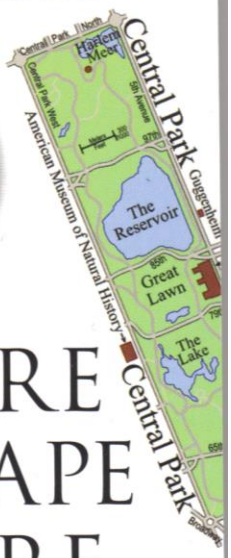
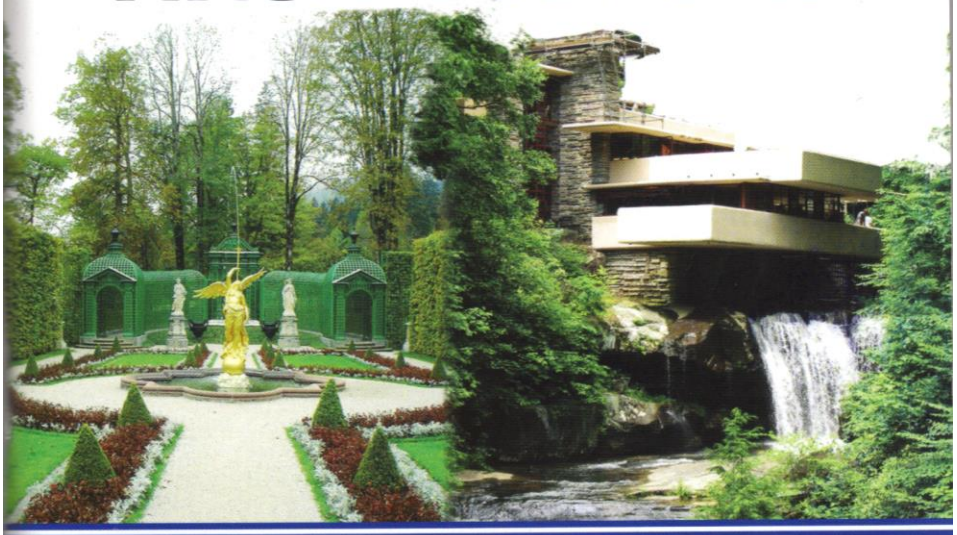
MERIT BADGE SERIES



ARCHITECTURE AND LANDSCAPE ARCHITECTURE



BOY SCOUTS OF AMERICA®

How to Use This Pamphlet

The secret to successfully earning a merit badge is for you to use both the pamphlet and the suggestions of your counselor.

Your counselor can be as important to you as a coach is to an athlete. Use all of the resources your counselor can make available to you. This may be the best chance you will have to learn about this particular subject. Make it count.

If you or your counselor feels that any information in this pamphlet is incorrect, please let us know. Please state your source of information.

Merit badge pamphlets are reprinted annually and requirements updated regularly. Your suggestions for improvement are welcome.

Send comments along with a brief statement about yourself to Youth Development, S209 • Boy Scouts of America • 1325 West Walnut Hill Lane • P.O. Box 152079 • Irving, TX 75015-2079.

Who Pays for This Pamphlet?

This merit badge pamphlet is one in a series of more than 100 covering all kinds of hobby and career subjects. It is made available for you to buy as a service of the national and local councils, Boy Scouts of America. The costs of the development, writing, and editing of the merit badge pamphlets are paid for by the Boy Scouts of America in order to bring you the best book at a reasonable price.

BOY SCOUTS OF AMERICA
MERIT BADGE SERIES

ARCHITECTURE AND LANDSCAPE ARCHITECTURE

BOY SCOUTS OF AMERICA®

Architecture Requirements

1. Do the following:
   a. Tour your community and list the different types of buildings you see. Try to identify buildings that can be associated with a specific period of history or style of architecture. Make a sketch of the building you most admire.
   b. Select an architectural achievement that has had a major impact on society. Using resources such as the Internet (with your parent's permission), books, and magazines, find out how this achievement has influenced the world today. Tell your counselor what you learned.
2. In the Outdoor Code, a Scout pledges to "be conservation-minded." Discuss the following with your counselor:
   a. The term *sustainable architecture.* Identify three features typical of green buildings.
   b. The difference between renewable building materials and recycled building materials, and how each can be used in construction.
   c. The relationship of architecture with its surrounding environment and the community.
   d. How entire buildings can be reused rather than torn down when they no longer serve their original purpose.

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3. Do ONE of the following:
   a. With your parent's and counselor's permission and approval, arrange to meet with an architect. Ask to see the scale model of a building and the drawings that a builder would use to construct this building. Discuss why the different building materials were selected. Look at the details in the drawings and the model to see how the materials and components are attached to each other during construction.

Thorncrown Chapel near Eureka Springs, Arkansas; Fay Jones + Maurice Jennings Architects

Pine Eagle Chapel at Camp Tiak Scout Camp, near Wiggins, Mississippi, makes an impressive backdrop for outdoor gatherings; Fay Jones + Maurice Jennings Architects.

b. With your parent's and counselor's permission and approval, arrange to meet with an architect at a construction site. Ask the architect to bring drawings that the builder uses to construct the building. While at the site, discuss why the different building materials being used were selected. Discuss how the different building materials and components are attached to each other during construction.

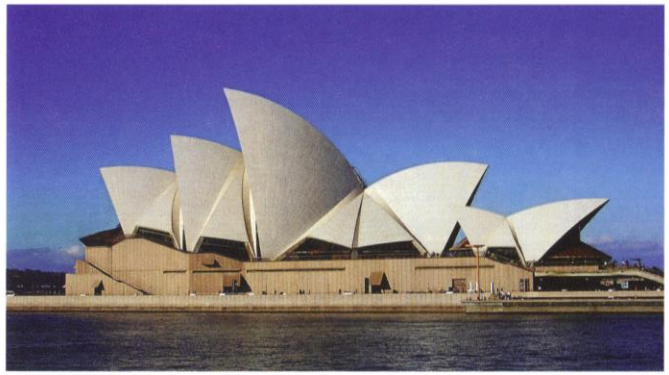
   Note: To visit a construction site will require advance planning. You will need permission from your parents, counselor, the architect, and the construction site manager. A construction site is a very dangerous place. While there, you will need to closely follow the site manager's directions and comply with all the safety procedures, including wearing a hard hat, protective eyewear, and proper footwear.

c. Interview someone who might be your client (such as a prospective homeowner or business owner) if you were an architect. Find out what your client's requirements would be for designing a new home or business building. Write a short program including a list of requirements for the project, the functions of the building and site, how the functions relate to one another, and the goals of the project.

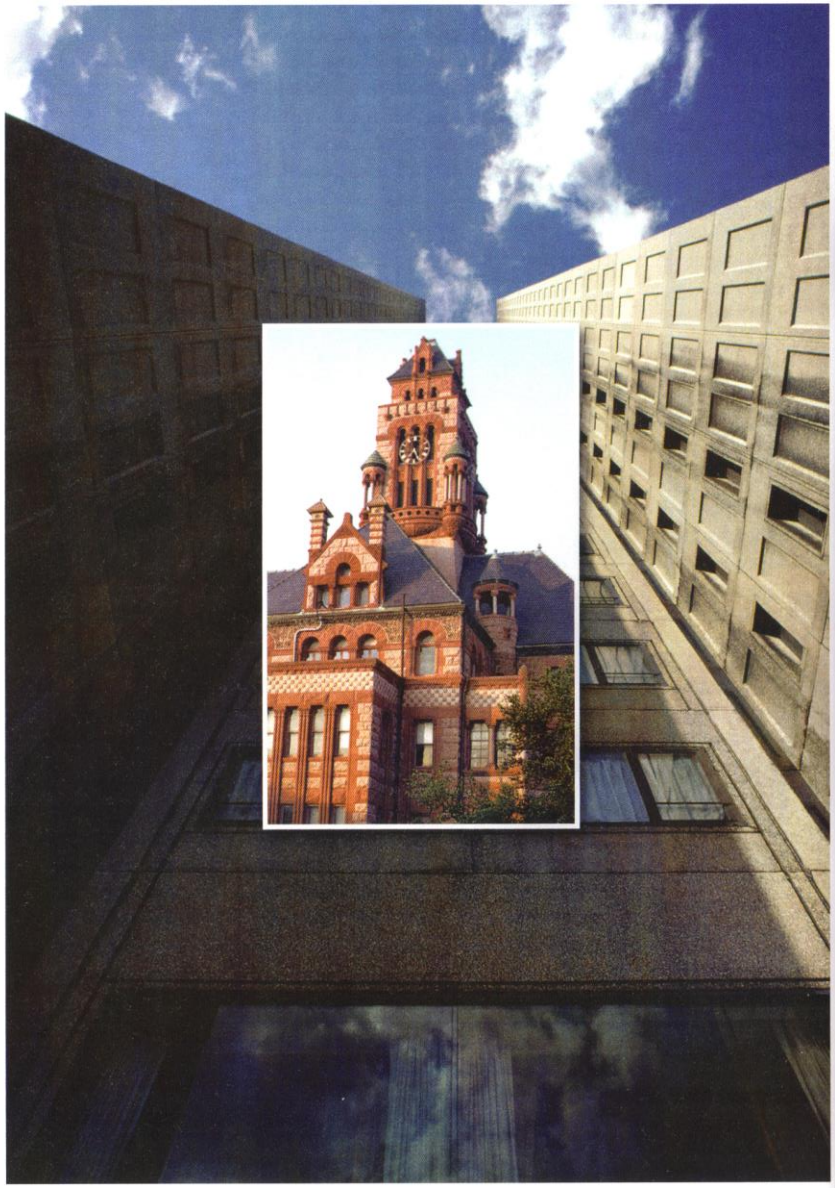
4. Measure a room such as one where you live or where your troop meets. Make an accurately scaled drawing of the room's floor plan showing walls, doors, closets, windows, and any built-in furniture or cabinets. Neatly label your drawing with the following: your name, the date, what room you drew, and the scale of the drawing. (Drawing scale: ¼ inch = 1 foot)

5. Find out about three career opportunities in architecture. Pick one and find out the education, training, and experience required for this profession. Discuss this with your counselor, and explain why this profession might interest you.

