precluded, for example, the Byzantine practice of developing an architectural form and continuing its use for centuries as too restrictive and contrary to the northern spirit. Furthermore, Gothic architecture did away with the last vestiges of classical proportion and organization of masses. Gothic architecture became a system of organization of spaces between structural elements, soaring vertically rather than existing in horizontal repose. Gothic is the first true skeleton structuring--a basic principle of modern architecture.

The status of women changed dramatically in this time. This was in a large measure due to the decline of the monastic influence and the development of the cult of the Virgin. Almost all Gothic cathedrals were dedicated to the Virgin Mary and the reverence for the mother of God gave rise to the whole concept of chivalry. Mary and her relationship to Jesus provided the bulk of primary subject matter for Gothic sculpture and glass.

The earliest examples of the Gothic style were developed in England in Durham Cathedral and in the Norman region of Ile-de-France in St. Denis Abbey Church. At Durham, records indicate that the first stone was laid in August of 1093 and that the plan indicated a Romanesque treatment. By 1104, when the vaults were centered, the plan had changed, and the Gothic ribbed vaults were begun. Surely it is no coincidence that this change occurred only five years after the fall of Jerusalem in 1099. It seems quite clear that the idea for the use of the ribbed vault and the pointed arch came from the East. Very soon after this, the church to be dedicated to the martyred Bishop Denis of Paris was begun on the foundations of the old Romanesque abbey church on the same site and was completed around 1150. St. Denis was remodeled in the late thirteenth century but, unfortunately, was completely destroyed during the French Revolution.

At Durham and St. Denis a new logic was applied to older engineering principles. Early Gothic, with the pointed arch and more advanced rib-vaulting systems, is a synthesis of well-tried engineering features and a much better understanding of stress factors. It was not nearly so daring with its application of light weight structure principles as the High Gothic of the thirteenth century. The difference between Early Gothic and High Gothic is not so much a departure from Romanesque proportions as it is the halting but crucial development into the use of the skeleton principle.

Sens and Laon Cathedrals were both begun around the same time (c. 1155-1168), and both are transitional buildings with many Romanesque stylistic features somewhat obscuring Gothic engineering. Both are examples of the "H" facade standard in Early Gothic in Ile-de-France. The "H" style is more symmetrical than is the case in later buildings, with three-pointed arched portals, a rose window on the second level over the center portal, and symmetrical twin towers. The Cathedral of Notre Dame, completed in 1169, is the climax of Early Gothic. In these early churches the vaulting is not especially steep, and one is not so conscious of the vertical thrust found in High Gothic of the next century. The skeleton principle was grasped but not yet exploited to create walls of glass, and as the result, the clerestory is a series of rosettes which do not allow as much

light to enter as in Amiens or Chartres a bit later.

In general, it has become customary to think of the thirteenth century cathedrals as being High Gothic and of the two Ile-de-France cathedrals of Amiens and Chartres as being Gothic at its very finest. Beautiful examples can be found in many of the countries of Europe, but few contain the remarkable unity of all elements--design, engineering, and ornamentation. The interdependence of architecture, sculpture, and glass is brilliant.

Construction began on Chartres Cathedral shortly after a fire destroyed the entire town of Chartres in 1194. The fact that the old towers and foundations were used accounts to a large extent for the plan the building took, but the final expression, especially apparent in the interior, is a magnificent example of the skeleton-skin of glass of High Gothic. Because of her marvelous glass, Chartres is known as the Queen of Cathedrals. Perhaps because of the attention lavished on the stained glass, much of the other more obvious ornamentation found in other cathedrals is played down.

Amiens was started in the year 1220 according to the inscription found on the stone pavement in front of the west portal. The final additions to the towers were not completed until 1402. (Years of difficult economic depression brought on principally by the Hundred Years' War slowed, or stopped, construction on a number of large-scale Gothic buildings.) In addition to its esthetic magnificence, Amiens is an engineering triumph. One of the significant things about the church is that it is one of the few known to have been built from *one* set of plans with very little deviation, except for superficial elements. The architect is known to be Robert de Luzarches, who attained an almost perfect abutment of the vaults with the compression primarily vertical. With the stress relieved in this way, the vast window space and lacy superstructure become possible. The mass-to-void relationship is well worked out in terms of the proper illusion, psychologically speaking of weight and support. It is a felt order, rather than mathematical in the Greek sense, and provides a very different kind of emotional reaction. The engineering is obviously calculated but is less apparent than in a Greek building.

