



“There are no really tall sea shells”¹ An Exploration of Architectural Space

Curriculum Unit 84.01.01
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We spend our lives in and around buildings yet we know little about them or how we are influenced by them. All of us make daily decisions related to architecture. We select a color for a room, rearrange furniture, plan a garden or buy a house. With some fundamental knowledge of architecture introduced at an early age decision making can be easier. This unit will not attempt to develop future architects but to widen the student’s awareness of architecture and the design of man-made environments.

(figure available in print form)

“ There are no really tall sea shells ” was written to introduce students to the relationship between themselves and the architectural space they move in.

For discussion, I have focused on the architecture of Frank Lloyd Wright, 1867-1959. I have analyzed three of his buildings for their design and especially for Wright’s use of space. In an historical context, Wright is but one of many whose ideas have had a profound effect on architecture. His work has been a special interest and source of inspiration for me.

“ There are no really tall sea shells ” may be used separately or as a follow-up to *Looking At History Through Architecture* which I wrote during the 1983 Yale-New Haven Teachers Institute.

There are many lessons included, their purpose is to develop perceptual, organizational and technical skills which the student may apply toward a better understanding of all architecture and environmental settings. The lessons are designed to provide the opportunity for students to observe and manipulate space.

This unit is presented with this thought:

I hear, but I forget.

I see, and I remember.

I do, and I understand.

(Chinese proverb)

UNITY TEMPLE 1906

(figure available in print form)

Unity Temple located near Chicago is primarily a reinterpretation of the cube shape, it is a closed cubic form. (2) Wright used pre-poured concrete blocks to construct the Temple as if he were using the building blocks in the Froebel Kindergarten method. He used a slab-like roof which would appear later in his domestic designs. An ideal interior space of many levels is created with wall planes and piers. The building is monumental yet scaled in human terms meaning that a person moving within the interior senses himself relative to it, not lost in its size. The design is dominated by flat planes, large expanses of surface harmonized with deeply recessed areas and ornamentation. The pebbled surface of the flat areas appears as rich texture at close range. The building is solid, grounded, open and closed. Wright let the great worshipping room determine the exterior. He felt that Unity Temple expressed “the idea of the reality of the building as the space within”.² The interior spaces are interwoven, their boldness softened by the light from the ceiling, natural light by day and artificial by night. The exterior appears powerful, protective and secretive.

The entrance is on a raised platform. The path to the great hall is dark and turning, suggesting an inward spiritual journey, which opens to a large, well lighted room. (The Yale Center for British Art in New Haven by Louis Kahn gives its visitors a similar experience.) Balconies were created in the spaces between the four piers located at the corners. These piers also carry heating ducts which give an even distribution of heat. The congregation sits in a tightly packed square. The configuration and compactness of the seating result in a strong sense of being in the place. The interior is a symphony of large masses and detailed areas a visual experience of contrasting movement and repose.

Unity Temple is closed on three sides.(3) The entrance also serves as a link to the secular area, Unity House which is entered at midpoint of its large rectangular space set on a single axis. The interior of Unity House is subdivided by movable screens enabling the members to manipulate the space, redefining path and place according to changing needs. The utility core, including kitchen and sewing room, is located away from the public space yet accessible to it.

Unity Temple (figure) relates to the surrounding space (ground) through recesses and projections in the shape of the buildings, the relationship of the Temple and the House, columns set into recessed space of the building and gardens.

(figure available in print form)

A building is a combination of mass and void with varying degree of emphasis placed on those respective elements. Wright was committed to mass, seen throughout his career in the dominating hearth, piers, slab roofs and great expanses of surface. At the same time he searched for a new definition of void, not as a result of mass, but as space, an integral design element.

Wright said “Unity Temple is where I thought I had it”,³ meaning that he thought he had created a building where the reality was no longer in the walls and roof. He was trying to resolve the challenge of “getting out of the box”⁴ of traditional architecture. By this he meant that the interior space opened to the outside and the outside came in. As we shall see, he went on to find a solution that surpassed anyone’s efforts.

