
- The two ends can be non-parallel to one another.
- The ends do not have to be of the same shape, size, and/or direction.

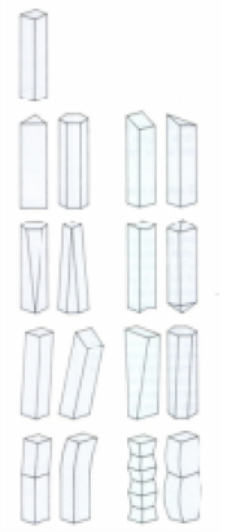


Figure 6-1: Variations of the basic prism.
Source: Wucius Wong

- The ends do not have to be flat planes.
- The edges do not have to be parallel to be perpendicular to the ends.
- The edges do not have to be parallel to one another.
- The body of the prism can be curved or bent.
- The edges of the prism can be curved or bent.

The hollow prism

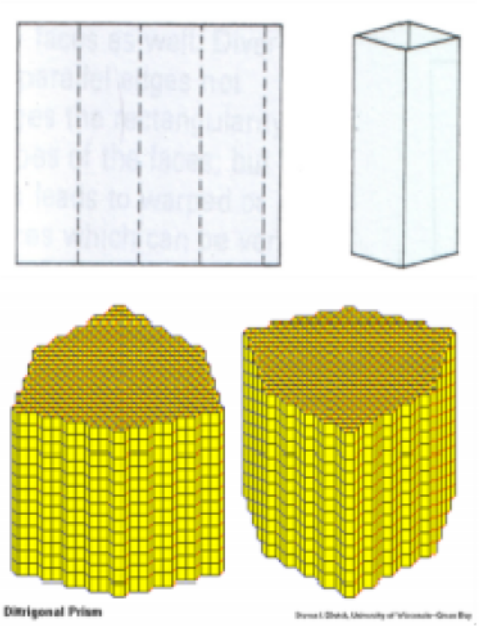


Figure 6-2: The hollow prism.

- If the prism is not of solid material, but constructed, then the variations and transformations can be even more complicated.

- Ends, edges, and faces of this prism can all be treated in special ways.
  - Treatment of the ends.
  - Treatment of the edges.
  - Treatment of the faces.

Treatment of the ends

- The ends may be covered up, but instead of using a flat continuous plane for each end, we can have planes containing negative shapes.
- The edges or faces near the two ends can be cut into different shapes, and the resulting loose pieces can be curled or folded if necessary.
- The ends can be split into two or more sections.
- A specially designed shape can be formed on or attached to the ends.

Treatment of the edges

- Nonparallel straight edges.
- Wavy edges.
- Chain or rhombic shapes along the edges.
- Circular shapes developed along the parallel straight edges.
- Intersecting edges.
- Complicated pattern scored on the surface of the sheet before it is folded to form a prism.

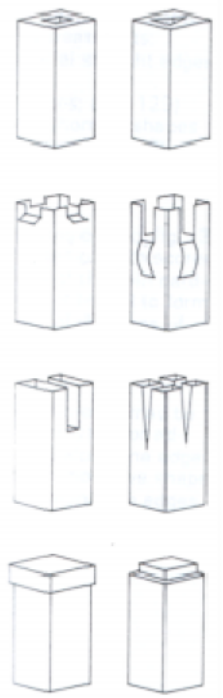


Figure 6-3: Treatment of the ends.
Source: Wucius Wong

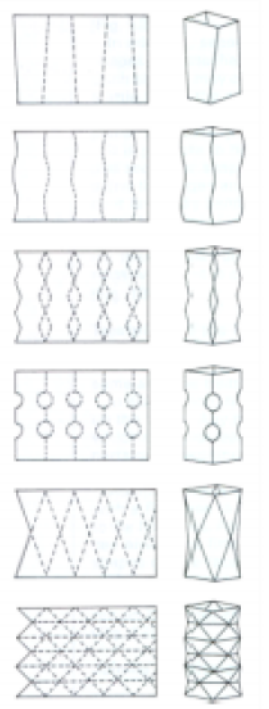


Figure 6-4: Treatment of the edges.
Source: ibid

Treatment of the faces

- Face treatment is very much the same as edge treatment.
- Chain or rhombic shapes along the faces.
- Complicated pattern scored on the surface of the sheet before it is folded to form a prism.
- Complicated pattern scored on the surface of the sheet before it is folded to form a prism.

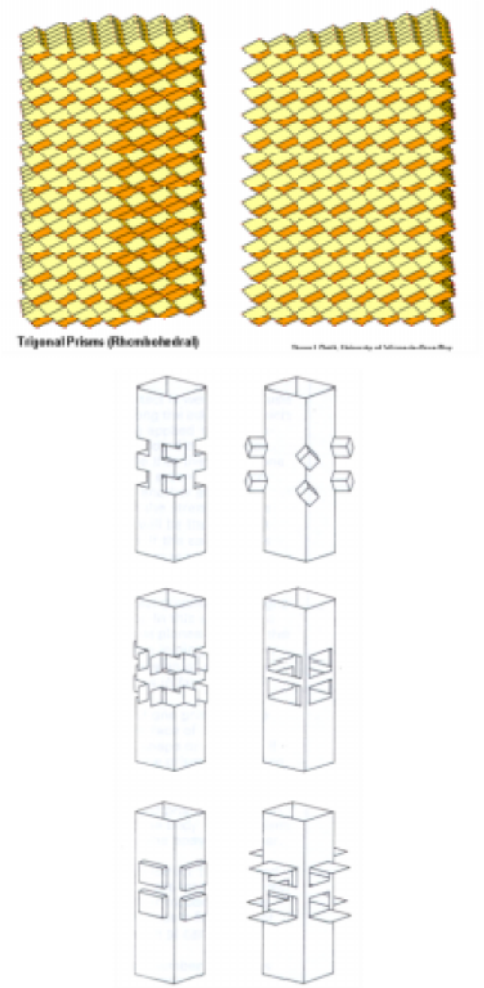


Figure 6-5: Treatment of the faces.
Source: ibid

Joining of prisms

Figure 6-6: Joining of prisms.
Source: ibid

The prism and the cylinder

- The minimum number of flat planes we can use for the sides of a prism is three, which results in a prism with a triangular top and bottom.
- By increasing the number of sides of a polygon infinitely, a circle may finally be reached.

- The body of cylinder is defined by one continuous plane, without beginning or end, and the top or bottom of a cylinder is in the shape of a circle.

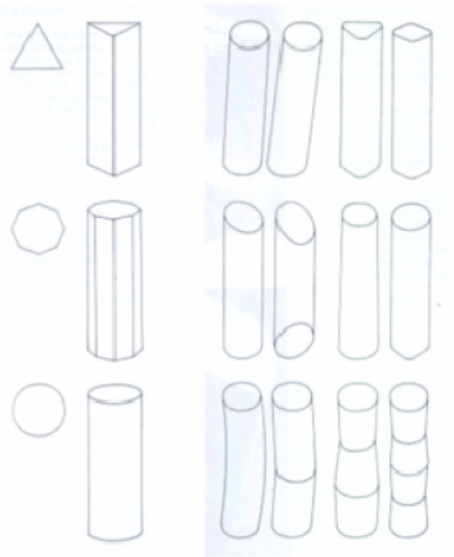


Figure 6.7: The prism and the cylinder.
Source: ibid

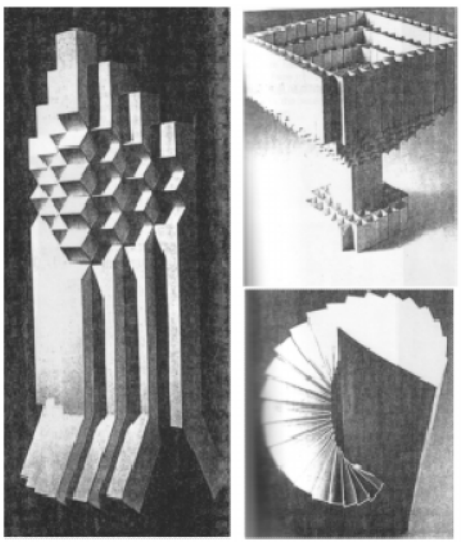


Figure 6.8: The prism and the cylinder.
Source: ibid

Polyhedral Structures

The platonic solids

- Polyhedral structures are fascinating shapes, which can be adopted as basic structures in three dimensional design.
  - Tetrahedron (Four faces)
  - Octahedron (Eight faces)
  - Dodecahedron (Twelve faces)
  - Icosahedron (Twenty faces)