It has often been said that the Gothic cathedrals were built in each town by laymen willing to work to the glory of God and that on certain days of the week joyous processions hauled in stones and put them in place. It does not take anything away from the cathedrals or the town pride to say that this simply could not be true. Although there is plenty of evidence that processions carted the stone from the quarries to the site, it is very doubtful that the voussoirs of the springs and haunches for the magnificent rib-vaults could have been entrusted to laymen, however zealous and anxious to contribute they might be. These structural elements had to fit perfectly to raise an arch over 140 feet off the floor, and only a highly trained builder and specialized crew could have accomplished the feat. As already indicated, calculus as a mathematical tool did not exist in the thirteenth century, and a master builder was forced to rely on his experience in practical building with most of his information kept in his head to be passed along to favorite apprentices. Other records

tell of extensive recruiting drives throughout Normandy, Saxony, and the rest of Europe to secure the services of skilled stone masons and master builders.

The role of the master mason in medieval building is a fascinating one, and without him large-scale building could not have been accomplished. Exactly who the master masons were as individuals is not clear (unhappily most of them are unknown), but as a group of artisans possessing a "master-plan concept," their contribution was essential. In the early eleventh century, for whatever reasons, the sudden desire to build on a large scale again--for the first time since the Roman Empire--was utterly dependent on the mason's skill. Exactly how he began to acquire his skills is certainly not clear either, but by the late Romanesque period we begin to hear of the "master builder," or "mason," who was responsible for the entire project of a great cathedral--design, engineering, logistics of obtaining and transporting materials, and coordination of all of the elements of construction. Today we would call him an architect. It is quite clear that in the 1100's the title of mason implied that such a man was in charge of carpenters, stonecutters, sculptors, and members of all the craft guilds on the building project. Furthermore, there are records, such as tax payments, contracts, and conditions of employment, which indicate that a mason was not only a highly respected member of society but also very well paid for his skills and knowledge.

Very little can be authenticated about the masons of the eighth and ninth centuries, though there are references to such a profession. Evidence seems to indicate that they came from the regions of Lombardy and Rome as well as from farther east in Byzantium (mostly Asiatic Greeks). It should be remembered that large-scale masonry buildings of a high order were being constructed throughout the Byzantine Empire in this same period. By the twelfth century the masons of Europe were well organized and known as the *Comancini*, or "brotherhood of associated masons." The term is Lombard Italian, since most of the master masons in the early period were from that region. Members of the Comancini migrated into northwestern Europe, where major architectural projects were already under way or planned. In France, Normandy, and Germany, these men frequently took local inhabitants as apprentices, and eventually the members of the Comacini were replaced by western Europeans, especially Normans, who became the master masons of the Gothic period.

For the most part, however, masonry was a closed society with jealously guarded secrets about techniques and procedures, which were often known only to families or members of villages of craftsmen. Much of the mystery surrounding late Romanesque and Gothic architecture is due to this penchant for secrecy. There were no manuals or "how to do" books. The crucial information about the various aspects of designing, calculating engineering stress, and limitations of materials was kept in the mason's head--though there were plans, some of which still exist.[1]

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[1]See *Chartres Cathedral* by Robert Branner for more information on this subject.

As to the educational methods utilized to train generations of masons, little is known. We can only speculate that they must have been absolutely awed by the Roman ruins as they attempted to understand how such monuments could have been constructed (nothing built before the late twelfth century was conceived with such skill and daring). It is also quite certain that much of the impetus for large-scale architecture as well as for experimentation with more daring engineering ideas was the direct result of the Crusades. Not only did members of the army of Crusaders become aware of the comforts of a higher civilization, with a much superior architecture in Byzantium and Islam, but they surely absorbed the technical aspects of that architecture as well. There is also ample evidence that among the thousands of Moorish prisoners taken in Sicily, southern Italy, and Spain by the Norman armies in the middle of the eleventh century were highly skilled artisans and craftsmen, including an entire corps of engineers who were sent north of the Alps and Pyrenees. They, too, must have played a part in the revival of great architecture in both major cathedrals and smaller buildings of the towns that were rising at about this same time.

There are many other fine examples of High Gothic in Normandy, the Rhineland, and England. In Normandy there are the cathedrals at Rheims (extensively damaged in World War I) and Rouen (begun in 1211 but finished with a facade of Late, or lacy, Gothic, and its famous Butter Tower, so-called because it was built from funds donated in return for permission to eat butter during Lent in 1485), while in England there is the cathedral at Salisbury. Major cathedrals in the Rhineland include those at Strasbourg, Maumburg, and Cologne.

