

COLLEGES

QUESTIONS AND TOPICS ABOUT OPTICIANS AND OPTICAL COLLEGES

ARCHITECTURE STYLES THROUGH HISTORY

First of all we must remember that when we speak about styles and Movements, we put together some general principles which are only theoretical ones. It is evident that these principles come from previous periods and go on to the following ones: we can never find a sharp separation in time and culture. The result is that any architecture which is classified as belonging to a specific historical period actually is the more complex product of multiple experiences. Consequently, when we say that a building belongs to a certain style, we should be aware of the fact that we cannot be rigid about it. Architectural history is just as rich as art history. There are just as many movements and evolutions of the form. Studying the evolution of the form is vital to any student of architecture.

PREHISTORIC ARCHITECTURE

Prehistoric architecture was mostly natural and made form the bare minimum requirements. Workability was the focus and aesthetics were almost accidental. Architecture, with all its varying phases and complex developments, must have had a simple origin in the primitive efforts of mankind to provide protection against inclement weather, wild beasts, and human enemies. Hunters and fishermen in primeval times naturally sought shelter in rock caves, and these were manifestly the earliest form of human dwellings. Among prehistoric remains of archaeological interest, but of little architectural value, are monoliths, dolmens, tumuli, and lake dwellings. Monoliths are single upright stones, known in Western France as " menhirs," such as those at Locmariaker and Carnac in Brittany, the latter of which is 63 ft. high, 14 ft. in diameter, and weighs 260 tons. Dolmens (Bret. dol = table + maen stone) and Cromlechs (Gael. crom = bent + leac = flat stone) are often used as interchangeable terms. The earliest stages of architectural evolution can only dimly be traced; for prehistoric remains show little constructive development or sequence, whilst the oldest existing historic monuments, as in Egypt, were the product of an already advanced civilisation. Thus there is a mysterious hiatus between prehistoric and historic monuments, although various forms and features of the latter inevitably suggest the possible nature of their lost prototypes.

GREEK AND ROMAN ARCHITECTURE

The history of architecture is very important in terms of understanding the evolution that has led to the building styles we see today. To look at the history of architecture is to see history itself reflected in the most beautiful manner possible. Ancient Greek architecture can be distinguished by the specific elements such as the rectangular buildings and the large columns. The temple was the most common and best-known form of Greek public architecture. The temple did not serve the same function as a modern church, since the altar stood under the open sky in the temenos or sacred fane, often directly before the temple. Temples served as storage places for the treasury associated with the cult of the god in question, as the location of a cult image, and as a place for devotees of the god to leave their votive offerings, such as statues, helmets and weapons. The inner room of the temple, the cella, served mainly as a strongroom and storeroom. It was usually lined by another row of columns. Some Greek temples were oriented astronomically. Common materials of Greek architecture were wood, used for supports and roof beams; plaster, used for sinks and bathtubs; unbaked brick, used for walls, especially for private homes; limestone and marble, used for columns, walls, and upper portions of temples and public buildings; terracotta, used for roof tiles and ornaments; and metals, especially bronze, used for decorative details. Architects of the Archaic and Classical periods used these building materials to construct five simple types of buildings: religious, civic, domestic, funerary, or recreational. The Architecture of Ancient Rome adopted the external Greek architecture for their own purposes, which were so different from Greek buildings as to create a new architectural style. The two styles are often considered one body of classical architecture. Actually it had a lot of influence from the Greek architecture. The use of the arches and domes are some of the characteristics of this style. The Roman temples, amphitheaters, coliseum, baths, basilicas etc stand testimony to the greatness of this style. The common features of this style are the use of balance in the design, geometrical shapes, the beautiful columns and domes etc. The Roman use of the arch and their improvements in the use of concrete facilitated the building of the many aqueducts throughout the empire, such as the magnificent Aqueduct of Segovia and the eleven aqueducts in Rome itself, such as Aqua Claudia and Anio Novus. The same idea produced numerous bridges, such as the still used bridge at Merida. The dome permitted construction of vaulted ceilings and provided large covered public space such as the public baths and basilicas. The Romans based much of their architecture on the dome, such as Hadrian's Pantheon in the city of Rome, the Baths of Diocletian and the Baths of Caracalla.