Architecture Contents



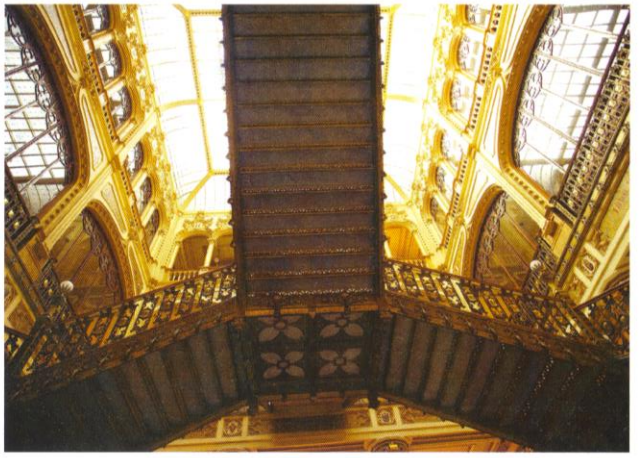
Sydney Opera House



Introduction to Architecture

Defined simply, architecture is the structure that shapes space. It includes the elements that form space around buildings as well as space inside buildings. We constantly experience architecture as we go about our daily lives, and we are influenced deeply by what we see, hear, and feel.

Architecture is not just the special buildings like cathedrals, museums, or sports stadiums we read about or see on television; it is as normal as the homes, places of worship, schools, and shopping malls where we live, worship, work, learn, and play every day. However, architecture is more than just common shelter; building has always satisfied the human need to create something of meaning. Even the simplest form of architecture is a work of art that requires thought and planning.

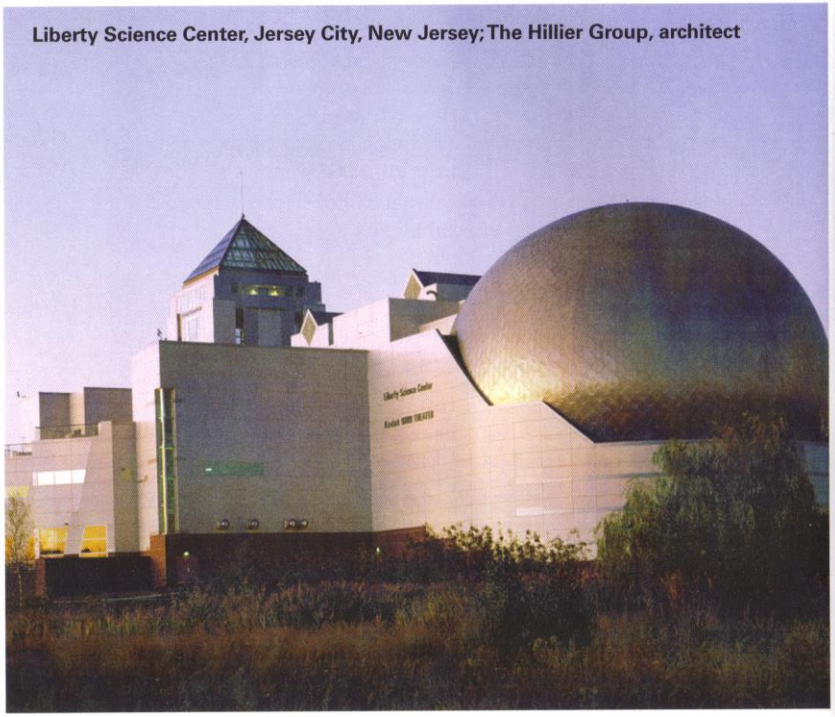


In a way, all architecture is sculpture in which people live their lives. Each of us creates architecture when we build a clubhouse, decorate a bedroom, or even stretch blankets over dining room chairs to fashion a hideout.

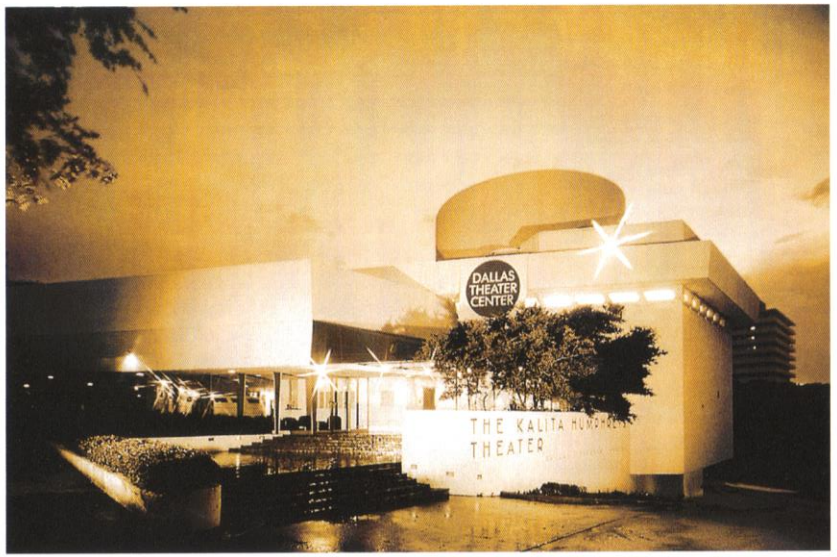
Whatever their work style, all architects must combine their knowledge of art and engineering to create useful places for people to live and work.

Architecture is dynamic and changes with the styles, colors, and building materials that vary from time to time, region to region, and nation to nation according to the different needs, different resources, and different ways that people see and do things. From cave dwellers to astronauts, all humans have influenced, and been influenced by, architecture.

Architects are problem solvers who have studied human nature, art, and science, and who understand how to create architecture that people need. Some architects still draw designs by hand and work directly with clients to design buildings or other "systems" that solve problems. Other architects use advanced computer technology and work in teams with other designers, such as engineers, to design very complicated projects that might be buildings or other systems that solve problems.



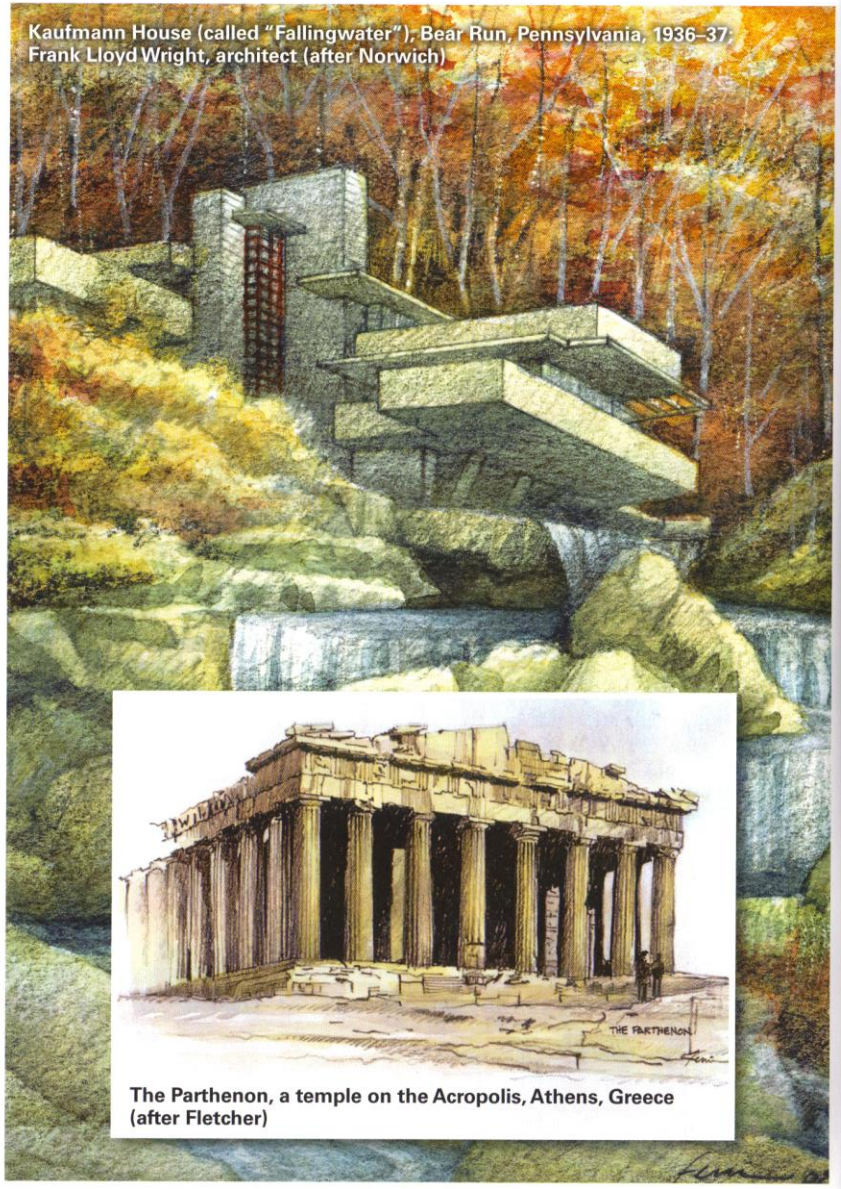
Liberty Science Center, Jersey City, New Jersey; The Hillier Group, architect



Kalita Humphreys Theater, Dallas, Texas; Frank Lloyd Wright, architect

Architecture is an exciting profession that can offer you a real chance to create something of meaning, whether it is a big project or a modest one. Many people with an education in architecture find challenging career opportunities in other fields that require artistic talent and the ability to evaluate and solve problems, such as filmmaking, acting, environmental science, education, law, governmental service, business systems, and many others.