THE PRAIRIE STYLE

The prairie style was the climax of Frank Lloyd Wright's search to achieve spatial continuity and "to get out of the box", the traditional structure. He said "I came to realize that the reality of the building was not the container but the space within".⁵ Wright created a new American domestic architecture with the prairie style and went beyond the architectural principles of his time.

The prairie style is a synthesis of Wright's beliefs and some of the major influences on his life. A brief look at them makes it easier to appreciate his work.

Frank Lloyd Wright's mother had decided that her son would be an architect. Using the revolutionary concepts of 19th century applied psychology, she hung pictures of the great cathedrals of Europe for her son to see before and after his birth! She taught him the Froebel Kindergarten method, a system of building blocks, folded papers, strings and beads which were played with on a grid table.

Wright saw himself as an artist creating in isolation. He denied the influence of elements which appear obvious to the observer. In particular, Japanese architecture seems to have played an important role in Wright's designs. The interlocked cross axes, the low roof and the use of movable screens as well as the Japanese concept of "eliminating the inessential" became powerful elements of Wright's architecture, particularly the prairie style.

The low horizontal lines and relationship of the house to the land are characteristic of the prairie style. They express Wright's belief in democracy and man's desire for movement and need for a sense of shelter and rootedness. The use of the massive central hearth states that belief and continues an element from traditional American Colonial buildings.

Wright disregarded Greek architecture which he, mistakenly, interpreted as a symbol of man's isolation. The relationship of man and the land was vital to him and meant building in terms of human scale while designing the structure to fit the site.

Louis Sullivan was revered as the "master" by Wright who became his pupil while working with the Sullivan and Adler firm in Chicago. There, he learned the foundations of his life's work. "Form following function", relating the interior and exterior and the use of ornament are concepts directly attributed to Sullivan. Wright began to solve the problem of how "to get out of the box" as a result of working with his "master" who had begun the process with his own designs.

The genius of Frank Lloyd Wright created a new form, the prairie style which is characterized by the unity of all aspects of the plan, interior and exterior, in a single integration of space. The plan typically includes a compact central arrangement of fireplace and utility units. The interior space seems to flow out indefinitely on an infinite path beyond the house to the horizon, real or imagined, or to a landmark in the environment.⁽⁴⁾ Wright called this concept of the infinite space or path, "continuity".⁶ The exterior of the prairie style house is dominated by low horizontal roof lines which run parallel to the earth, hugging it, expressing both movement and groundedness. This is an example of Wright's "organic" architecture meaning that the house belonged to the land and specifically to the land upon which it was built.

(figure available in print form)

The boundaries between the interior and the exterior were fused by deep recesses of space, create by the cantilevered roof, set in windows and gardens. The bays as round and triangular shapes of the house (figure) push aggressively out to the surrounding space (ground) to create unity with the environment.

The interior consists of interlocking spaces, separated by angles of vision. There are surprises such as the usually low ceilings suddenly being pitched at unexpected angles. The low ceilings and central hearth give a feeling of intimacy and security. The sense of shelter is further stated by the overhangs of the sweeping cantilevered roof. The eye has the freedom to wander into the distance while protected by the shelter.

Innovations in domestic architecture derived from the prairie style are numerous, including; ribbon and corner windows, cathedral ceilings,built in furniture and lighting, concrete slab floors without basements, heating systems in floors, houses planned around utility cores and car ports, to name a few.

ROBIE HOUSE 1909

(figure available in print form)

The Robie House in Chicago is considered the masterpiece of Wright’s prairie style. It is one of thirty-five prairie style houses he built in a ten year period, few of which were actually on the prairie.

Robie House is arranged on one dominant axis through the living room. The central fireplace mass is on a shorter cross axis which grounds the house. The wide hearth is set deep in the house in the American Colonial fashion representing security and permanence. The sweeping roof line is anchored at the center with the upper gables on the 3rd level and chimneys at right angles to the principal axis. The floors and cantilevered roofs are carried by the chimney, the stone masses and piers. The walls, which are not used to hold the building up, are free to be placed to create the interior space and angles, to reflect light and create vistas.