BYZANTINE AND ROMANESQUE ARCHITECTURE

Architecture during medieval times was spiritually charged. The structures were made so that light could permeate them, and through geometry the designers tried to represent divinity. Some of the noteworthy sub-movements of this period were the Byzantine and Romanesque Architectural movements. Byzantine architecture is the architecture of the Byzantine Empire. The empire gradually emerged as a distinct artistic and cultural entity from what is today referred to as the Roman Empire after AD 330, when the Roman Emperor Constantine moved the capital of the Roman Empire east from Rome to Byzantium. Early Byzantine architecture was simply a continuation of Roman architecture. Stylistic drift, technological advancement, and political and territorial changes meant that a distinct style gradually emerged which imbued certain influences from the Near East and used the Greek cross plan in church architecture. Buildings increased in geometric complexity, brick and plaster were used in addition to stone in the decoration of important public structures, classical orders were used more freely, mosaics replaced carved decoration, complex domes rested upon massive piers, and windows filtered light through thin sheets of alabaster to softly illuminate interiors. Romanesque architecture developed between the 10th and the 12th centuries in Western Europe. Romanesque Architecture It represents architecture of the Middle Ages in Europe. The Romanesque architecture is known by the rounded arches, the very large towers, decorative arcades, walls of massive thickness and the overall symmetry in design. It grew out of the early medieval obsession with defending property and keeping out intruders. Every building, whether castle or church, was built as a stronghold, with thick walls, small windows, short columns and circular arches. This reflects the centuries of conflict that Europe had suffered since the fall of Rome. This architecture represented the symbol of a new Europe dominated by the authority of the Pope and of the Kings, that is a medieval Christian culture and civilization.

GOTHIC ARCHITECTURE

Gothic architecture is a style of architecture which flourished during the high and late medieval period and began at the Abbey of Saint-Denis. It evolved from Romanesque architecture and was succeeded by Renaissance architecture. There are certain characteristics that are particularly symbolic of Gothic architecture such as the pointed arches, large individual windows, flamboyant designs and the emphasis on the creation of vertical lines in the design. Gothic architecture is most familiar as the architecture of many of the great cathedrals, abbeys and parish churches of Europe. It is also the architecture of many castles, palaces, town halls, guild halls, universities, and to a less prominent extent, private dwellings. The term "Gothic", when applied to architecture, has nothing to do with the historical Goths. It was a pejorative term that came to be used as early as the 1530s by Giorgio Vasari to describe culture that was considered rude and barbaric. At the time in which Vasari was writing, Italy had experienced a century of building in the Classical architectural vocabulary revived in the Renaissance and seen as the finite evidence of a new Golden Age of learning and refinement. A further regional influence was the

availability of materials. In France, limestone was readily available in several grades, the very fine white limestone of Caen being favoured for sculptural decoration. England had coarse limestone and red sandstone as well as dark green Purbeck marble which was often used for architectural features. In Italy, stone was used for fortifications, but brick was preferred for other buildings. Because of the extensive and varied deposits of marble, many buildings were faced in marble, or were left with undecorated facade so that this might be achieved at a later date. Gothic symbolized a new synthesis of Humanity, God and nature. While Romanesque churches reflected an atmosphere of darkness and mistery, the new ones became an image of nature, imitating plant forms, ribs, stems or fronds, and growing out of the earth like a tree. The distinctive characteristic of English cathedrals is their extreme length, and their internal emphasis upon the horizontal, which may be emphasised visually as much or more than the vertical lines. Each English cathedral (with the exception of Salisbury) has an extraordinary degree of stylistic diversity, when compared with most French, German and Italian cathedrals. The Gothic cathedral represented the universe in microcosm and each architectural concept, including the loftiness and huge dimensions of the structure, were intended to convey a theological message: the great glory of God. The building becomes a microcosm in two ways. Firstly, the mathematical and geometrical nature of the construction is an image of the orderly universe, in which an underlying rationality and logic can be perceived. Secondly, the statues, sculptural decoration, stained glass and murals incorporate the essence of creation in depictions of the Labours of the Months and the Zodiac and sacred history from the Old and New Testaments and Lives of the Saints, as well as reference to the eternal in the Last Judgment and Coronation of the Virgin. The decorative schemes usually incorporated Biblical stories, emphasizing visual typological allegories between Old Testament prophecy and the New Testament. Many churches were very richly decorated, both inside and out. Sculpture and architectural details were often bright with coloured paint of which traces remain at the Cathedral of Chartres. Wooden ceilings and panelling were usually brightly coloured. Sometimes the stone columns of the nave were painted, and the panels in decorative wall arcading contained narratives or figures of saints. These have rarely remained intact, but may be seen at the Chapterhouse of Westminster Abbey. This style was also predominant in England and one can recognize English Gothic architecture from the pointed arches, the very large windows, and the conical structures on top of the buildings known as spires.