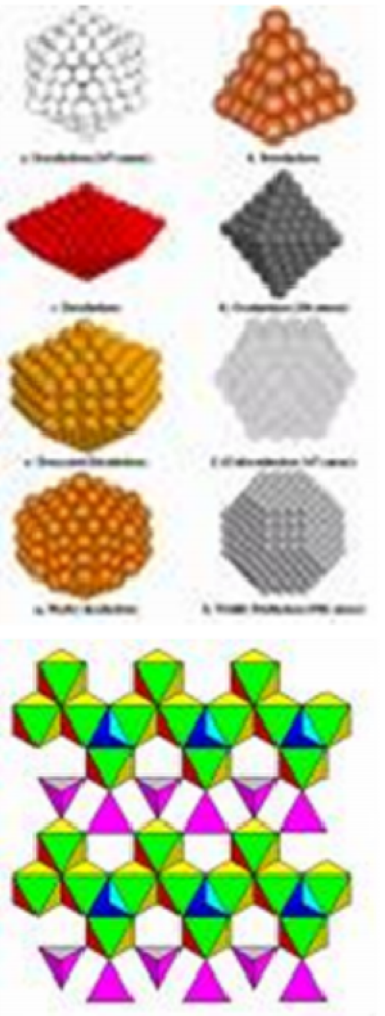


Figure 6-9: The platonic solids.

The tetrahedron

- Four faces
- Four vertices
- Six edges
- Each face is an triangle (equals)
- The tetrahedron the simplest among the platonic solids, but it is the strongest structure that can be made.

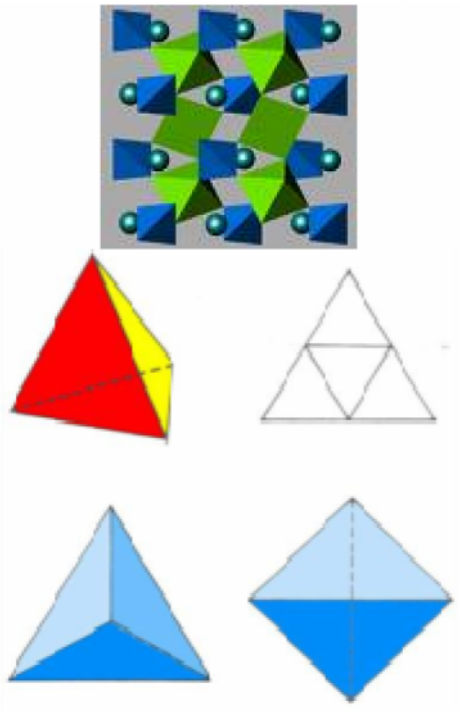


Figure 6-10: The tetrahedron.

The cube

- The best known shape among the platonic solids
- Six faces
- Eight vertices
- Twelve edges
- Each face is a square
- All angles are right angles

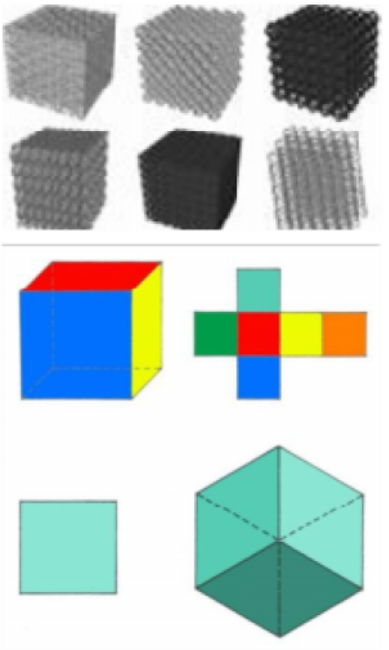


Figure 6-11: The cube.

The octahedron

- The octahedron is the dual of the cube, each vertex of the cube is replaced by a face of the octahedron, and each face of the cube by a vertex of the octahedron
- Eight faces
- Six vertices
- Twelve edges

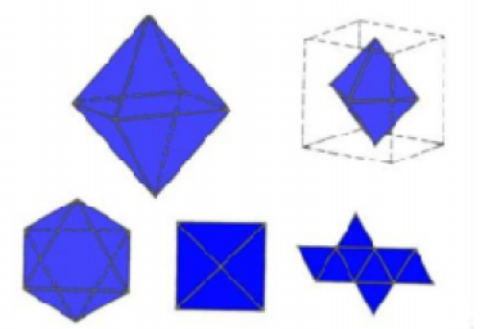


Figure 6-12: The octahedron.

The dodecahedron

- It is composed of regular pentagons (five sides)
- Twelve faces
- Twenty vertices
- Thirty edges

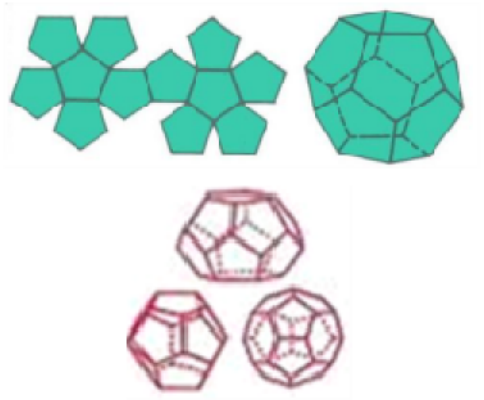


Figure 6-13: The dodecahedron.

The icosahedrons

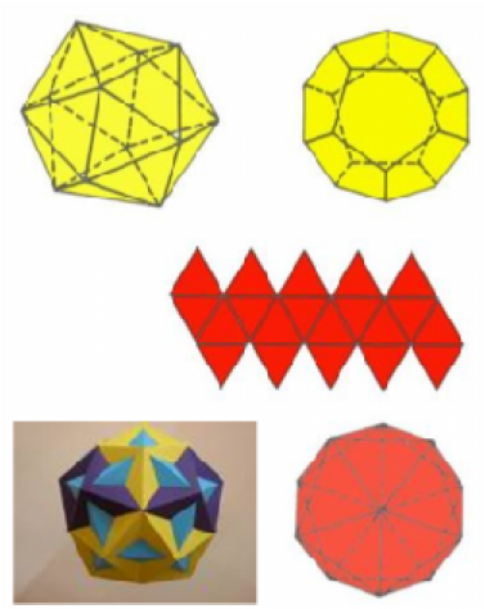


Figure 6-14: The icosahedrons

- It is the dual of the dodecahedron
- Twenty faces
- Twelve vertices
- Thirty edges
- Each face is triangle , just as in the tetrahedron and the octahedron

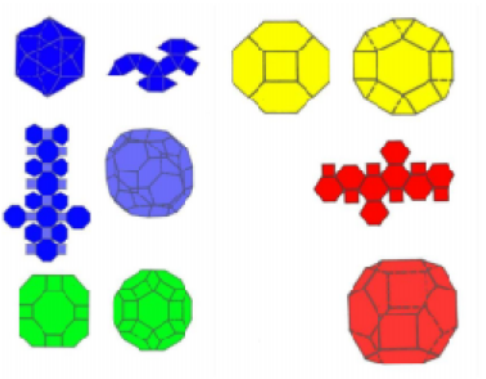


Figure 6-15: The icosahedrons.