Architects enjoy many opportunities and face many challenges. They must continue their education to help keep their awareness keen and their expectations high. Like the buildings that architects design, the responsibilities and rewards of the architectural profession come in all shapes and sizes. Earning the Architecture merit badge will give you a new perspective of architecture and a chance to see what architects do.



Kaufmann House (called "Fallingwater"), Bear Run, Pennsylvania, 1936–37; Frank Lloyd Wright, architect (after Norwich)

The Parthenon, a temple on the Acropolis, Athens, Greece (after Fletcher)

History of Architecture

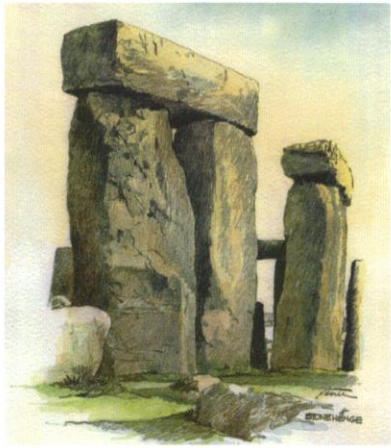
The well-known modern architect Le Corbusier said that architecture is experienced by "the foot that walks, the head that turns, the eye that sees." Architecture appeals to and involves all of the senses. To understand the importance of architecture as the setting for our lives, we need to know something of architecture's history and development. Let's look briefly at architecture through the ages.

Prehistoric Architecture

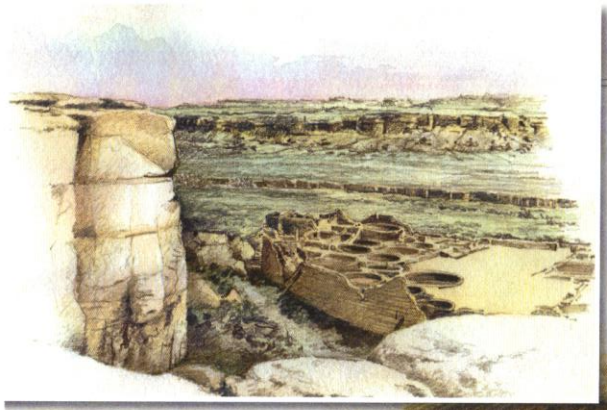
Architecture had simple beginnings. People first sought shelter in caves. Then, they learned to construct simple huts of reeds and to build structures of timber and stone. This is architecture as shelter.

As people began to live together in large groups, and once they had solved the basic problem of shelter, another kind of architecture was developed, that of ritual and ceremony.

Two important aspects of architecture can be seen in one famous prehistoric site, Stonehenge. One aspect is *function.* Function is the way a building or structure does its job—the way it accommodates the uses for which it was built. Stonehenge may have functioned as a unique type of calendar, plotting annual alignments of the sun and moon. The second aspect is *ritual.* Stonehenge is thought to have been an outdoor temple that had sacred and religious meaning.



Stonehenge on Salisbury Plain, Wiltshire, England (from *World Architecture*)



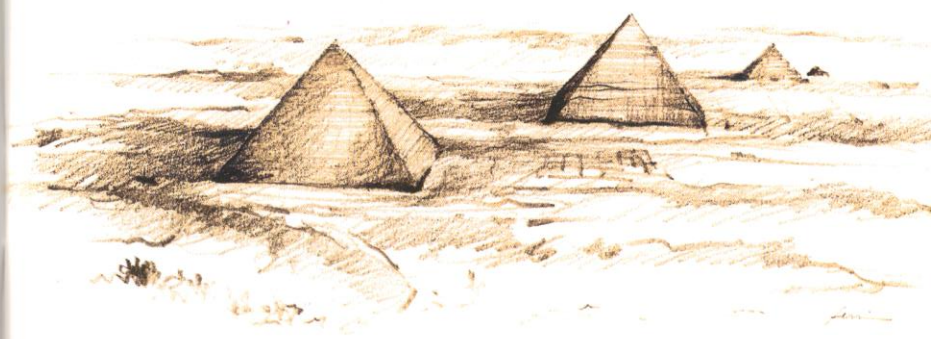
Pueblo Bonito, Chaco Canyon, New Mexico (R. B. Ferrier)

Cliff Palace, Mesa Verde, Colorado (R. B. Ferrier)

Adobe dwelling, Taos, New Mexico

Native American Architecture

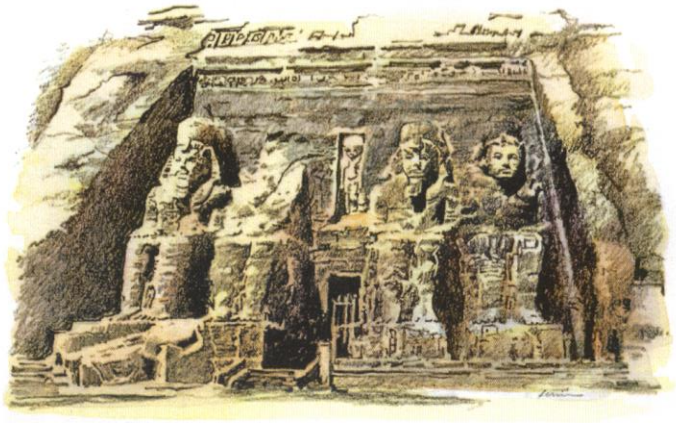
Architecture designed by the ancient cultures of North America is among the most significant found anywhere in the world. In the Southwest during ancient times, Anasazi Indians developed a sophisticated culture and an architecture of great complexity and excellent construction. The largest and best-preserved ruins are those of Pueblo Bonito, a five-story building that was constructed in the 10th century.



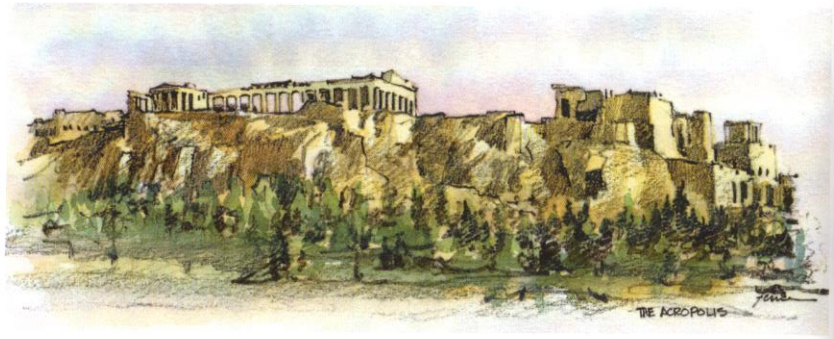
Pyramid complex, Giza, Egypt, 2570–2500 B.C. (after Kostof)

Ancient Egyptian Architecture

The people of ancient Egypt developed a complex society that was reflected in their architecture. They built great pyramids to preserve the bodies and possessions of their kings, who were called *pharoahs.* The Egyptians designed and built religious temples and the pyramids to resist the erosion that would occur over time. The aspects of function and ritual were important in the architecture of ancient Egypt.



Great Temple of Abu Simbel, Egypt, circa 1301 B.C. (after Fletcher)



The Acropolis, Athens, Greece (after Norwich)

Greek Architecture

Many people believe that the most significant building site in the history of architecture is the Acropolis at Athens, Greece. The basic elements of classical architecture are preserved in the ruins of the Acropolis, which was erected in the fifth century B.C. (*Classical* refers to the forms and styles of ancient Greece and Rome.)

The Acropolis was dedicated mostly to the celebration of ritual, but it also had functional areas, including markets where goods were bought and sold, and theaters for entertainment.

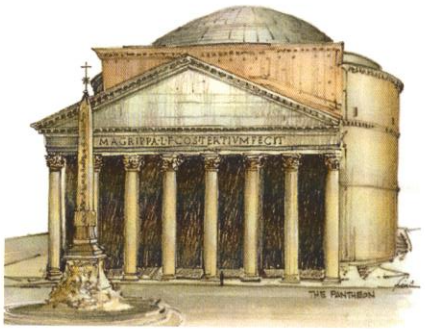
The term *tripartite* refers to the three parts of a building or column. The classic column has a base, a shaft, and a *capital* (a decorative upper end). The classic temple has a base, a *colonnade* (columns set in a row), and a *pediment* (a triangle-shaped upper structure). This is similar to the human form, which consists of the feet, the torso, and the head.