On the 1st and 2nd levels large rooms stretch past the central chimney in both directions.(6) These large spaces are at once enclosed safely under the low ceiling yet give the feeling of movement and freedom because of their size and window placement which create vistas. While these vistas pull the visitor toward them it is possible to leave the imagined path to places of repose, or inglenooks. The hearth, the placement of seating in groups and the enclosed areas bays provide places for repose. The utility rooms (kitchen, laundry, etc.) are grouped together, away from the places and paths for living and entertaining. Privacy is maintained for the residents with the bedrooms on the 3rd level. The children’s play room and the billiard room (adults play room) are separated from the private quarters by the 2nd level.

(figure available in print form)

3RD FLOOR bedrooms, baths, guestroom and balcony

2ND FLOOR living room, dining room, kitchen and servants rooms

1ST FLOOR billiard room, childrens playroom, entrance hall, laundry/boiler room, garage or porch

The entrance to Robie House is in the back. The street side of the house is a series of unbroken horizontals, a rich interplay of mass and void. The interior and exterior glow together through terraces and walls. The

windows are arranged in rows, set deeply into the brick mass of the structure. Windows at either end of the large rooms on the 1st and 2nd levels extend vistas into the exterior. Wright used iridescent or opalescent glass which plays with natural light to create mosaic patterns. Other windows are ornamental with geometric patterns, letting light in while offering privacy. From the outside, they provide ornament in contrast to the large expanses of flat surface. Wright avoided plain glass windows which appear as holes in the surface rather than integrated elements of the total design.

Wright was not the only one of his time designing in the prairie style. What we know today as the “prairie school” consisted of a group of several independent, known architects who were achieving success with the idea. It was Frank Lloyd Wright who quickly emerged as the master, the one to go beyond the limitations of all others. His synthesis and innovation profoundly affected architecture.

GETTING OUT OF THE BOX

A lesson from Frank Lloyd Wright

Objective: To create a structure which doesn't depend on the traditional four walls for support. To free the interior space to the outside, to create cantilever and continuity.

Goal : Students will understand Wright's solution to the architectural problem of relating interior and exterior space by manipulation of the walls.

Materials : Heavy paper such as oak tag or chip board. Scissors, rulers, glue or tape.

Procedure : Make the models approximately 4" x 6".

1. Make a box but cutting six pieces (4 walls, a roof and floor). Assemble.
2. Make another model putting spaces in the walls for windows before assembling.
3. Cut pieces for a roof and floor. Use rolled up paper to support the roof, placing them 1" or 2" away from each corner wherever they can be so the roof corners won't sag. Look at the spaces between the supports. Measure it.
4. Make another model, the walls should be the size of the measured spaces in #3.
Now the corners are open. Move the walls into the interior of the model. How far can they go and still support the roof? Assemble. You have cantilever and “continuity”.
5. Make another model and experiment with the size and placement of the walls. (Wright called them screens). He used a massive hearth located at the center to carry the roof. Now consider the roof how can you express freedom and continuity there?

The Solomon R. Guggenheim Museum in New York was conceived in 1943 and built between 1957 and 1959. It was not completed at the time of Wright's death in 1959 at age 92. Wright climaxed his long creative life and belief in the organization of natural forms with this design. He especially admired the seashell and cocoon which represented to him the ideal structural prototypes for plasticity and continuity. He had concluded that the square was harsh, artificial and alien to nature, that rectilinear geometry shouldn't be imposed on the earth.

The circle dominated Wright's final years of work. The spiral becomes the next step from the circle, stretched to the 3rd and 4th dimensions. (The 4th dimension is a person in the space). Wright had first used the idea in 1925 for a planetarium which was never built. His use of the spiral or snail shape also represents a return (if he ever really left) to the curvilinear and influence of his master, Louis Sullivan.(13) Geometric forms had dominated Wright's work in the years since he'd left his master.