RENAISSANCE ARCHITECTURE

During the Renaissance the architecture shifted somewhat. The perception of infinity had entered architectural consciousness. Expanses of space opened up and in fact the openness of spaces were designed to be understood in their own right from certain fixed views. This was the central theme to Renaissance architecture, which in the eyes of many analysts is still one of the more powerful and influential styles. Renaissance architecture is the architecture of the period between the early 15th and early 17th centuries in different regions of Europe, in which there was a conscious revival and development of certain elements of ancient Greek and Roman thought and material culture. The Renaissance style places emphasis on symmetry, proportion, geometry and the regularity of parts as they are demonstrated in the architecture of classical antiquity and in particular ancient Roman architecture, of which many examples remained. Orderly arrangements of columns, pilasters and lintels, as well as the use of semicircular arches, hemispherical domes, niches and aedicules replaced the more complex proportional systems and irregular profiles of medieval buildings. Developed first in Florence, with Filippo Brunelleschi as one of its innovators, the Renaissance style quickly spread to other Italian cities and then to France, Germany, England, Russia and elsewhere. Besides accomplishments in architecture, Brunelleschi is also credited with inventing one-point linear perspective which revolutionized painting and allowed for naturalistic styles to develop as the Renaissance digressed from the stylized figures of medieval art. In addition, he was somewhat involved in urban planning: he strategically positioned several of his buildings in relation to the nearby squares and streets for "maximum visibility". Brunelleschi's interests extended to mathematics and engineering and the study of ancient invented hydraulic machinery and elaborate clockwork, none of which survives. Brunelleschi also designed fortifications for Florence in its military struggles against Pisa and Siena. Another famous architect of this period was Leon Battista Alberti who developed theories of proportion which equated beauty with geometry. Also Andrea Palladio with his books on the theory of the practice od design, had great influence on the architecture of this period. His design were simple and practical and extended the idea of the building reflecting the elements of the human body: the building should be symmetrical (the left half mirrors the right) around an axis (the spine) from the front, but not from the side; each part should relate to the whole and to every other part. The most important elements are in the middle (head, brain, eyes, etc.); elements on the outside should reflect the structure inside (the skin over bones).

BAROQUE ARCHITECTURE

The Baroque Architecture style was dominant at the beginning of the 17th century. Baroque architectural styles always played around with a dramatic use of light, central projections, ornamental decoration, pear domes etc. The works of Michelangelo created for the late Roman buildings belong to Baroque architecture. Baroque architecture, starting in the early 17th century in Italy, took the humanist Roman vocabulary of Renaissance architecture and used it in a new rhetorical, theatrical, sculptural fashion, expressing the triumph of absolutist church and state. New architectural concerns for color, light and shade, sculptural values and intensity characterize the Baroque. The new style manifested itself in particular in the context of new religious orders, like the Theatines and the Jesuits, which aimed to improve popular piety. By the middle of the 17th century, the Baroque style had found its secular expression in the form of grand palaces, first in France as in the Château de Maisons (1642) near Paris by François Mansart and then throughout Europe. The finest expression of the Baroque is to be found in ecclesiastical buildings. During the Renaissaince period architecture was essentially static composed of separate and defined elemets according to the laws of proportion. Flat walls expressed simple geometric plans. The Baroque developed from Mannerism into a dynamic and unified architecture. In Rome the most famous architects of this period were Gian Lorenzo Bernini and Francesco Borromini, while in England it was Chrstopher Wren who interpred the style of the epoch designing many churches in the rebuilding of London after the great fire of 1666, the best known of which are St. Paul's Cathedral. Important features of Baroque architecture include: long, narrow naves are replaced by broader, occasionally circular forms; dramatic use of light, either strong light-and-shade contrasts, chiaroscuro effects (e.g. church of Weltenburg Abbey), or uniform lighting by means of several windows (e.g. church of Weingarten Abbey); opulent use of ornaments (puttos made of wood (often gilded), plaster or stucco, marble or faux finishing); large-scale ceiling frescoes; the external façade is often characterized by a dramatic central projection; the interior is often no more than a shell for painting and sculpture (especially in the late Baroque); illusory effects like trompe l'oeil and the blending of painting and architecture.