Samples of Polyhedral Structures

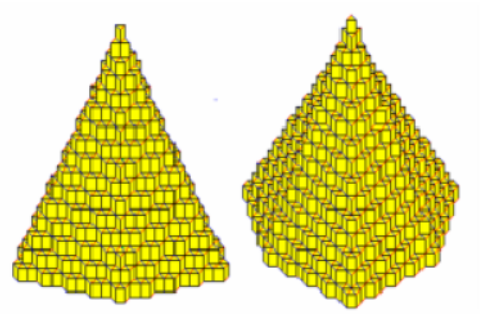


Figure 6-16: Ditrigonal pyramid.

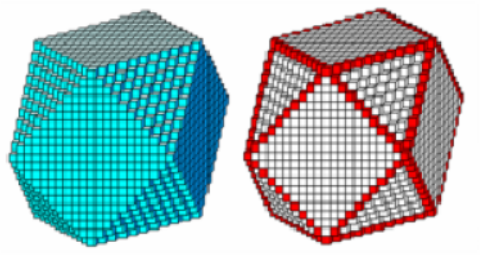


Figure 6-17: Cuboctahederon (cube plus octahedron).

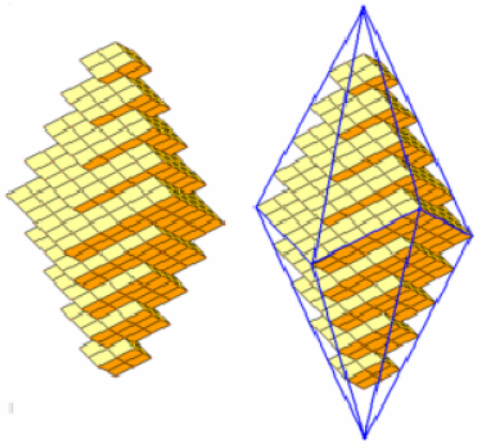


Figure 6-18: Ditrigonal scalenohedron (rhombohedral).

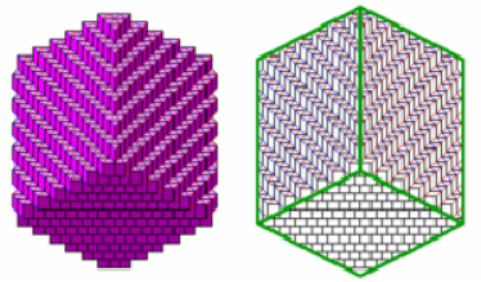


Figure 6-19: Cube plus octahedron.

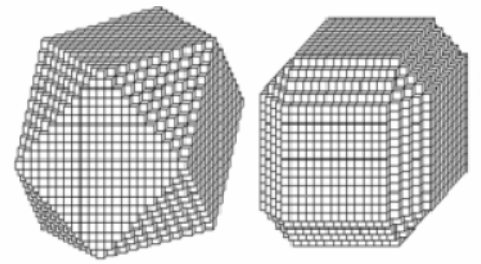


Figure 6-20: Cube, octahedron and dodecahedron.

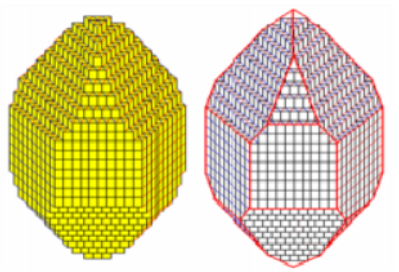


Figure 6-21: Typical quartz habit.

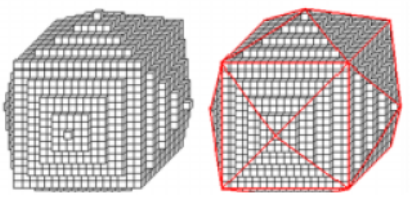


Figure 6-22: Tetrahexahedron.

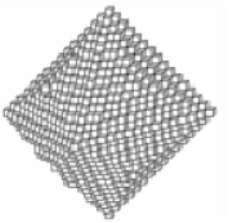


Figure 6-23: Trigonal trisoctahedron.

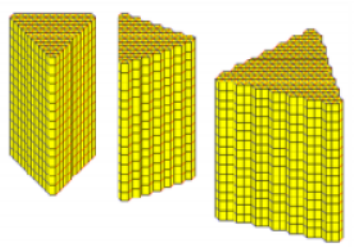


Figure 6-24: Trigonal prisms.

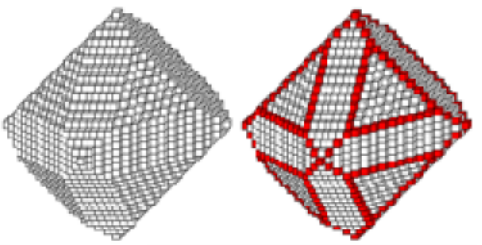


Figure 6-25: Dodecahedron and octahedron.

Face treatment

The simplest face treatment is to make negative shapes on some or all of the faces, revealing the empty space inside.

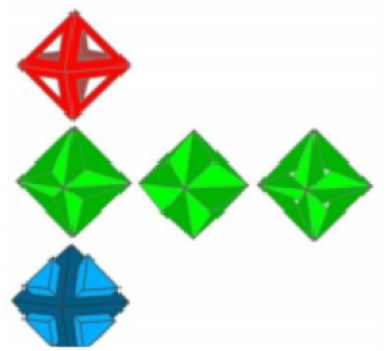


Figure 6-26: Face treatment.

Edge treatment

- Along the edges of a polyhedron, shapes can be added or subtracted
- Each single line edge can be replaced by double or multi – line edges, and this will lead to the creation of new faces.

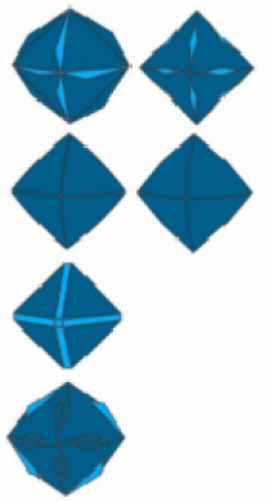


Figure 6-27: Edge treatment.

Vertex treatment

- Vertex treatment normally affects all he faces which join one another at the single point of the vertex.
- Shapes on the vertex can be added or subtracted.

Joining of polyhedral shapes

For a more complicated structure, two or more polyhedral shapes of the same or different designs can be joined together by **face contact**, **edge contact**, or **vertex contact**.

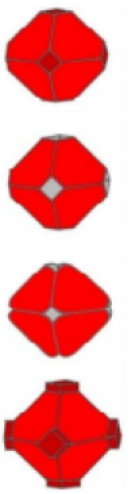


Figure 6-28: Vertex treatment.

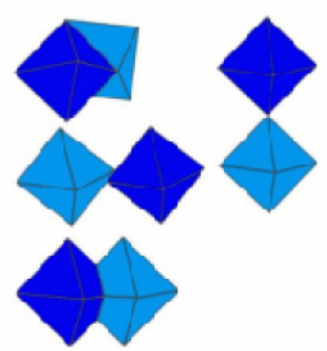


Figure 6-29: Joining of polyhedral shapes.