The Erechtheum, a temple on the Acropolis, Athens, Greece (after Fletcher)

Roman Architecture

The architecture of the early Roman Empire was directly influenced by the classical elements of Greek architecture. The Romans refined these classic components and developed the use of the arch, vault, and dome. An *arch* is a curved structure spanning an opening. A *vault* is an arch-shaped structure used as the ceiling of a room or other enclosed space; a *dome* is a rounded vault. The use of the arch and vault introduced curved forms, and the Romans were the first to include these elements on a massive scale in their architecture. These classical architectural basics have continued to evolve and can be seen in modern buildings.

Arch of Titus, Rome, Italy, A.D. 82 (from *World Architecture*)



The Pantheon, Rome, Italy, exterior view (after Fletcher)

The major monuments of Roman architecture also show the importance of function and ritual. The Roman Forum—a large, open space in the central part of the city where people gathered—featured functional parts such as shops, markets, theaters, and buildings for conducting legal and political business. Monuments, statues, and the temples of the Forum fulfilled the purposes of religion and ritual.

The Pantheon, Rome, Italy, interior view (after Fletcher)

Gothic Architecture

As the great cities in Italy, France, Spain, Germany, and England flourished, an elaborate new form of architecture emerged in the 12th century. Called the *Gothic* style, it was the dominant structural style in Europe for 400 years. Ornate cathedrals and churches, palaces, and other types of buildings reached toward the sky, their intricate stone construction emphasizing soaring spaces and allowing larger areas of glass.

Cathedral of Notre Dame, Paris, France; front view

Renaissance Architecture

The term *renaissance* means rebirth or revival. In history, the Renaissance was a period from the 14th century to the 17th century in Europe, when great cultural and social advances were made. Renaissance architects studied classical Roman and Greek architecture. They used the ideas of balance, proportion, and order to develop a new architecture based on the principles of the classical era. Important accomplishments in art and architecture were achieved during the Renaissance.

Dome of St. Peter's Basilica, Rome, Italy, 1546–1626; Michelangelo, architect (from *World Architecture*)

Robie House, Chicago, Illinois, 1908; Frank Lloyd Wright, architect (after Constantino)

Modern Architecture

The Industrial Revolution, which began in England about 1760, shaped the modern world in which we live. Many people moved from rural areas, leaving their farms to work in factories making mass-produced products. The structure of society changed significantly, and architecture responded with dramatic innovations. By the late 19th century, buildings of concrete, iron, steel, and glass had become the dominant architectural forms.

In the first half of the 20th century, three architects emerged as leaders of modern architecture: the American Frank Lloyd Wright, the Swiss-French Le Corbusier, and the German-American Ludwig Mies van der Rohe. Study any modern city, and you will see the impact of modern architecture.

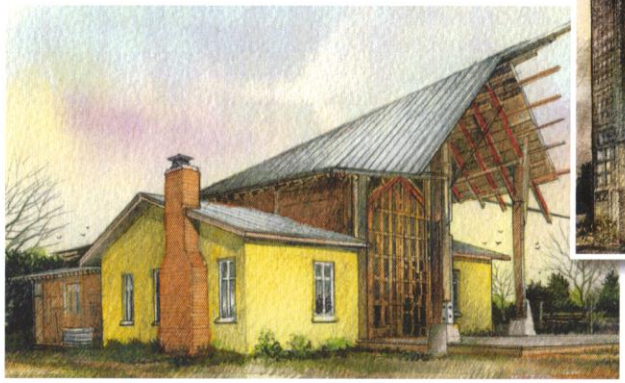
La Tour IBM–Marathon Tower, Montreal, Canada; Kohn Pederson Fox Associates, architect

Smith House, Darien, Connecticut, 1965–67; Richard Meier, architect

Architecture After the Modern Era

By the end of the 20th century, computers and the other technological advances of the information age had signaled other changes in the structure of society. Architecture responded in a unique way. Rather than one new movement, architects pursued a variety of directions. For example, Richard Meier's buildings continue to use the highly ordered, geometric shapes of modern architecture, while Michael Graves designs buildings that use classical elements and descriptive images. Other architects are designing buildings that appear to be incomplete, or in a state of collision and conflict.

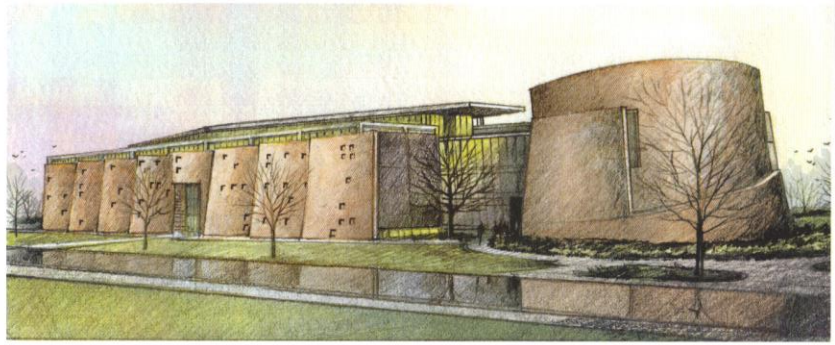
Humana Building, Louisville, Kentucky; Michael Graves, architect



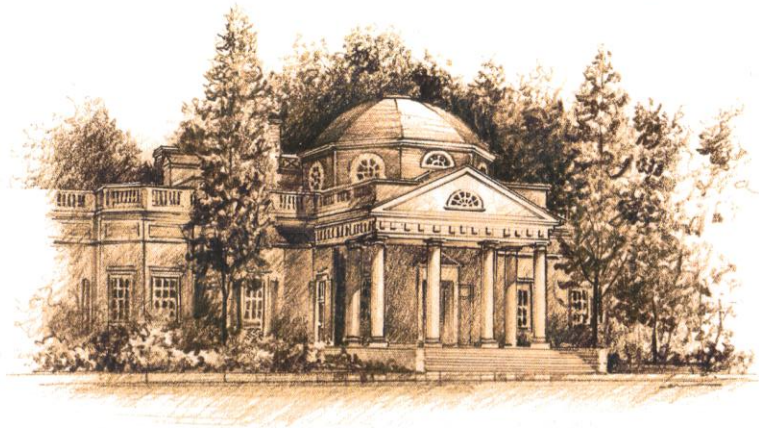
Goat House, the Rural Studio, Sawyerville, Alabama; Samuel Mockbee and Auburn University architecture students, architects

Guggenheim Bilbao Museum, Bilbao, Spain; Frank Gehry, architect

If you look carefully at the buildings in your community, you will be able to see architectural features from various periods of history. For requirement 1, you are to identify buildings that can be associated with a specific historical period. Look at the shapes of windows, doors, columns, and roofs, and the different ways in which building materials are used. Look at homes, places of worship, your city hall, or perhaps an older school or college building to discover how architects learn from the buildings of the distant—or recent—past.



School of Architecture, Prairie View A&M University, Prairie View, Texas; RoTo Architects with HKS



Monticello, near Charlottesville, Virginia, 1770–1808; Thomas Jefferson, architect

Preserving Architecture From the Past

Humans always have been builders. The architecture that early humans leave tells us something about how they lived and what they believed was important in life. Many people feel that it is important to save old buildings, whenever possible, because they are important links to history. Buildings can be historic even if they are as old as the pyramids in Egypt or Stonehenge in England. A railroad depot, place of worship, or house near where you live might be important to the history of your community.

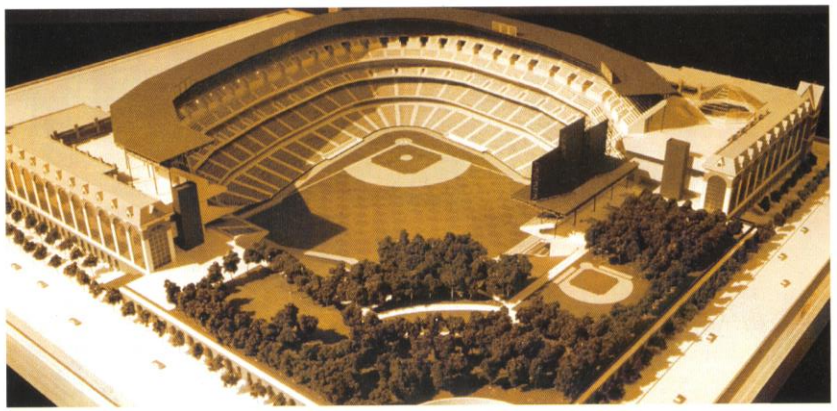
There are many reasons for preserving architecture from the past. Some buildings should be preserved because their appearance sets a historic trend, like the Robie House in Chicago, Illinois, or the Empire State Building in New York City. Some buildings should be preserved because they link us to the past, like Independence Hall in Philadelphia, Pennsylvania, or the Alamo in San Antonio, Texas. Finally, some buildings should be preserved because they can be used for another purpose. For example, a railroad depot might become a restaurant, or a warehouse might become loft apartments.

Remodeling older buildings for another use is called *adaptive reuse.* Think of it as the ultimate in recycling, saving materials and craftsmanship that might be impossible to replace today. Many times, buildings that have been preserved and remodeled for another use make the most interesting places to live and work.

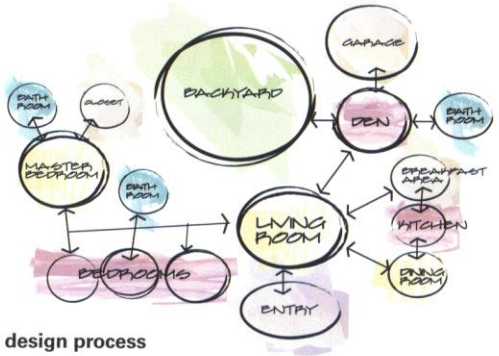
How Architecture Happens

The process of designing and constructing an architectural project may take a few months or a few years, depending on the size of the project. Throughout the design process, the architect works closely with his or her client. The client might be the owner of the project or someone who represents the interests of the owner. The architect also will work with many other people during the project, including engineers, government officials, builders (sometimes called general contractors), and manufacturers of building materials.