NEOCLASSICAL ARCHITECTURE

In the 1800s architecture was used to emphasize characteristics of form. This is however also the period when the individual architect began to distinguish himself and make inroads into the mainstream art community. Neoclassical architecture was an architectural style produced by the neoclassical movement that began in the mid-18th century, both as a reaction against the Rococo style of anti-tectonic naturalistic ornament, and an outgrowth of some classicizing features of Late Baroque. In its purest form it is a style principally derived from the architecture of Classical Greece and the architecture of Italian Andrea Palladio. Indoors, neoclassicism made a discovery of the genuine Roman interior, inspired by the rediscoveries at Pompeii and Herculaneum, which had started in the late 1740s, but only achieved a wide audience in the 1760s, with the first luxurious volumes of tightlycontrolled distribution of Le Antichità di Ercolano. The 18th century was called the age of reason and while Baroque architecture was linked with the aristocracy, Neo-Classical buildings were seen, by the new middle class, as a symbol of the new Republic. From about 1800 a fresh influx of Greek architectural examples, seen through the medium of etchings and engravings, gave a new impetus to neoclassicism that is called the Greek Revival. Neoclassicism continued to be a major force in academic art through the 19th century and beyond a constant antithesis to Romanticism or Gothic revivals although from the late 19th century on it had often been considered anti-modern, or even reactionary, in influential critical circles. By the mid-19th century, several European cities - notably St Petersburg, Athens, Berlin and Munich - were transformed into veritable museums of Neoclassical architecture. Neoclassical architecture is usually now classed under the umbrella term of "traditional architecture" and is practised by a number of members of the Traditional Architecture Group.

ART NOUVEAU STYLE

Art Nouveau Style It was particularly popular at the turn of the 20th century. This architectural style is about encompassing artistic and floral motifs in the structure. Architecture belonging to this style is all about highly stylized designs. There are many historical buildings that belong to this type of architecture. They followed the Arts and Crafts Movements in rejecting the styles of the old order, but contrary to William Morris and John Ruskin (They had proclaimed that if architecture was as important as cultured people said, it should be accessible to everybody and not just to the elite, since they believed that architecure should drawn inspiration not from the Classical italian "palazzi", but from the people's own buldings), the new style didn't linked to social art or to social consciuosness and nationalism. Art Nouveau combined many influences, especially stylized Japanese Art and Art Nouveau Architecture developed first in Belgium and France, exploiting the new possibilities of casting iron, and then in Barcelona with the works of Antonio Gaudì, whose buildings became a fusion of organic form and structure, like a piece of sculpture. Another great architect was Charles Mackintosh who worked in Glasgow, a town which at the time enjoyed great industry and wealth. His School of Arts is a perfect combination of Arts and Crafts and Art Nouveau, a fusion of structure and decoration through the use of iron and glass, the building is robust yet delicate in detail, functional and human in scale, economic yet rich in imagination. Art Nouveau drew its inspiration directly from nature to create a new style and looked forward to the new industrial wealth. The free form curve became its hallmark, the dynamic stem structure of plants and buds with flowers that symbolized purity and freedom.