(figure available in print form)

The Guggenheim consists of two parts, the main exhibition hall and a small circular administration building.(14) The main structure is a domed spiralling shape which encloses a large central well. The spiralling ramps are the places and paths of the gallery space. Arriving at the top in an elevator, the visitor experiences a continuous flowing journey of descent, returning to the ground floor, having made five complete turns around the central well. Along the way, the visitor may step off the path, taking control of his journey, into bays or places of repose, to look at the art hanging. The bays provide a place for intimate viewing while a glance across the open central space presents a panoramic view of the art and environment. This is consistent with Wright's method of designing. On a two dimensional plane he weaves large expanses of surface with areas of intricate detail so the viewer's interest is held from any distance.

Wright has reiterated his quest for "continuity" with the spiral. This quest had been explored and articulated in the prairie style house with its infinite vistas and horizontal expanses set in cross axes.

Each ramp becomes deeper than the one below as the building radiates outward, pushing into space, toward the top. There the expansion is checked by the dome which has a stabilizing effect by bringing the eye to a dominant point of focus.(15) The continuous spiralling is checked by the vertical piers rising up from the ground floor. Balance is achieved in a structure which possesses tension and stability.

Looking up from the ground floor, the visitor sees ribbons of light surfaces and dark deeply recessed spaces created by the ramp. The concave interior is broken by a vertical convex band again balancing tension and stability. The ramp is enclosed space which pulls the visitor forward on the path. It remains open with recessed bays on one side and the panoramic vista on the other. One senses motion and freedom in a secure space.

(figure available in print form)

As a museum, the Guggenheim has not been entirely successful. It has been a challenge for the director to exhibit the art so it appears significantly separate from the building. Natural light has been replaced by fluorescent in the bays where the paintings hang from metal bars. This is not in accordance with Wright's specifications, but to compensate for the curved walls which make traditional methods of mounting difficult.

The utility core consisting of the elevator, cafe, lecture room and storage area is adjacent to and integrated with the great spiral. They are located so they serve but do not intrude upon the exhibit hall. The same plan is seen at Unity Temple and Robie House. The lecture room and cafe provide alternative spaces, places for repose in contrast to the spiral and its powerful journey.

The exterior repeats the ribbon effect of light surfaces and dark recessed spaces. The concrete was painted tan to accentuate the alternating spaces and to restrain the concrete masses. There is no surface ornament to distract from the bold exterior design.

(figure available in print form)

The design of the Guggenheim is not integrated to the established urban pattern. Wright's contempt for the urban environment is clearly expressed with this building. The great sculpture is self-contained, it stands alone in the crowd and withdraws to its interior. It is interesting that Wright has re-introduced the Greek principle of architecture, as he understood it, by presenting an image of human isolation, a principle he

adamantly rejected. It seems he was reflecting what he saw the urban environment as monumental to the isolation of man. (16)

MOTHER, NATURE AND ARCHITECTURE

Frank Lloyd Wright said architecture was the mother art. Mother Nature has been called an architect there's a connection here somewhere a circle.

When Wright was preparing to build a skyscraper he faced a dilemma. He believed in the structural forms of nature, especially seashells, as perfect architecture, but as Peter Blake quips "There are no really tall sea shells." ¹ So Wright looked again to nature for inspiration. The tree was the answer. There, the deep roots spread out in the earth while limbs stretched out to keep the trunk in perfect vertical balance. Wright used this concept to design the Johnson Wax Building, Laboratory Tower in 1950.(17) Structure, form, shape and patten can be found everywhere in nature.

(figure available in print form)

ARCHITECTURE IN NATURE

Lesson

Objective: To observe structure, form, shape and pattern in nature.

Goal : To relate nature and architecture.

Materials : Found objects, paper, cardboard, microscope if available, pencils, markers, fabric.