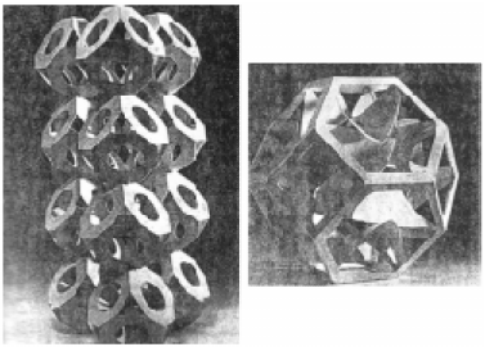
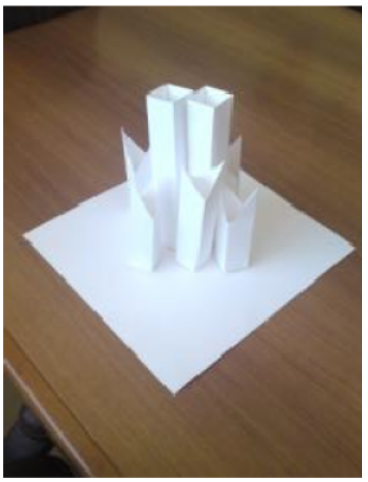


Figure 6-30: Polyhedral shapes.
Source: Wucius Wong

One of a Student's project "Prism Composition", Second Year, College of Design, University Of Dammam



TRIANGULAR PLANES

THREE DIMENSIONAL DESIGN METHOD

Triangular Planes

The three out of five of the platonic solids, the **tetrahedron**, the **octahedron** and the **icosahedrons**, are constructed of triangular planes.

Triangular planes are also used for the construction of projecting or interjecting pyramidal shapes created from the faces of any polyhedron. Thus triangular planes are of considerable importance in three-dimensional design and cannot be ignored.

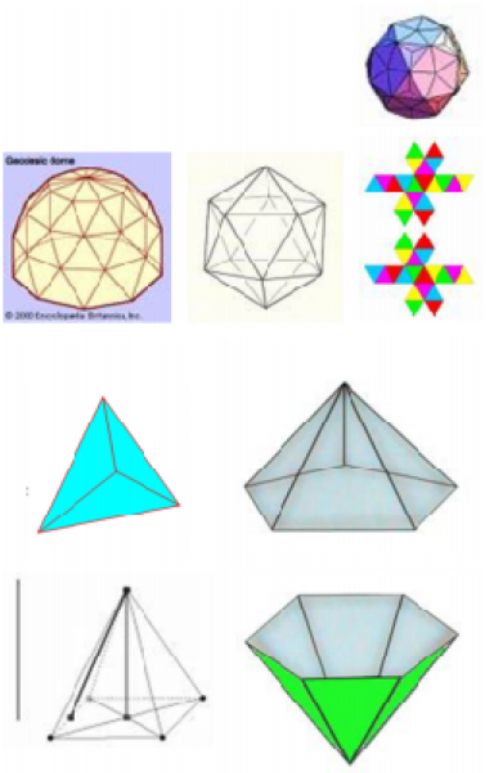


Figure 7-1: Triangular planes.

Equilateral triangles

- To explore the possibilities of construction with triangular planes, we can use a narrow strip of thin cardboard and divide it into a series of equilateral triangles.
- Cutting one triangle from the strip, we have a flat plane with three equal sides and three angles of sixty degrees each.
- Two linked triangles may be folded in any desirable angle. This can be a free-standing three-dimensional shape.
- Three linked triangles can make a tetrahedron with one face missing.
- Four linked triangles can male a complete tetrahedron.
- Five linked triangles can make a double-tetrahedron with one face missing.
- Six linked triangles can make a complete double-tetrahedron.
- They can also form an octahedron with two faces missing.
- Eight linked triangles can make a prismatic shape, with a hollowed square top and a hollowed square bottom. The two hollowed square shapes are of the same size but in different direction.

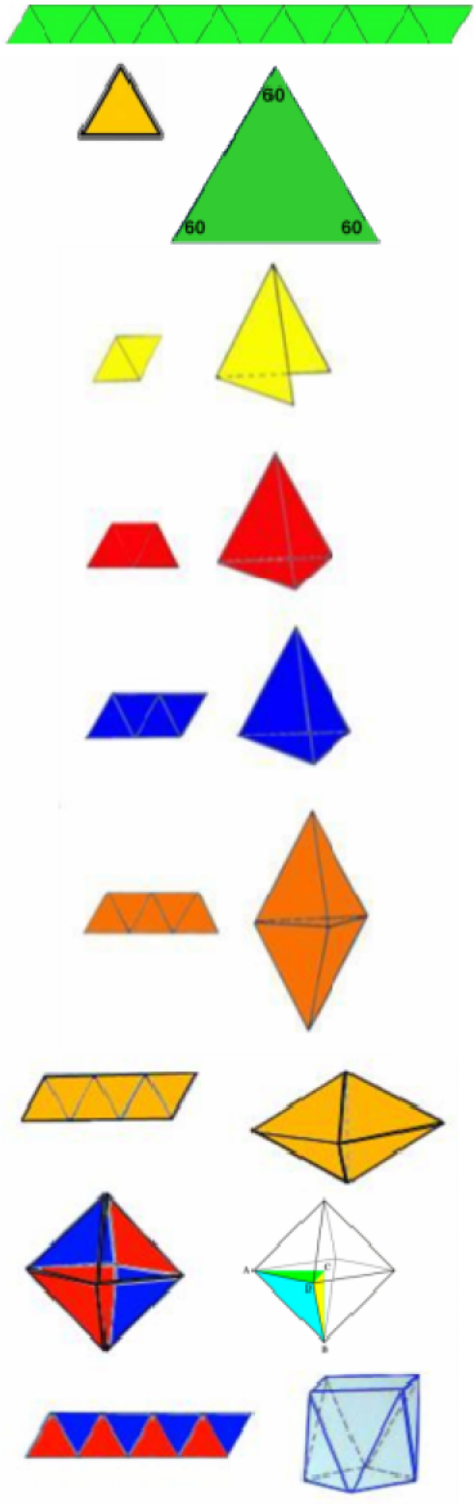


Figure 7-2: Equilateral triangles.

Isosceles triangles

- The equilateral triangles can be elongated to form narrow and tall isosceles triangles, with two equal sides.
- Four linked triangles of this kind can make a much distorted tetrahedron which may also be described as a prism with two wedge-shaped ends.
- Five linked triangles can make a prism with an open triangular shape at one end and a wedge-shaped shape at the other end.
- Six linked triangles can make a prism with an open triangular shape at each end.
- Eight linked triangles can make a prism with open square ends.

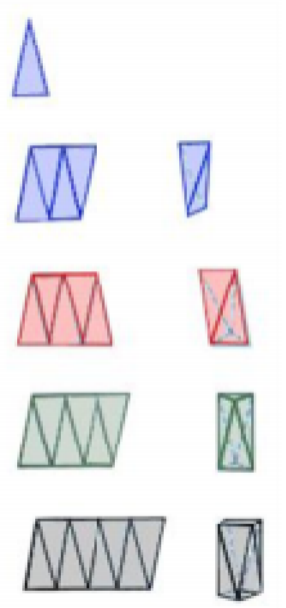


Figure 7-3: Isosceles triangles.