ART DECO STYLE

Art Deco Architectural Style was visible during the years, 1925-1939 and it was a popular international art design movement. It refers to a decorative and elegant style of architecture that encompassed many other basic techniques of architecture affecting the decorative arts such as interior design, and industrial design, as well as the visual arts such as fashion, painting, the graphic arts and film. At the time, this style was seen as elegant, glamorous, functional, and modern. The movement was a mix of many different styles and movements of the early 20th century, including Neoclassical, Constructivism, Cubism, Modernism, Art Nouveau, and Futurism. Its popularity peaked in Europe during the Roaring Twenties and continued strongly in the United States through the 1930s. Although many design movements have political or philosophical roots or intentions, Art Deco was purely decorative. Art Deco experienced a decline in popularity during the late 30s and early 40s, and soon fell out of public favor. It experienced a resurgence with the popularization of graphic design in the 1980s. Art Deco had a profound influence on many later artistic movements, such as Memphis and Pop art. Surviving examples may still be seen in many different locations worldwide, in countries as diverse as the United Kingdom, Spain, Cuba, the Philippines, Romania, New Zealand and Brazil. Many classic examples still exist in the form of architecture in many major cities. The Chrysler building, designed by William Van Alen, is a classic example of this, as it is one of the most notable examples of Art Deco architecture today. Art Deco is characterized by use of materials such as aluminium, stainless steel, lacquer and inlaid wood. Exotic materials such as sharkskin (shagreen), and zebraskin were also in evidence. The bold use of stepped forms and sweeping curves (unlike the sinuous, natural curves of the Art Nouveau), chevron patterns, and the sunburst motif are typical of Art Deco. Some of these motifs were ubiquitous — for example, sunburst motifs were used in such varied contexts as ladies' shoes, radiator grilles, the auditorium of the Radio City Music Hall, and the spire of the Chrysler Building. During the 1930s, Art Deco had a noticeable influence on house design in the United Kingdom, as well as the design of various public buildings. Straight, white-rendered house frontages rising to flat roofs, sharply geometric door surrounds and tall windows, as well as convex curved metal corner windows, were all characteristic of that period.

MODERN ARCHITECTURE

Modern architecture started in the early 1900s and rose to prominence as it sown architectural movement in the 1940s. In those years the style was called the International Style and the label has held to this day. The characteristics of modern architecture are being discussed right now and are entirely open to interpretation. Modern architecture is a set of building styles with similar characteristics, primarily the simplification of form and the elimination of ornament. The first variants were conceived early in the 20th century. Modern architecture was adopted by many influential architects and architectural educators, however very few "Modern buildings" were built in the first half of the century. It gained popularity after the Second World War and became the dominant architectural style for institutional and corporate buildings for three decades. Some historians see the evolution of Modern architecture as a social matter, closely tied to the project of Modernity and thus the Enlightenment. The Modern style developed, in their opinion, as a result of social and political revolutions. Others see Modern architecture as primarily driven by technological and engineering developments, and it is true that the availability of new building materials such as iron, steel, and glass drove the invention of new building techniques as part of the Industrial Revolution. Other historians regard Modernism as a matter of taste, a reaction against eclecticism and the lavish stylistic excesses of Victorian Era and Edwardian Art Nouveau. Note that the Russian word for Art Nouveau, and the Spanish word for Art Nouveau, "Modernismo" are cognates of English word "Modern" though they carry different meanings. Whatever the cause, around 1900 a number of architects around the world began developing new architectural solutions to integrate traditional precedents (Gothic, for instance) with new technological possibilities. The work of Louis Sullivan and Frank Lloyd Wright in Chicago, Victor Horta in Brussels, Antoni Gaudi in Barcelona, Otto Wagner in Vienna and Charles Rennie Mackintosh in Glasgow, among many others, can be seen as a common struggle between old and new. An early use of the term in print around this time, approaching its later meaning, was in the title of a book by Otto Wagner.[2][3] By the 1920s the most important figures in Modern architecture had established their reputations. The big three are commonly recognized as Le Corbusier in France, and Ludwig Mies van der Rohe and Walter Gropius in Germany. In 1932 came the important MOMA exhibition, the International Exhibition of Modern Architecture, curated by Philip Johnson. Johnson and collaborator Henry-Russell Hitchcock drew together many distinct threads and trends, identified them as stylistically similar and having a common purpose, and consolidated them into the International style. This was an important turning point. With World War II the important figures of the Bauhaus fled to the United States, to Chicago, to the Harvard Graduate School of Design, and to Black Mountain College. While Modern architectural design never became a dominant style in single-dwelling residential buildings, in institutional and commercial architecture Modernism became the pre-eminent, and in the schools (for leaders of the profession) the only acceptable, design solution from about 1932 to about 1984. Modern architecture is usually characterized by: an adoption of the principle that the materials and functional requirements determine the result an adoption of the machine aesthetic; a rejection of ornament; a simplification of form and elimination of "unnecessary detail"; an adoption of expressed structure; form follows function.