Often, architects must present their project plans to city councils or planning and zoning commissions to gain approval to build the project.



Rangers Ballpark in Arlington, Texas; Harwood K. Smith Inc. with David M. Schwarz, architects



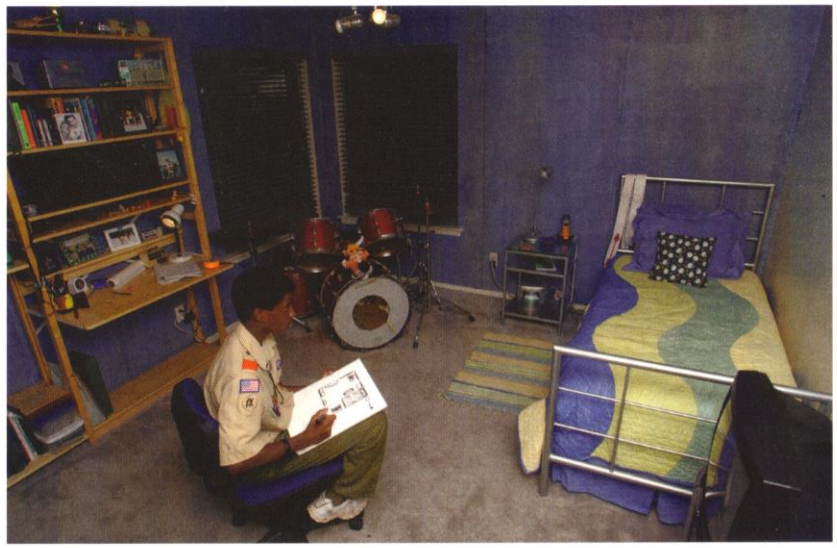
The design process

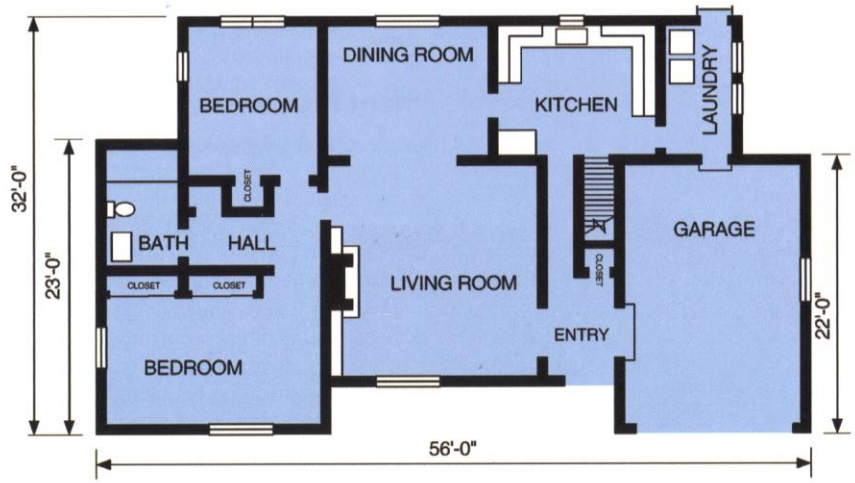
To arrive at a design solution for a project, architects use a problem-solving process that follows several steps, or design phases. Each design phase divides the work effort into small parts so that the architect can consider all the issues that will lead to a successful conclusion. The consistent use of design phases makes it less likely that the architect will forget an important part of the project.

Programming Phase

The first step in the design of a project is to develop a list of requirements for the project, called a *program*. The program describes all of the functions that the building and its surrounding site must accommodate, including the relationships of the functions to one another, the needs of each function, and specific goals the project must achieve. The program must address the level of quality and the number of facilities needed by the client. The final form of the program usually is a written document that contains descriptions and diagrams showing important relationships between certain functions, and lists of rooms or spaces and their required sizes. The diagrams sometimes are called "bubble diagrams" because they use round or oval shapes to signify the spaces.

The architect must work closely with the client during the programming phase to understand the client's expectations for the project. The programming phase defines the problem that the architect must solve, and the success of the project can be determined by the quality of work performed in this first step.





For requirement 4, you will need to create a floor plan of your bedroom. This floor plan shows an entire house.

Some architects use computers to create renderings of the completed project.

Schematic Design Phase

The project's design begins to take shape in this phase. Using the program as a guide, the architect develops general ideas, or *concepts*, to solve the problem of the overall building and site layout. Usually, the architect develops several conceptual plans to find the best solution to the problem. The architect then presents the conceptual plans to the client for review and approval. After analyzing the pros and cons, the architect and client agree to a concept. Then, the architect draws detailed floor plans and site plans based on the final design concept. The architect may meet with the client many times as the design develops.

The architect also begins to design the exterior and interior during this phase. When the schematic design phase is complete, the architect will prepare drawings that show these ideas. Usually, the *schematic design package* includes drawings for a site plan, floor plans, exterior elevations (what the building will look like from all sides), and possibly a three-dimensional, realistic drawing of the building so the client can see how the completed project will look. This perspective view is called a *rendering*. It is a work of art in pencil, ink, oil paints, or watercolors created by the architect or a commercial artist who specializes in rendering.

Design Development Phase

The architect continues to develop the design concept in greater detail, finalizing interior spaces and refining the exterior appearance. The architect investigates and selects the important materials needed for the exterior and interior construction and determines the systems that will make the building useful to its future occupants, such as air-conditioning, heating, electrical power, lighting, and their supporting structures. All of these systems require space. The architect must make sure that all of the parts fit within the building and within the overall design concept.

The construction phase is an exciting time for the owner, builder, and architect. For architects, it is the phase during which their ideas and concepts become reality.

Contract Documents Phase

To make it possible for someone to build the project, the architect prepares instructions for how to construct it. The architect makes detailed drawings of each part of the project so the builder can see how each part fits together. The architect also writes a book of requirements, called *specifications*, that includes the exact materials, systems, and components that will be used in construction. Except for the construction phase, this usually is the longest phase of the design process. It is called the contract documents phase because the plans that the architect prepares will become part of the contract between the project owner and the builder.

Negotiation, or Bidding Phase

Once the plans and specifications have been completed, the project owner "offers" the project to one or more builders, called general contractors; each of them determines a cost for building the project. The cost that each builder submits to the project owner for consideration is called a *bid*. The architect frequently assists the client in evaluating the bids and selecting a general contractor. When the architect's client selects a contractor, and that contractor agrees to construct the project, it is called an *award*, and the builder is said to have been *awarded* the contract.

Construction Phase

Once the owner and the builder agree on the cost and sign a contract, construction can finally begin. While the project is under construction, the architect answers the contractor's questions, visits the site to observe the progress of the work, checks to see if the specified materials and systems are being installed, and helps solve problems that arise. When construction is complete, the project owner moves in and the architect's services come to an end.

Parkway Hills Baptist Church, Plano, Texas, phase 3 of construction; Rogers-O'Brien Construction Company, contractor; Leo A. Daly, architect

Sustainable Architecture

Many of today's architects recognize the desire of their clients to create more earth- and eco-friendly structures. They use a variety of methods to incorporate **sustainable architecture** (sometimes called *green architecture*) in their projects. The trick is to strike the right balance between environmental and ecological considerations, budgetary limitations, and community needs.

Experts say that buildings burn up about 40 percent of the total energy consumed in this country and around 35 percent of the electricity used. Architects who design sustainable buildings understand how using alternative methods can result in tremendous energy and cost savings. Among the practices they incorporate are the use of more durable materials for greater longevity, the use of local materials (to support local businesses and cut down on shipping costs) and renewable resources, and conservative use of space, energy, and water.

Renewable resources are those that recover faster than the demand for products they are used to make. Examples include bamboo that can be used for fencing, flooring made from cork, or agricultural waste products that are pressed into fiberboard and used for some cabinetry.

Sustainable architecture has become increasingly important to the building industry and to clients—from homeowners to companies, government offices, and other businesses. They want the completed structure to work together with the surrounding environment, to efficiently fulfill the needs of the users and occupants, and to be conservative with natural resources. Here are some examples of sustainable architecture.

Artists for Humanity EpiCenter, Boston, Mass.; architect/engineer: Arrowstreet Inc. This 23,500-square-foot building uses natural ventilation, ceiling fans, daylighting (a combination of natural and artificial lighting), and is superinsulated. Architects added a heat recovery system that utilizes warm exhaust air exiting the building, and a night cooling system that uses ventilation to lower the temperature in the facility. Solar panels mounted on the roof convert sunlight into electrical energy for building use. These and other energy-saving techniques will help Artists for Humanity recapture approximately 100 percent of the building's bottom-line energy costs.

Capitol Area East End Complex, Block 225, Sacramento, Calif.; architect/engineer: Fentress Bradburn Architects. This building has more than 5,500 photovoltaic panels, which produce up to 160 kilowatts of pollution-free energy, resulting in a cooling-cost reduction of up to 40 percent. Architects incorporated an underfloor air system for more efficient distribution of cooled air throughout the building. Its "cool roof," constructed of materials made to reflect the sun's heat, can reduce the surface temperature of the roof up to 100 degrees Fahrenheit, further reducing energy costs. The building's design was projected to save taxpayers $400,000 annually in energy savings.