Unequal-sides triangles

- Just as a narrow strip of thin card-board can be divided into a number of equilateral or isosceles triangles, it can also be divided into a number of triangles with unequal sides.
- With six or eight linked unequal-sided triangles, we can construct prisms very similar to the figures in the last slide, if all the angles of the triangles are acute angles.
- Unequal-sided triangles of different shapes and sizes can be used to build irregular tetrahedra or octahedra which may become exciting elements in a design.

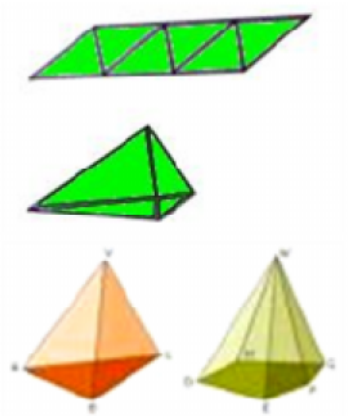


Figure 7-4: Unequal-sides triangles.

The octet system

- Just as squares can fill up two-dimensional space without gaps, cubes can fill up three-dimensional space without gaps.
- Equilateral triangles can fill up two-dimensional space without gaps, but tetrahedral cannot fill up three-dimensional space without gaps. With three octahedral in edge-contact positions we discover that the space left over exactly accommodates one tetrahedron.
- Thus when octahedral and tetrahedral are used together, they can fill up three-dimensional space without gaps. This is called the octet system, and it can produce structures of amazing strength that use a minimum of materials.

Figure 7-5: The octet system.

- Triangular planes offer unlimited possibilities in design. Regular or irregular

tetrahedral, octahedral, and pyramidal shapes can be joined together with unexpected effects.

➥ The figure demonstrates the varied constructions that can be created from triangular planes. Eight linked triangles have been used to construct one unit form. a number of such unit forms makes a ring, which is one layer of the design. Layers of the same construction but in diminishing sizes establish the structure for this design.

Figure 7-6: Varied constructions created from triangular planes.
Source: Wucius Wong

➥ Each unit form is made of several triangular planes. The unit forms are glued to one another by face contact, forming a circular ring which is repeated several times in the final design.

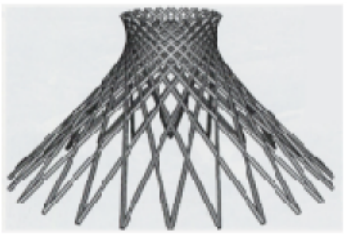
Figure 7-7: A circular ring made of several triangular planes.
Source: ibid

➥ Three folded triangular planes have been used to construct each unit form. Twenty unit forms in vertex contact make one large tetrahedral super-unit form, four of which are then put together in one design.

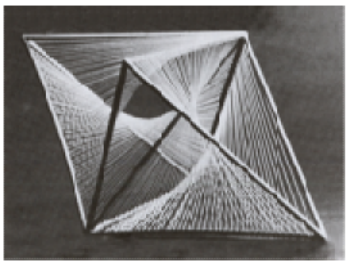
Figure 7-8: Tetrahedral super-unit form.

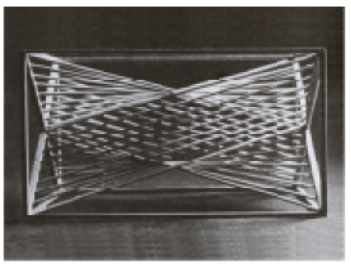
➥ One element of the unit form is constructed of three linked and folded triangular shapes. Four of such elements in vertex contact make one unit form, and these unit forms in vertex contact build the design.

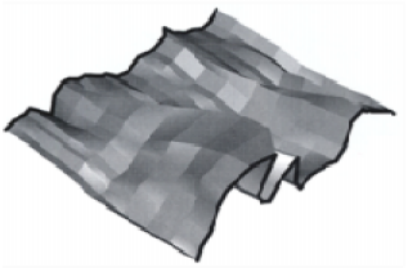
Examples of linear shapes



Hyperboloid







Generated surface model

Figure 7-9: Linear shapes.
Source: Wucius Wong

DESIGN THINKING PROCESS

DESIGN THINKING PROCESS

Before beginning any design project, the following questions should be answered and categorized under the main categories:

What

- What is the complete name and nature of the project?
- What is the proposed location and it's nature?
- What are the major goals and objectives of the project from functional, aesthetic, religious, cultural, economic and technological point of view?
- What are the possible finances available for the project?
- What are going to be the materials and technologies of construction, etc?

Who

- Who is the client? i.e., whether an individual or a trust or a government body or organization … etc.
- Who will finance the project? i.e., whether the client the client himself or government or public trust.
- Who will use the project? Whether males or females, or children, or adults or animals or birds, etc. (Information about the users' habits, way of living, professions, interests, liking, disliking) etc.

Where

- Where the project is going to be located? i.e. (information about the exact location, site characteristics, surrounding environment and social, economic and culture life of the neighborhood)

Why

- This means a complete justification for the project in terms of its need for the community or the individual and also in terms of its functions, benefits, profits, effects etc. for the owner as well as the society.
- A designer is sometimes asked to prepare a report for the justification of a project in a particular location. In this report, he will have to make a thoroughly investigation of the reasons and factors which make that project justification.

How

- This means the total process through, which a project has to pass starting from program development up to the complete construction and final evaluation stage i.e.
- How the project as a whole is going to be carried out.
- This may include the following stages:
- Data collection and research
- Graphic analysis of the collected data
- Design criteria and concepts
- Design development
- Preliminary, design presentation
- Design refinement and redevelopment
- Detailed design and contract document
- Construction and execution
- Related design development, graphic design, architecture, furniture design …etc.
- Self-evaluation and recording of the project.

ORGANIZATIONS OF FORM AND SPACE-1

ORGANIZATIONS OF FORM AND SPACE-1

Design is the process of inventing physical things which display new physical order, organization, and form, in response to function**.**

Space and form

- The nature of space is complex because there are many ways space can be viewed. Space may be positive or negative, flat, conflict….
- Space surrounds us everywhere but it is formless.
- Elements of Form enclose and organize space to create Volume in architecture.

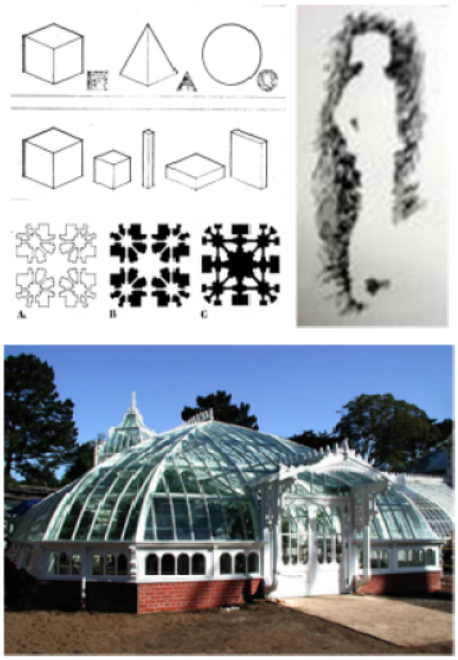


Figure 8-1: Space and form.

Types of planes

Floor, Wall and Ceiling are planes and they are categorized as:

- Base plane.
- Vertical plane.

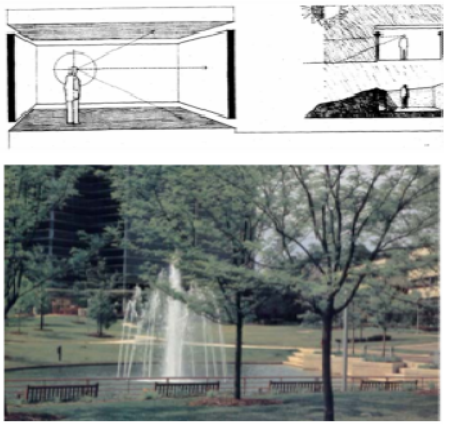


Figure 8-2: Types of planes.