POSTMODERN ARCHITECTURE

The Postmodern Architecture Style could be seen in the 1950s and it continues to influence architects even today. There is a use of unusual surfaces and the basics often contradict with the modernist ideas. Postmodern architecture was an international style whose first

examples are generally cited as being from the 1950s, and which continues to influence present-day architecture. Postmodernity in architecture is generally thought to be heralded by the return of "wit, ornament and reference" to architecture in response to the formalism of the International Style of modernism. As with many cultural movements, some of postmodernism's most pronounced and visible ideas can be seen in architecture. The functional and formalized shapes and spaces of the modernist movement are replaced by unapologetically diverse aesthetics: styles collide, form is adopted for its own sake, and new ways of viewing familiar styles and space abound. Classic examples of modern architecture are SOM's Lever House or Mies van der Rohe's Seagram Building, as well as the architecture of Le Corbusier or the Bauhaus movement. Transitional examples of postmodern architecture are Michael Graves' Portland Building in Portland, Oregon and Philip Johnson's Sony Building (originally AT&T Building) in New York City, which borrows elements and references from the past and reintroduces color and symbolism to architecture. A prime example of inspiration for postmodern architecture lies along the Las Vegas Strip, which was studied by Robert Venturi and Denise Scott Brown in their 1972 book Learning from Las Vegas celebrating the strip's ordinary and common architecture. Postmodern architecture has also been described as "neo-eclectic", where reference and ornament have returned to the facade, replacing the aggressively unornamented modern styles. This eclecticism is often combined with the use of non-orthogonal angles and unusual surfaces, most famously in the State Gallery of Stuttgart (New wing of the Staatsgalerie Stuttgart) and the Piazza d'Italia by Charles Willard Moore. The Scottish Parliament buildings in Edinburgh have also been cited as being of postmodern vogue. Modernist architects regard post-modern buildings as vulgar and cluttered with "gewgaws". Postmodern architects often regard modern spaces as soulless and bland. The divergence in opinions comes down to a difference in goals: modernism is rooted in minimal and true use of material as well as absence of ornament, while postmodernism is a rejection of strict rules set by the early modernists and seeks exuberance in the use of building techniques, angles, and stylistic references. High-tech or Late Modern is the new multinational style, claiming to have overcome the defects of steel and glass boxes by using up-to-date technology. For British architects like Norman Foster, or Richard Rogers and the Italian architect Renzo Piano, heavy masonry construction went out with the steam engine. Drawing on aircraft technology, their exposed structures are light and strong, using heavily insulated wall panels, steel and alluminium frames and mirror glass in neoprene gaskets. High-tech is characterized by light, spacious sheds where all the services (like ventilation ducts, pipes or even stairs) are placed outside the buildings to leave free uninterrupted floor space where layouts for offices, exhibition halls, or factory, can be changed at will with great flexibility.

GREAT ARCHITECTS THROUGH HISTORY

Sir Christopher Wren (20 October 1632 – 25 February 1723) was a 17th century English designer, astronomer, geometer, and one of the greatest English architects in history. Wren designed 53 London churches, including St Paul's Cathedral, as well as many secular buildings of note. He was a founder of the Royal Society (president 1680–82), and his scientific work was highly regarded by Sir Isaac Newton and Blaise Pascal. Wren had been involved in repairs of the old cathedral since 1661. In the spring of 1666, he made his first design for a dome for St Paul's. It was accepted in principle on August 27, 1666. One week later, however, the Great Fire of London reduced two-thirds of the City to a smoking desert and old St Paul's to a ruin.