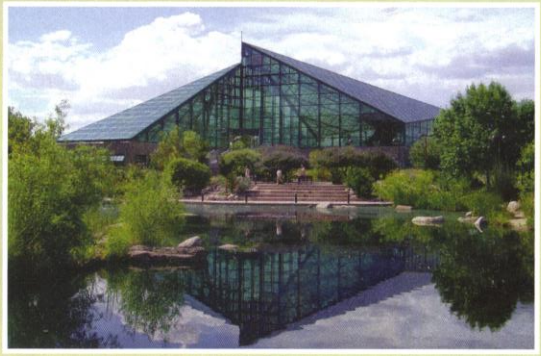
Clackamas High School, Clackamas, Ore.; architect/engineer: BOORA Architects Inc. Its multiple sustainable features help this high school use about 40 percent less energy than a building of similar scope. The school utilizes natural ventilation (which utilizes the distribution of air pressure surrounding a building to enhance the flow of air around doors and windows), daylighting, high-efficiency boilers for heating, and other energy-saving methods. This well-insulated building will save the school district approximately $69,000 annually in energy costs.

Energy Resource Center, Downey, Calif.; architect/engineer: WLC Architects Inc. Among the many sustainable features of this building are its cool roof and an evaporative cooling system that operates according to the humidity of the air in the building. The center also generates energy using microturbines, very small turbines that produce electricity. Its windows have low e-glazing, a very thin coating that reduces the transfer of the sun's heat through the glass. The daylighting techniques and efficient lighting used throughout the facility reduce its electric lighting consumption by 40 percent, resulting in an annual savings of up to $30,000.

Erie Ellington Homes Project, Boston, Mass.; architect/engineer: Elton + Hampton Architects. These homes feature daylighting, are superinsulated, and have high-efficiency glazing on the windows, among other resource-saving methods. Construction costs amounted to $92 per square foot, compared with $115 per square foot for the average cost of affordable housing. To help this project fit the needs of residents, Energy Star appliances were installed in every home. (Energy Star is a program administered by the Environmental Protection Agency to identify and promote energy-saving appliances and practices.) Residents can expect to save about 50 percent on heating, electricity, and water expenses.

Occupational Safety and Health Administration, Salt Lake Technical Center, Sandy, Utah; architect/engineer: Architectural Nexus. Its high-efficiency chillers, daylighting, cool roof, low-use water fixtures and appliances, and many other sustainable elements allow this building to reduce its energy consumption by 50 percent when compared with buildings of similar scope. The facility is well insulated and also boasts a heat recovery system, efficient lighting, and high-efficiency glazing on the windows. Its conservation features will save OSHA more than $40,000 annually.

Rio Grande Conservatory, Albuquerque, N.M.; architect/engineer: Mazria Inc. Among the building's energy-saving features are its mechanical and natural ventilation systems, use of daylighting and other efficient lighting methods, and highly engineered glazing on windows. In designing the conservatory, the architect applied proper building orientation and window sizing and placement, natural heat convection and radiation, and other energy-saving applications. The facility uses only about 5 to 10 percent of the energy normally consumed by a building of similar structure.

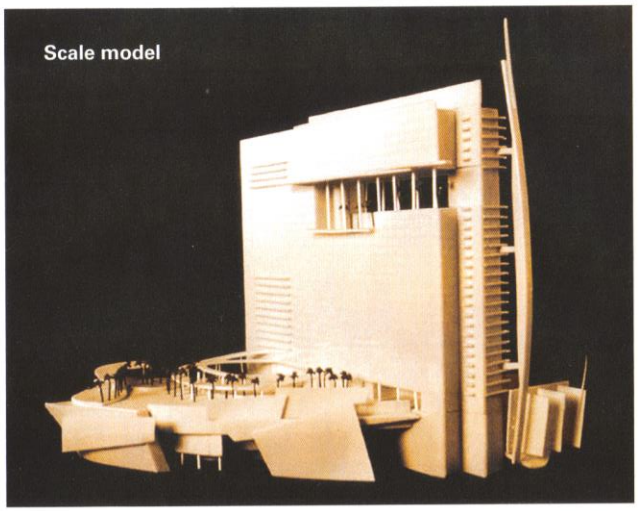


Tools That Architects Use

Just as sports teams must use the proper equipment to play a game, an architect's team must use the right equipment to make architecture happen. Architects use drawings to show how an idea for a project can look and how it can be constructed. An architect's first ideas about a building's design often are expressed through quick freehand sketches made with a pen or pencil on a sketchpad.

As the design of a project becomes more detailed, the architect prepares drawings that have the exact proportions as the real building, only smaller. These are called *scale drawings,* and they are prepared by hand on a drawing table or electronically on a computer. When using a drawing table, the architect draws on a durable paper called vellum, which has a plastic-like texture, and uses drafting instruments to accurately measure and draw the design. Drafting instruments include parallel bars, triangles, a compass, and a ruler that is called a *scale.*

Architects also prepare drawings using computer-aided design and drafting (CADD) software. An architect skilled in CADD can use a computer to draw a building design quickly and accurately. Computers also can be used to prepare three-dimensional drawings and renderings of a project to show the client how the building will look from different views, inside and out. Some architects use computers to create realistic animated images of the building from the point of view of a person walking through it.



An architect's studio also is a business office, and it needs all of the tools found in one, such as computers for accounting and writing letters and reports, telephones, a copier, and a fax machine for sending letters and documents over telephone lines.

Another tool architects use to explain their designs to others is a *scale model.* Models can be built of inexpensive materials such as cardboard or polystyrene plastic. Architects use rough study models to explore various design ideas and to imagine the building's final form. Sometimes, after a design has been completed, an architect will make a very realistic and often very expensive model that shows the client and the public how the building will look.

Information that an architect must know and use in building design constantly changes. New ideas develop, new building materials become available, and styles and tastes change. The architect's library includes books and magazines that show how many types of buildings were designed. The library also includes technical books that show how to construct and use building materials and components.

Copies of the various building laws always are found in an architect's library. Known as building codes and standards, these laws explain the minimum requirements for building design. Architects also keep samples of building materials to use in selecting the finishes and colors that will create the visual affects required by the design concept.

Education and Career Opportunities in Architecture

The education and career opportunities of an architect are varied and unlimited. Because of this, people with artistic talent and people with strong analytical and problem-solving abilities can find a place in the architectural profession.

Education

To be able to design safe, useful spaces for many different uses, an architect must have a broad, well-rounded education and must understand many things about how people live and work. An architecture degree takes five or six years to complete and includes courses in art, science, mathematics, history, and humanities (the study of human thought and relationships) as well as literature, writing, and business administration. An architect's education also includes artistic training, such as freehand drawing, mechanical drawing, and model building. Many universities in the United States and other countries house schools of architecture.

Internship

Upon graduation with a professional degree in architecture, the student planning to become an architect must work for a specific period of time in an architect's studio to learn more about architecture as well as construction methods and materials. This is called an *internship,* and like graduates

from medical school, graduates from architecture school are called *interns*. Depending on the college degree and the state in which the candidate is employed, the length of the internship can be three or more years. Generally, the more education a person has, the shorter the internship. Once a candidate has met the educational requirements and completed an internship, he or she is eligible to take the licensing examination.

Registration

Because an architect's work affects the health, safety, and welfare of the public, architects must be registered or licensed. Every state has similar, but not always identical, eligibility requirements. Each state requires some combination of education and experience before an architect is eligible to take that state's licensing exam. Architectural interns who successfully complete the examination are registered and granted a license to practice architecture in that state. Some of the differences in state requirements are exactly what you would expect. For example, California requires special technical knowledge about designing for earthquakes, while Florida requires specialized knowledge about designing for hurricanes.

Every state recognizes professional degrees from colleges that have an accredited architectural program leading to a bachelor of architecture degree (a five-year program) or a master of architecture degree (a one- or two-year program in addition to a four-year undergraduate degree in a subject related to architecture). In most master's degree programs, students select building design, urban design, city planning, interior architecture, or another specialized field. Many times, the four-year undergraduate degree for those pursuing a master's degree is a bachelor of arts or a bachelor of environmental design.

Career Opportunities

Architects have a lot of different career options. Historically, the architect was seen as an individual practicing alone. Today, single, or private, practices exist, but other interesting opportunities for architects exist as well. Some architectural firms are very large and handle very large projects. Some architects specialize in a particular building type, while others take on a variety of projects. Some large architectural firms may have construction and/or real estate divisions.

Architects are especially qualified for city planning and urban design work for local governments, such as townships, cities, and counties. State and federal governments also hire architects to design and plan government facilities, such as a state capitol building. Architects also work in related professions, such as real estate, construction law, politics, or public service. Any task that involves problem solving is appropriate for a person with an education in architecture.

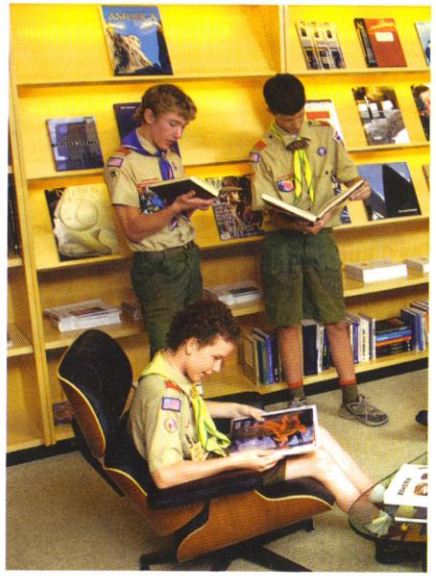
Architectural training, with its emphasis on history, art, humanities, and problem solving, prepares architects to meet a wide variety of challenges, with benefits for all of society.