Base plane

The ground or floor in a space is really a horizontal plane lying in a space.

Types of base plane

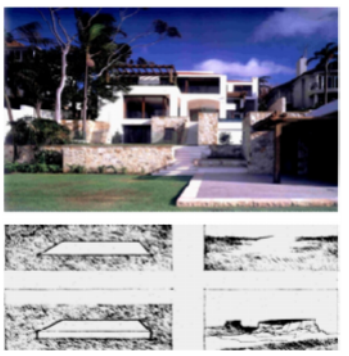


Figure 8-3: Elevated base plane.

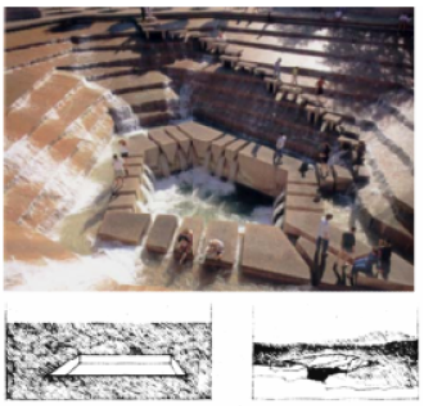


Figure 8-4: Depressed base plane.

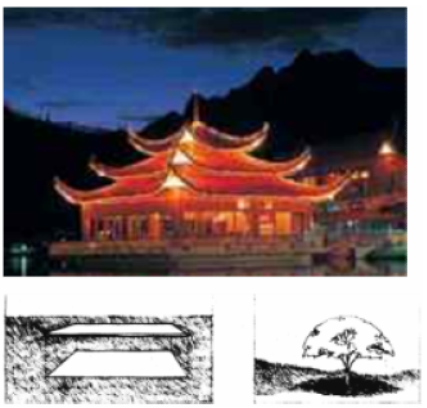


Figure 8-5: Overhead plane.

Vertical plane

The vertical plane, wall or column defines a boundary and creates a closing of volume that creates an enclosed space and provide visual and spatial continuity in a space.

Columns

- A column is a vertical, linear element that establishes a point on the ground plane and makes it visible in space.
- Column can be a single element in a space to create a focal point.
- Columns can be put in a series or grid to create divisions in space.

Figure 8-6: Columns.

Types of vertical plane walls

1- Single Vertical.
2- Parallel Vertical.
3- U-shaped Vertical.
4- Four Vertical.

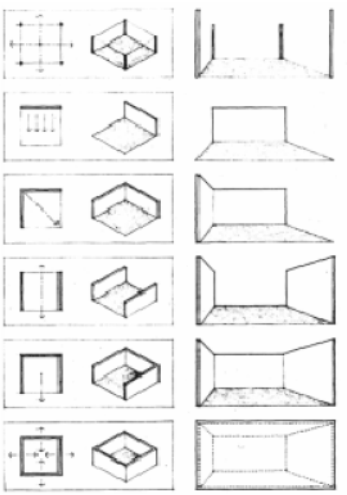


Figure 8-7: Types of vertical plane walls.

Positive and negative space

Positive space is what surrounds a negative form, and negative space is what surrounds a positive form.

All Positive forms contain positive space, but positive space is not always perceived as a positive form.

Similarly, all negative forms contain negative space, but negative space is not always perceived as a negative form.

Flat and illusory space

Space is flat when all the forms seem to lie on the picture plane and be parallel to it. The forms themselves should be flat too.

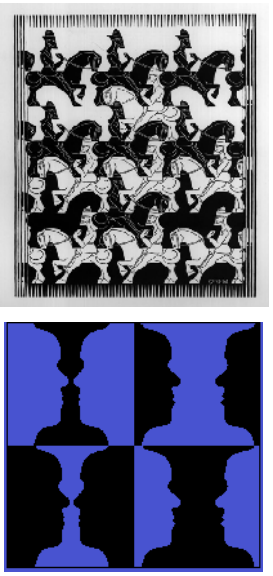


Figure 8-8: Positive and negative space.

Forms can meet one another by touching, union, subtraction, intersection, detachment, but they can never meet by overlapping.

Variations in shape, size, color and texture may destroy the flatness of space.

Space is illusory when all the forms seem not to lie on or be parallel to the picture plane. Design area opens up like a window or a stage where the forms are displayed.

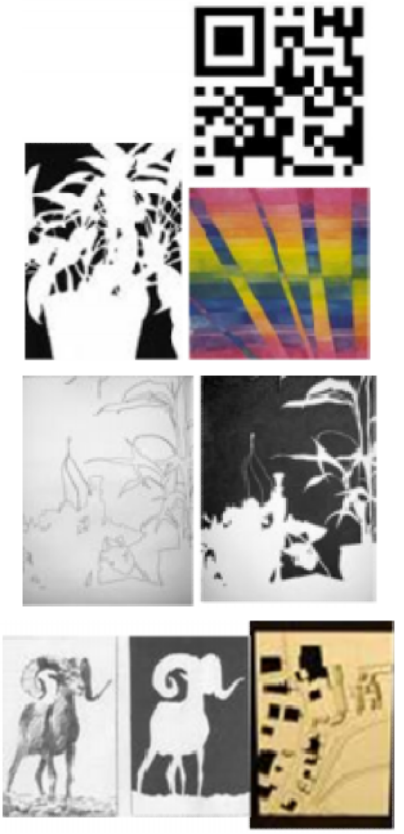


Figure 8-9: Flat and illusory space.

Volume and depth in illusory space

There are isometric, axonometric, perspective and other systems of projection in the representation of volume and depth.

Figure 8-10: Volume and depth in illusory space.

If we have to represent a cube that has six equal edges meeting each other at right angles, simple systems of projection maintain the equality of the edges and angles to some extent, but perspective which gives a more convincing picture renders most of the equal elements unequal.

Fluctuating and conflicting space

Fluctuating space is similar to conflicting space.

Figure 8-11: Fluctuating and conflicting space

Fluctuating space is ambiguous, because there is not definite way whereby we can interpret the special situation.

But conflicting space provide an absorb spatial situation which seems impossible for us to interpret at all.

Organization of space

The rigid rectilinear forms of contemporary architectural design neither resemble nor relate the space surrounding us as an extension of the self whether physical or mental. By "extending" or "projecting" space and form outward from the body and its movements, a new paradigm can be applied to the structure of place as it relates to the extended space of the human self. The following project proposes a method, for the design and organization of space.

Figure 8-12: Organization of form and space, Idea (1).

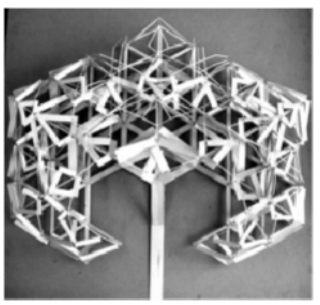


Figure 8-13: Organization of form and space, Idea (2).

Figure 8-14: Organization of form and space, Idea (3).

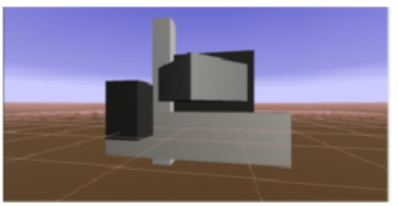


Figure 8-15: Organization of form and space, Idea (4).

Figure 8-16: Organization of form and space, Idea (5).