Filippo Brunelleschi (1377 – April 15, 1446) was one of the foremost architects and engineers of the Italian Renaissance. All of his principal works are in Florence, Italy. There is little biographical information about Brunelleschi's life to explain his transition from goldsmith to builder and, no less importantly, from his training in the gothic or medieval manner to the new classicism in architecture and urbanism that we now loosely call the Renaissance and of which Brunelleschi is considered the seminal figure. By 1400

there emerged an interest in 'humanitas' which contrasted with the formalism of the medieval period. But initially this new interest in Roman antiquity was restricted to a few scholars, writers and philosophers; at first it did not influence the visual arts. Apparently it was in this period (1402-1404) that Brunelleschi and his friend Donatello visited Rome to study the ancient Roman ruins. Donatello, like Brunelleschi, had received his training in a goldsmith's workshop, and had then worked in Ghiberti's studio. Brunelleschi's success can be attributed to no small degree to his technical and mathematical genius. Brunelleschi used more than 4 million bricks in the construction of the dome. Thus he invented a new hoisting machine for raising the masonry needed for the dome, a task no doubt inspired by republication of the seminal work De Architectura by Vitruvius, which describes Roman machines used in the first century AD to build large structures such as the Pantheon and the Baths of Diocletian, structures still standing which he would have seen for himself. Brunelleschi's interests extended to mathematics and engineering and the study of ancient invented hydraulic machinery and elaborate clockwork, none of which survives. Besides accomplishments in architecture, Brunelleschi is also credited with inventing one-point linear perspective which revolutionized painting and allowed for naturalistic styles to develop as the Renaissance digressed from the stylized figures of medieval art. In addition, he was somewhat involved in urban planning: he strategically positioned several of his buildings in relation to the nearby squares and streets for "maximum visibility". For example, demolitions in front of San Lorenzo were approved in 1433 in order to create a piazza facing the church. At Santo Spirito, he suggested that the façade be turned either towards the Arno so travelers would see it, or to the north, to face a large, prospective piazza.

Louis Henri Sullivan (September 8, 1856 – April 16, 1924) was an American architect, and has been called the "father of modernism." He is considered by many as the creator of the modern skyscraper, was an influential architect and critic of the Chicago School, was a mentor to Frank Lloyd Wright, and an inspiration to the Chicago group of architects who have come to be known as the Prairie School. Louis Sullivan was born to an Irish-born father and a Swiss-born mother, both of whom had emigrated to the United States in the late 1840s. He grew up living with his grandmother in South Reading (now Wakefield), Massachusetts. Louis spent most of his childhood learning about nature while on his grandparent's farm. In the later years of his primary education, his experiences varied quite a bit. He would spend a lot of time by himself wandering around Boston. He explored every street looking at the surrounding buildings. This was around the time when he developed his fascination with buildings and he decided he would one day become a structural engineer/architect. While attending high school Sullivan met Moses Woolson, whose teachings made a lasting impression on him, and nurtured him until his death. After graduating from high school, Sullivan studied architecture briefly at the Massachusetts Institute of Technology. Learning that he could both graduate from high school a year early and pass up the first two years at the Massachusetts Institute of Technology by passing a series of examinations, Sullivan entered MIT at the age of sixteen. After one year of study, he moved to Philadelphia and talked himself into a job with architect Frank Furness. Prior to the late 19th century, the weight of a multistory building had to be supported principally by the strength of its walls. The taller the building, the more strain this placed on the lower sections of the building; since there were clear engineering limits to the weight such "load-bearing" walls could sustain, large designs meant massively thick walls on the ground floors, and definite limits on the building's height. He went into a twenty-year-long financial and emotional decline, beset by a shortage of commissions, chronic financial problems and alcoholism. He obtained a few commissions for small-town Midwestern banks (see below), wrote books, and in 1922 appeared as a critic of Raymond Hood's winning entry for the Tribune Tower competition, a steel-frame tower dressed in Gothic stonework that Sullivan found a shameful piece of historicism. Original drawings and other archival materials from Sullivan are held by the Ryerson & Burnham Libraries in the Art Institute of Chicago and by the Drawings and Archives Department in the Avery Architectural and Fine Arts Library at Columbia University. Fragments of Sullivan buildings are also held in many fine art and design museums around the world.