Procedure :

1. Students will collect some of natures creations such as leaves, mushrooms, flowers, stones, shells, vegetables.
2. Draw and describe each item looking for structure, form, shape and pattern.
3. Imagine a small building based on an idea from nature. First, make a drawing and describe it. Them make a small model using folded paper, cardboard, etc. Build up from a drawing. Last, build it big enough for one person.

POSITIVE/NEGATIVE SHAPES

Lesson

Objective: Students will use simple shapes to define positive and negative space.

Goal : Students will gain an understanding of the figure-ground concept.

Materials : (figure available in print form)

Procedure :

1. Open paper like a book. On the left side place the shapes (2) so they are not touching each other. Trace shapes. Color the *inside* space of the shapes the positive. All the space *outside* the shape becomes the negative.
2. Repeat place the shapes on the right side of the paper the same way. Trace. Color the space *outside* the shapes this time. Which is positive or negative?

Another way

Students may create an abstract collage using two or three colors of construction paper (1/4 page each) and one sheet of white paper. Fabric, newspaper, etc. may be used instead of construction paper.

- Procedure* :
1. Cut random shapes one out of each piece of paper.
 2. Using the shapes and the paper they were cut from () create a design (organize the materials) by laying them on the white paper. Encourage the students to consider overlapping, placing big next to small, dark near light, round near square, etc. Emphasize the importance of the white paper peeking through as *new shapes* , to use them in the design.
 3. Before gluing, remove all pieces and start arranging again.
 4. Crayon, paint or magic marker may be used in the spaces.

INTERPENETRATION

Lesson

Objective: Students will create a 2D design by drawing shapes (overlapped) and painting.

Goal : Students will better understand the figure ground concept by exploring interpenetration.

Materials : Paper, pencil, paints, brushes.

- Procedure :**
1. Draw a few shapes overlapping them so that new shapes are created. Simple shapes are fine.
 2. Mix paints. A monochromatic scheme is a good start. Use one color and mix white in varying proportions to create 3-4 values of the color.
 3. Paint *each* shape. Try to balance the location of the colors. Don't paint any two adjacent shapes the same.
 4. Next time draw a more complex design and paint with a wider variety of colors.
(figure available in print form)

CONTOUR DRAWING

Lesson

Objective: Student will examine interior and exterior space through the contour drawing method.

Goal : Students will gain understanding of the figure ground concept. Students will develop observation skills.

Materials : Crayon (dark color), paper, viewer a 3" x 3" cut out of a piece of cardboard, a model or still life of objects.

- Procedure :** It is beneficial to establish a quiet environment. Students should observe the subject for 3-5 minutes by walking around as well as from a fixed position.
1. After observing, draw the *outline* of the subject in the air. Use one connecting line from start to finish.
 2. Looking through the viewer. Emphasize not looking at the paper concentrate on the involvement with the subject. Use one continuous line. Allow 5-7 minutes. Repeat until students feel more comfortable. The drawings will be extremely distorted. That will diminish with practice. It should be enjoyed for its oddness! Pablo Picasso used this technique often!

3. Students may begin to draw for more detail. For example, follow the lines of the folds of fabric as it moves to the interior space of the subject, away from the outline.
4. Ask students to observe the subject through the viewer. Now draw the outline as if it were the definition of the exterior space. Refer to the lesson about positive and negative space.
5. Encourage the students to share and discuss their work. Can they see any change in the level of distortion? Have they observed more detail? Can they see the difference in the drawing when thinking interior/ exterior (inside/outside) space?

SPACE EXPLORERS

Lesson

Objective: To explore 3 dimensional positive and negative space using a variety of materials.

Goal : That students may consider space not as a void but as an integral part of the whole.

Materials : Wood blocks, ball, boxes, juice cans, malleable wire, screen (regular window screen available at hardware stores).

Procedure : Point out to the students that we draw on a 2 dimensional surface. Here wire will be used as if it were a drawn line drawing in space.