Star City Casino, Sydney, Australia; The Hillier Group, architect

How to Learn More About Architecture

If your activities toward earning the Architecture merit badge have stirred your interest, here are other ways you can learn more about architects and architecture.

Visit your local library. Whether large or small, the library likely will have a section on architecture and architectural history. The library also will have biographies about well-known architects and probably books with drawings and photographs of notable buildings.



Notable Architects

Renaissance
Leon Alberti (1404–72; Italy)
Geovanni Bernini (1598–1680; Italy)
Donato Bramante (1444–1514; Italy)
Filippo Brunelleschi (1377–1446; Italy)
Michelangelo Buonarroti (1475–1564; Italy)
Inigo Jones (1573–1652; England)
Andrea Palladio (1508–80; Italy)

Baroque
Jose Churriguera (1665–1725; Spain)
Nicholas Hawksmoor (1661–1736; England)

Neo-Classical
Charles Bulfinch (1763–1844; America)
Thomas Hastings (1860–1929; America)
Claude-Nicolas Ledoux (1736–1806; France)
Sir John Soane (1753–1837; England)
Stanford White (1853–1906; America)

Pre-Modern
Gustave Eiffel (1832–1923; France)
Sir Joseph Paxton (1803–65; England)

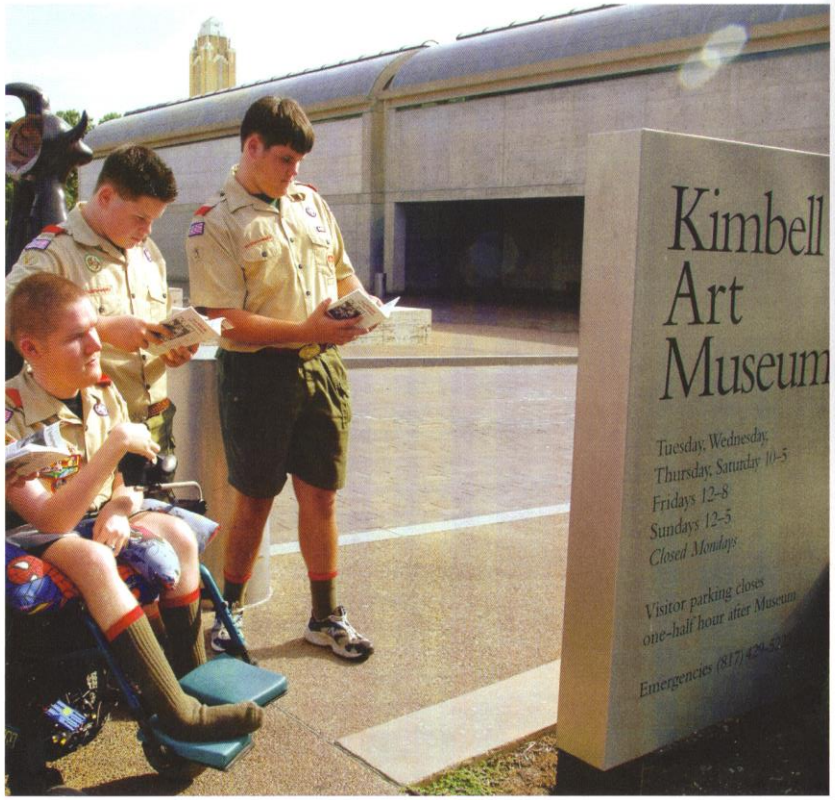
Early Modern
Henry Bacon (1866–1924; America)
Antonio Gaudi (1852–1926; Spain)
Marion Mahony Griffin (1871–1961; America)
Walter Gropius (1883–1969; Germany)
Le Corbusier (1887–1965; Switzerland/France)
Charles Rennie Mackintosh (1868–1928; Scotland)
Erich Mendelsohn (1887–1953; Germany)
Ludwig Mies van der Rohe (1886–1969; Germany/America)
Louis Sullivan (1856–1924; America)
Paul Williams (1894–1980; America)
Frank Lloyd Wright (1867–1959; America)

Mid-Modern
Alvar Aalto (1898–1976; Finland)
Denise Scott Brown (1931– ; America)
Michael Graves (1934– ; America)
Eileen Gray (1878–1976; Ireland)
Philip Johnson (1906–2005; America)
E. Fay Jones (1921–2004; America)
Louis Kahn (1901–74; America)
Richard Meier (1934– ; America)
Richard Neutra (1892–1970; Austria)

Late Modern
Frank Gehry (1929– ; Canada/America)
Kohn Pederson Fox (Firm in America, China, and England)
I. M. Pei (1917– ; America)
César Pelli (1926– ; Argentina/America)
Edward Durell Stone (1902–78; America)
Kenzo Tange (1913–2005; Japan)
Bernard Tschumi (1944– ; Switzerland)

Arts and Crafts Movement
Charles (1868–1957; America) and Henry Greene (1870–1954; America)
Bernard Maybeck (1882–1957; America)
H. H. Richardson (1838–86; America)

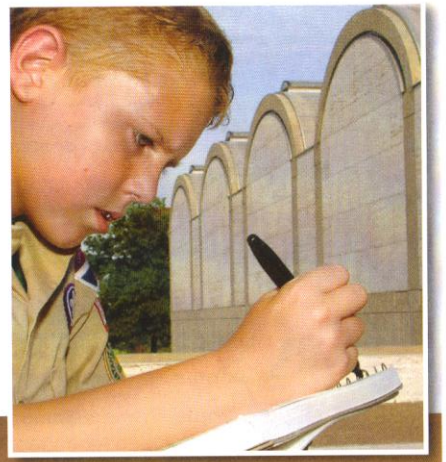
If you are interested in a career in architecture, look for opportunities at school to develop skills that will be useful to you as an architect. Consider courses in art, science, mathematics, history, and computer and hand drafting. Try to recognize the principles taught in these classes that will be useful to you as an architect. Also, an architect must be a good leader and team player. The teamwork and leadership skills you learn as a Boy Scout will help prepare you to lead a design team as an architect.

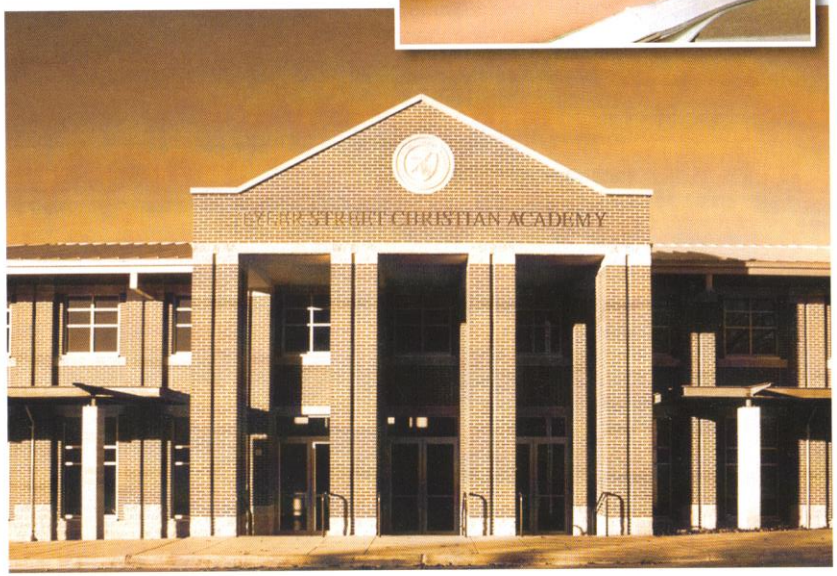


Start carrying a sketchbook. You can get one at most stores that sell art or school supplies. Each day, you can add a sketch of a building or landscape scene that you see and add notes about the people and activities you find there. This activity will sharpen your ability to observe and visualize, and it will help develop your skill in design.

If you would rather photograph the buildings you see, you can keep a photo album of the interesting places you visit. Or, make a scrapbook of pictures or articles about interesting buildings, gardens, and landscapes that you find in newspapers and magazines.

Another good way to learn more about what architects do would be to approach a local architect about summer or after-school employment.





Tyler Street Christian Academy, Dallas, Texas; The Beck Group, architect

Glossary of Architectural Terms

arcade. A series of arches carried on columns.

atrium. An open courtyard surrounded by a building, or a covered entrance hall.

buttress. A masonry or brickwork projection that strengthens a building.

clerestory. The part of a building that rises above the roofs of the other parts.

cornice. A decorative projection along the top of wall.

cupola. The element placed at the roof ridge to provide light or ventilation; common to barns.

dimension. A scaled measurement of building elements shown on a drawing.

dormer. A window placed vertically in a sloping roof.

façade. The side of a building emphasized architecturally, usually the front of a building.

flute, or fluting. Vertical channeling, roughly semicircular in cross section and used principally on columns.

footing. The bottom element that anchors a wall or column to the ground.

fall. A building's principal room, or sometimes the principal building in a complex.

head. The top of a door, window, or other opening.

jamb. The side of a door, window, or other opening.

joist. A timber stretched from wall-to-wall to support a floor above.

keystone. The central, uppermost element in an arch.

loggia. A covered space or building open on one or more sides with arcades or colonnades.

molding. In architecture, a continuous, narrow surface designed to break up a wider surface as an accent or decoration.

pillar. A column.

pitch. The slope of a ramp or roof.

plotter. A printer used to print drawings on large sheets of paper.

portico. A covered entrance to a building.

rafter. The beams that form the support for a roof.

rendering. A detailed artistic drawing that shows the anticipated final appearance of a building.

rose window. The large, circular window with tracery and stained glass that is frequently used in the façades of Gothic churches.

rotunda. A round building, or a large round room.