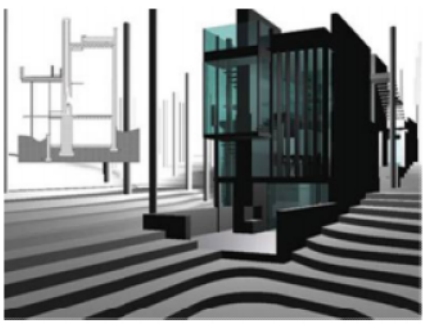


Figure 8-17: Organization of form and space, Idea (6).

ORGANIZATIONS OF FORM AND SPACE-2

ORGANIZATIONS OF FORM AND SPACE-2

Organizations

- The basic organizations for this section are: centralized, grid, clustered, radial, linear, and spiral.
- Spatial organization defines the exterior and interior of an area.

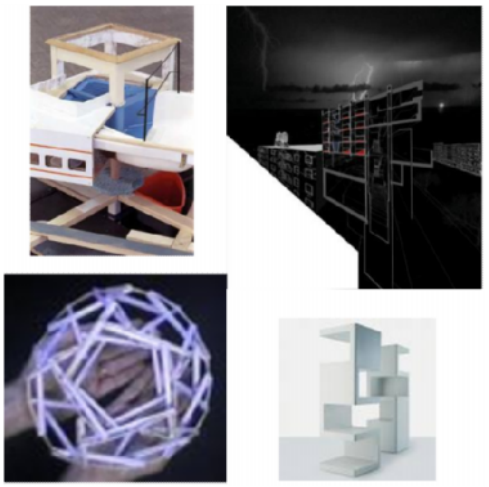


Figure 9-1: Organizations.

- Depending on the overall arrangement of forms in space, different relationships are established among the individual parts and between the parts and the whole.
- Ching describes the spatial organization that is clustered as, "spaces grouped by proximity or the sharing of a common visual trait or relationship".

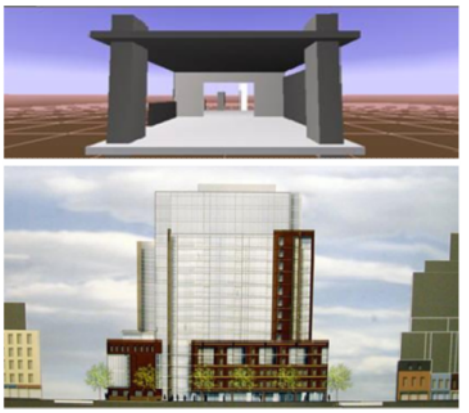


Figure 9-2: Spatial organization.

Design integration

- A building has a purpose: The arrangement of spaces facilitating various human activities such as living, working and studying.
- A building is situated at a place: The impact of site conditions, climate, historical, cultural and social contexts, etc. on the form of a building.
- A building is a built object: The adoption of appropriate materials, structural systems and construction methods to achieve stability.
- For Active Learning
  A building is a form-space object: The organization of form and space according to formal principles such as figure and ground, solid and void, symmetry and dynamics, etc.

Organization of form and space

This lecture lays out for discussion the basic ways a building's spaces can be related to one another and organized into coherent patterns of form and space.

Space within a space

In the type of spatial relationship, the larger, enveloping space serves as a three-dimensional field for the space contained within it. For this concept to be perceived, a clear differentiation in size is necessary between the two spaces. If the contained space were to increase in size, the larger space would begin to lose its impact as an enveloping form.

If the contained space continued to grow, the residual space around it would become too compressed to serve as an enveloping space. It would become instead merely a thin layer or skin around the contained space.

The elements of the architecture space

- Spatial enclosure: height, width, length.
- Design equipments: furniture, lighting units, fabrics, plantation, signs, texture, color, water pools.
- People who use the architecture space.
- Activities in the architecture space.
- Rhythmical change in the space.

Figure 9-3: Space within a space.

Figure 9-4: The elements of the architecture space.

Visual perception

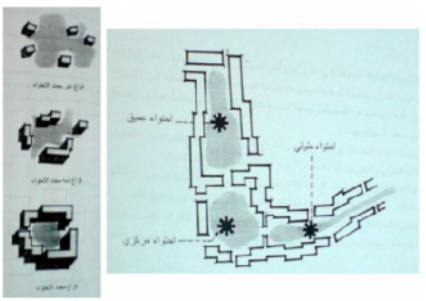
Interior designer should:

- Determine the visual information inside the space.
- Understand the space environment (activity).
- Study and determine the collected information resources.
- Design the interior space based on the previous points.

The visual perception of the space can be divided to **3 main groups**:

1st Group: Spatial aspects
2nd Group: Human aspects
3rd Group: Temporal aspects

Spatial aspects



Position Shape

Figure 9-5: Spatial aspects, position and shape.

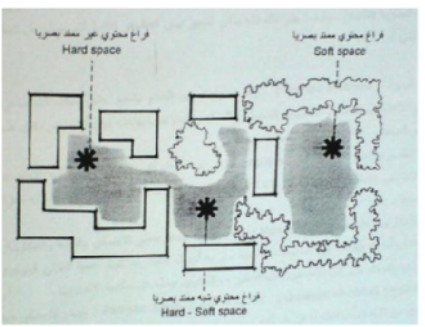


Figure 9-6: Spatial aspects, environment.

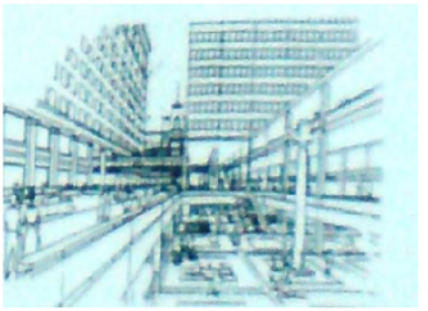


Figure 9-7: Spatial aspects, human scale.

Figure 9-8: Spatial aspects.

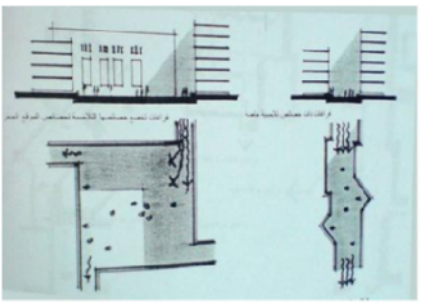


Figure 9-9: Spatial aspects, shape.

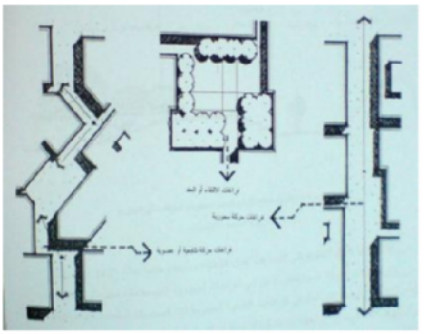
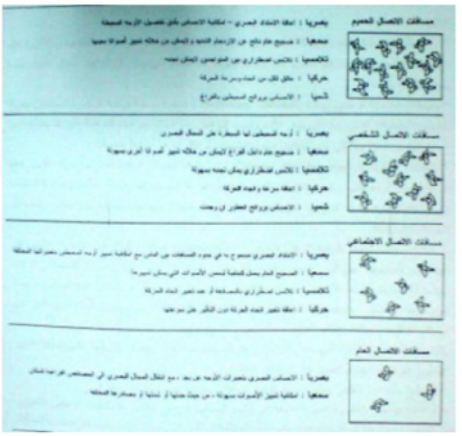
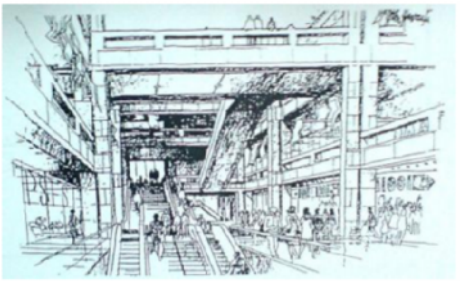


Figure 9-10: Spatial aspects, shape.