1. Explore the outside of the objects by wrapping the wire around them. Remove the object to observe the shape of the space now represented by the wire.

2. Explore the inside of the object with the wire. Remove the wire to observe its shape.

3. Use the screen repeating #1 and #2.

4. Place two objects a few inches apart. Use one length of wire to explore the outsides of the two objects keeping them apart. Explore the insides, explore one inside, 1 outside.

5. Continue the process, carry the wire beyond the object to continue the implied shape of the space.

This exercise can go on have students bring interesting objects for exploration. Terrific sculpture can result which may be permanently mounted to a block of wood.

From: Rowland, Kurt. *Learning to See Book IV Rhythm* . New York: Van Nostrand Reinhold Company, 1971.

This superb series is well worth tracking down. There are five books and workbooks and teachers guide.-

ANALYSIS AND DESIGN PROJECT

The following is an analysis and plan of a building I have designed to be a studio and deck, adjacent to an existing house located on several wooded acres. The structure can be dismantled, to be stored or moved.

The diagonal entrance, located on a corner, is situated to provide access to the house and to the garden and path which lead away from the studio. The porch entrance extends to become a deck (2 levels) which zigzags onto the land. Clay pots, sculpture and evergreens will be arranged on the deck. The studio and deck create an enclosed space which can be seen from the kitchen of the house.

Upon entering the studio the visitor will look ahead to a vista into the woods, created by a window in a

diagonal wall which is parallel to the entrance. The nine foot wall will be the work area. Paintings in progress will hang there.

The interior becomes two spaces, one open and the other closed. The studio door opens to the left leaving the enclosed space unseen until the visitor has entered and turned around.

A loft bed or rest area and storage or shelves will be in the enclosed space with a skylight overhead. From that vantage point the work in progress can be studied.

The rest of the interior is immediately available to the visitor with exterior views ahead and to the right.

Some seating will be arranged on the thirteen foot wall which is shared by the open and enclosed spaces. The deck and garden will be seen from there. The seating will be out of the path to the work area. That path becomes "place" when the artist uses it to view the work from a distance.

The deck extends the studio to the exterior and reaches out to the land. It also obscures the foundation when approaching the studio from the garden path. The repeated low horizontal lines of the deck ground the structure which has strong vertical lines created by the diagonal slanting roof, long narrow windows and vertical siding.

A small stove will be located near the seating. A fan will be placed in the nine foot wall near the roof and all windows will open to provide ventilation. The floor will be covered with straw mat.

Natural light will be available from all angles. Artificial light will be mounted from the ceiling on either side of the dome for the work area and above the loft bed.

This project was accomplished during the 1984 Yale New Haven Teachers Institute with the guidance of Kent Bloomer who led the seminar series on architecture.

NOTES

1. Blake, *Frank Lloyd Wright Architecture and Space* , p. 86.
2. Kaufman, *An American Architecture* , p. 140.
3. Ibid., p. 75.
4. Ibid., pp. 76-78.
5. Gardner, *Gardner's Art Through the Ages* , p. 736.
6. Ibid., p. 736.

ILLUSTRATION CREDITS

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 2. Kaufman, Edgar, ed. *An American Architecture* , p. 143.
 3. Ibid., p. 142.
 4. Wright, Frank Lloyd. *An Autobiography* . p. 1.
 5. Scully, Vincent Jr. *Frank Lloyd Wright* . p. 39.
 6. Gardner, Helen. *Gardner's Art Through the Ages* . p. 73.
 - 7-12. Kaufman. pp. 76-78.
 13. Patricia Gaffney Ansel
 14. Scully. p. 116.
 15. Blake, Peter. *Frank Lloyd Wright Architecture And Space* . p. 120.
 16. Scully. p. 120.
 17. Blake. p. 89.
- All illustrations are in my own hand.

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Wright, Frank Lloyd. *An Autobiography* . New York: Duell, Sloan and Pearce, 1943. The master speaks.

*Recommended for students as well as teachers.

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