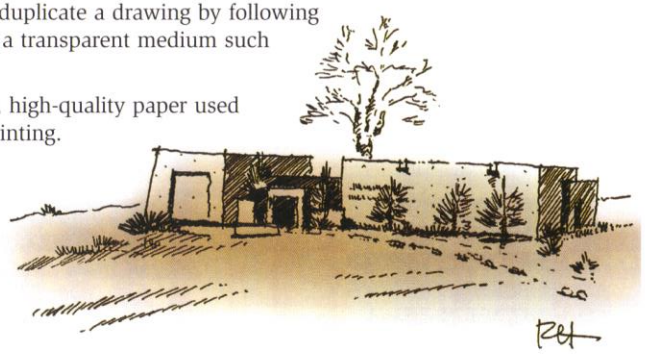
scale. A reduced-size proportion used with drawings and models to represent the true size of a building or design (for example: $^1/_4$" = 1', 1' = 20', etc.).

sustainable architecture. Architecture that includes environmentally conscious design techniques.

truss. A framework of beams attached in a manner to brace each other and to form a single structural element.

tracing. A way to duplicate a drawing by following lines seen through a transparent medium such as paper vellum.

vellum. A durable, high-quality paper used for drawing and printing.



Philmont Museum and Seton Memorial Library, Cimarron, New Mexico; McHugh-Kidder-Plattenburgh, architects

Architecture Resources

Scouting Resources

Art, Computers, Drafting, Engineering, Model Design and Building, Photography, and *Surveying* merit badge pamphlets

Visit the Boy Scouts of America's official retail Web site (with your parent's permission) at *http://www.scoutstuff.org* for a complete listing of all merit badge pamphlets and other helpful Scouting materials and supplies.

Books

ARCHITECTURAL DESIGN, HISTORY, AND NOTABLE BUILDINGS

Ancient Buildings. Bellerophon Books, 1992.

Diamonstein, Barbaralee. *Landmarks: Eighteen Wonders of the New York World.* Abrams, 1992.

Ching, Francis D. K. *Architecture: Form, Space, and Order.* Van Nostrand Reinhold, 1991.

Ching, Francis D. K., and Cassandra Adams. *Building Construction Illustrated.* Van Nostrand Reinhold, 1991.

Hayden, Kate. *Amazing Buildings.* DK Publishing, 2003.

Isaacson, Phillip M. *Round Buildings, Square Buildings, and Buildings That Wiggle Like a Fish.* Knopf, 1988.

Kostof, Spiro. *A History of Architecture: Settings and Rituals.* Oxford University Press, 1985.

Macaulay, David. *City: A Story of Roman Planning and Construction.* Houghton Mifflin, 1974.

———. *Cathedral: The Story of Its Construction.* Houghton Mifflin, 1973.

Nelson, Peter. *Tree Houses.* Mariner Books, 1994.

Rifkind, Carole. *A Field Guide to American Architecture.* Bonanza Books, 1980.

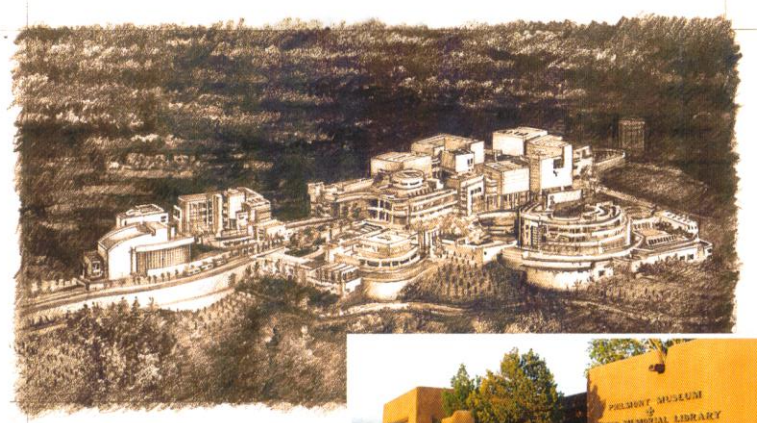
Sharp, Dennis. *Twentieth Century Architecture: A Visual History.* Images, 2002.

Stewart, Gail. *Living Spaces.* The Rourke Book Company, 1990.

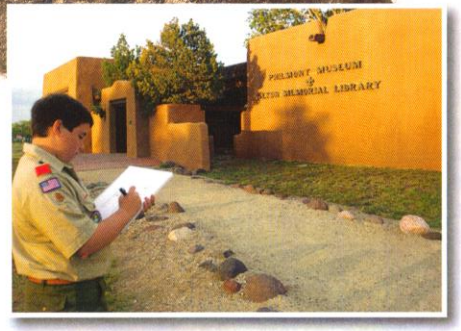
Susanka, Sarah, and Kira Obolensky. *The Not So Big House.* The Taunton Press, 1998.

Susanka, Sarah. *Creating the Not So Big House.* The Taunton Press, 2000.

Wilson, Forrest. *What It Feels Like to Be a Building.* Preservation Press, 1988.



Getty Center, Los Angeles, California; Richard Meier, architect



Scout sketching the Philmont Museum and Seton Memorial Library, Cimarron, New Mexico

BIOGRAPHIES

Aaseng, Nathan. *More With Less: The Future World of Buckminster Fuller.* Lerner, 1986.

Dell, Pamela. *I. M. Pei: Designer of Dreams.* Children's Book Press, 1994.

Heinz, Thomas A. *Frank Lloyd Wright.* St. Martin's Press, 1992.

Hoag, Edwin, and Joy Hoag. *Masters of Modern Architecture: Frank Lloyd Wright, Le Corbusier, Mies van der Rohe, and Waler Gropius.* Bobbs-Merrill, 1977.

Ivey, Robert Adams. *Fay Jones.* American Institute of Architects Press, 1992.

Murphy, Wendy B. *Frank Lloyd Wright.* Silver Burdett Press, 1990.

Potter, Robert R. *Buckminster Fuller.* Silver Burdett Press, 1990.

DRAWINGS AND MODELS

Biesty, Stephen, and Richard Platt. *Stephen Biesty's Incredible Cross-Sections.* Knopf, 1992.

Eisen, David. *Fun With Architecture.* Viking Press, 1992.

Munro, Roxie, and Diane Maddex. *Architects Make Zigzags: Looking at Architecture From A to Z.* John Wiley and Sons, 1986.

Salvadori, Mario. *The Art of Construction.* Chicago Review Press, 1990.

Weiss, Harvey. *Model Buildings and How to Make Them.* Crowell. 1979.

Organizations and Web Sites

American Architectural Foundation
Telephone: 202-626-7318
Web site: *http://www.archfoundation.org*

The American Institute of Architects
1735 New York Ave. NW
Washington, DC 20006-5292
Telephone: 202-626-7300
Web site: *http://www.aia.org*

The American Institute of Architecture Students
1735 New York Ave. NW
Washington, DC 20006-5292
Telephone: 202-626-7472
Web site: *http://www.aiasnatl.org*

Association of Collegiate Schools of Architecture
1735 New York Ave. NW
Washington, DC 20006-5292
Telephone: 202-785-2324
Web site: *http://www.acsa-arch.org*

Association of Licensed Architects
Telephone: 847-382-0630
Web site: *http://www.licensedarchitect.org*

National Council of Architectural Registration Boards
1801 K Street NW, Suite 1100-K
Washington, DC 20006
Telephone: 202-783-6500
Web site: *http://www.ncarb.org*

National Organization of Minority Architects
c/o School of Architecture and Design
College of Engineering, Architecture and Computer Sciences
Howard University
2366 Sixth Street NW, Room 100
Washington, DC 20059
Web site: *http://www.noma.net*

The New York Society of Architects
Telephone: 212-385-8950
Web site: *http://www.nysarch.com*

Society of American Registered Architects
Toll-free telephone: 888-385-7272
Web site: *http://www.sara-national.org*

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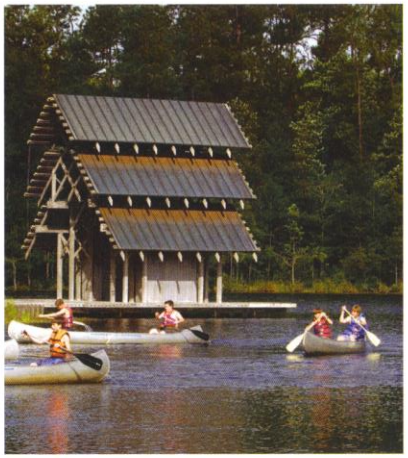

Pine Eagle Chapel, Camp Tiak Scout Camp, near Wiggins, Mississippi; Fay Jones + Maurice Jennings Architects

HAAP Media Ltd., courtesy—cover *(all except merit badge, top blueprint, Central Park plan)*

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