Human aspects



People density



People type

Activity

Figure 9-11: Human aspects.

Temporal aspects

Three main aspects:

- Past denotations
- Present signs
- Future indicators

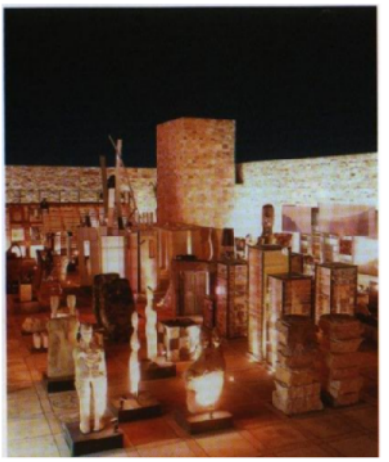


Figure 9-12: Temporal aspects, past denotations.

Figure 9-13: Temporal aspects, future indicators.

Figure 9-14: Temporal aspects, present signs"1".

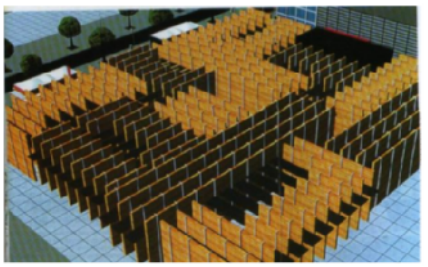


Figure 9-15: Temporal aspects, present signs"2".

Fibonacci sequence and the golden ratio

Who Was Fibonacci?

- Fibonacci is an european mathematician scientist from 1175 to 1250.
- Real name Leonardo of Pisa.
- Author of Liber abaci or Book of the Abacus.

What is the Fibonacci sequence and why is it significant?

Generalized sequence of first two positive integers and the next number is the sum of the previous two, i.e. 1, 1, 2, 3, 5, 8, 13, 21, …

- A remarkable property of the sequence is that the ratio between two numbers in the sequence eventually approaches the “Golden Ratio” as a limit.
- 1/1=1, 2/1=2, 3/2=1.5, 5/3=1.6667
- 8/5=1.6, 13/8=1.625, 21/13=1.6154

Golden ratio

- Has intrigued mathematicians for centuries. Shows up unexpectedly in architecture, science and nature.
- Used extensively by Ancient Greeks in architecture.

Figure 9-16: Golden ratio.

- Famous Irrational number phi—1.61803398…
- Only positive # that becomes its own reciprocal by subtracting 1.

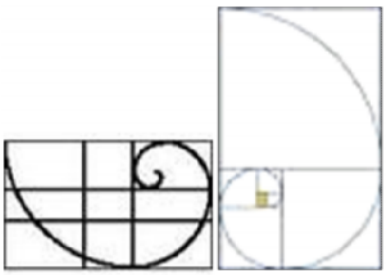


Figure 9-17: Golden ratio.

Golden ratio continued

- Ratio also shows up in many famous paintings
- Da Vinci studied extensively the ratio and body proportions.

ACCESSIBLE DESIGN

ACCESSIBLE DESIGN

Accessible design

Sometimes referred to as universal design or design-for-all, accessible design is “the practice of designing products or environments that can be effectively and efficiently used by people with a wide range of abilities operating in a wide range of situations.

A mindful awareness of our sensorial limitations and an increment in the multiplicity of pathways to the same body of knowledge will provide a better Accessible/Universal design experience. People vary in a number of ways, that can have an impact on the design of a user interface, and rather than trying to design for "the average user", it is often better to understand how people vary to design acceptably for a broad audience. Sometimes this may even mean designing separate interfaces for different user populations (such as when extremely simplified drawing programs are made for young children versus sophisticated versions designed for graphic design professionals).

The benefits of accessible design seem clear. People with disabilities benefit from accessible design through access to equipment and services that were once difficult to obtain or impossible to use. By broadening its target audience to include people with disabilities and enhancing the general usability of museum experiences, cultural agencies benefits from accessible design through increased participation. Finally, participants enjoy the benefits of accessibly designed environments through the increased availability of well-designed, fun-to-interact experiences.

Supplemental theories of experience

In addition to ethnographic methods adapted from anthropology, methods from social and behavioral science have been adapted to explore the form, function, and content of the products made by designers. What is unique to design research relative to understanding experience is that it is focused on the interactions between people and products, and the experience that results. This includes all aspects of experiencing a product -- physical, sensual, cognitive, emotional, and aesthetic. [Forlizzi, 2004, Towards a

Framework of Interaction and Experience As It Relates to the Design of Products and Systems].

Designers lack a unified understanding or theory of user experience, let alone a process for trying to design for it. There is great interest in the subject, and there have been both initial efforts to create theories of user experience, as well as more recent efforts to exemplify and categorize specific types of experiences as they relate to designed artifacts. “Rather than increase the diversity, we need to better understand how the different approaches relate to each other." [Forlizzi, 2004]

Understanding experience is complex

Designing the user experience for interactive systems, like a museum exhibit, is even more complex, particularly when conducted by a team of experts coming from different disciplines (education, history, design, and theater). Integrating all these perspectives is a challenge. What is needed is a framework that articulates experience in a way that does not rely on the point of view of any single discipline, but provides a common design-oriented frame of reference for all the relevant factors involved in design.

Quality of experience

Alben and her colleagues developed a set of criteria for assessing quality of user experience in order to judge entries in the first ACM/interactions Design Awards. The jury was interested in how effective interaction design could provide people with successful and satisfying experiences. They defined experience as “…the way it feels in their hands, how well they understand how it works, how they feel about it while they're using it, how well it serves its purpose, and how well it fits into the entire context in which they are using it.” If these experiences are successful and engaging, they argue, and then they are valuable to users. The criteria fall into two categories: those that directly impact user experience (e.g., learnable and usable), and those that make their contribution indirectly (e.g., understanding of users and effective design process).

- **Understanding of users** refers to how well the design team understood the needs, tasks and environments of the users, and

how well this understanding was reflected in the process.

- **Effective design process** refers to having a well thought-out process that addresses various project concerns and included user involvement, iteration, and multidisciplinary collaboration.
- **Needed** refers to whether the product meets some recognized need, and makes some significant social, economic, or environmental contribution.
- **Learnable and usable** refers to how well a product communicates its purpose and operation, and how well it supports different personal styles, given users different knowledge, skills, and strategies for problem solving.
- **Appropriate** refers to whether a product solves the right problem at the right level, with a good fit to social, cultural, economic and technical factors.
- **Aesthetic** refers to whether the product is aesthetically pleasing and sensually satisfying, and whether it performs well within its technological constraints. There is also some reference to contributing factors, such as cohesive design, and continuity across interaction, information, visual, and industrial design.
- **Mutable** refers to how well the product can adapt both to individual needs and over time.
- **Manageable** refers to whether the designers have taken a more systemic view of the product, for example by thinking about how the product might be purchased, installed, maintained, and disposed of.

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Hand out

- Dr. Hala Wakeel, handout in Basic Design Studio course, College of Design, King Faisal University, Dammam, Saudi Arabia.
- Prof. Yousef Alouhaly, handout in Design Method course, College of Arch. & Planning, King Faisal University, Dammam, Saudi Arabia.