At its finest, Gothic architecture is a fantastic multiplication of lines and vertical rhythms that direct the eye heavenward. Spiny details create a sharp and often complicated silhouette. (Late Gothic sometimes gets carried away with this later tendency.) The great attention to detail seems due to a feeling that, no matter how insignificant, details of parts contribute to the whole--strong evidence of the influence of Scholastic thought and the belief that all things are an important part of God's creation and are established in an order (Thomas Aquinas). Many Gothic stylistic elements manifested themselves in secular buildings, especially in Germany. Both Gothic engineering and ornamentation were used for city halls, castles, guild halls (in the Netherlands), but the pure Gothic is in the cathedrals.

In Late Gothic churches the emphasis was on the surface form and there were no longer any innovations in engineering; perhaps indeed none were possible. The elaboration of decoration began with the lacy elegancy sometimes known as *rayonnant*, or radiant. The term *flamboyant*, or flame-like, is another descriptive word of the ornamentation, a word which has come today to mean "grandiose" and "overdone." Flamboyance is a characteristic of the fourteenth and fifteenth centuries, and its artificiality cannot compare with either the Rayonnant period of the last half of the thirteenth century or the earlier period. The Chapel of Henry VII, in England, and the Cathedral of Milan, in Italy, are examples of the Flamboyant style. (The facade of Rouen has already been mentioned.)

In the Early and High Gothic periods, the integration of sculpture with architecture is nothing short of brilliant. Only rarely--in the Parthenon and in certain Romanesque churches--is such harmony and consistency found. The fact that the Gothic sculptor used the same stone that was used in the building accounts in part for the harmony between the sculpture and the architecture. One shudders and thanks fortune that there was no marble in the north of Europe because the total effect might have been disastrous. There are many examples of beautiful sculpture in various churches in northern Europe, but nowhere does the harmonious unity of the whole become so apparent as in Chartres and Amiens. It is, of course, possible to discern that some pieces of sculpture were cut decades apart, but the feeling of unified style still shines through.

Although sculpture is found throughout the church, the main focus is on the receding door jambs of the facade and the proches. The figures on the jambs retain the ascetic feeling of earlier times but are subservient to the vertical properties of the columns and the settings for them. Many of the hundreds of figures are symbolic and iconographic. Some are portraits of important churchmen. The grotesque gargoyles and other beasts, used as rainspouts, seem purely decorative. The turbulance of Romanesque, with all of its expressive eccentricity, has given way to a calm, quiet mood, as if many matters of faith and the threat of impending doom have been resolved.

The simplicity characteristic of Chartres is carried out in the work of the west portals and more especially on the tympanum of the center portal in the *Second Coming* and the *Last Judgment*. In the *Last Judgment* a grave and stern Christ, seated on a throne, is surrounded by the ancient Apostolic symbols of the eagle (St. John), winged lion (St. Mark), calf, and sometimes bull (St. Luke), and man (St. Matthew). It makes an interesting comparison with the version of the same subject on the south transcept portal done a bit later.

The sculptures of Amiens are a bit less rigid than those at Chartres. Generally, the compositions are more complicated as well. More complex compositional settings and a more "pictorial" treatment of subject matter (probably influenced by Saxon manuscripts) are also characteristic of the sculpture of German cathedrals.

As mentioned earlier, the High Gothic cathedrals display a remarkable feeling of unity of all elements. However, in the Late Gothic cathedrals this unity is destroyed. Sculpture, particularly, intrudes and submerges the architecture. The structural aspects are obscured, and the building becomes a mere setting for sculpture and other ornamental elements. The dignity and asceticism of earlier sculpture gives way to figures with rather dumpy and not too pleasing proportions. The exaggerated "S" curve and the perky little smirk characteristic of the *Virgin of Paris* (Notre Dame, Paris, c. 1320) is quite upsetting to many people.

Stained glass is the unique and crowning glory of Gothic cathedral architecture and, because of the skeleton principle developed in Norman churches, is found primarily in the north. Glass is the equivalent of

the fresco mural in southern churches, which had much more wall surface. The glass becomes the skin between the ribs of stone.

The origins of stained glass are obscure, but there is evidence that it was made in Damascus in the late 800's. The Italians used stained glass in the 900's, and the medium is thought to have entered Europe by way of Venice. Glassmakers at Murano and Venice were mostly craftsmen from Asia Minor. Earliest stained glass was not pictorial or narrative like the windows of the Norman cathedrals. Neither was lead used. Colored glass panes were set into standard window frames of stone or wood--as decoration. The first known pictorial window of any size was used in the Romanesque cathedral at Rheims in 988. An illustration and description in an extant manuscript show that its subject was the miracle of St. Benoit. The cathedral was demolished to make way for the Gothic cathedral presently on the site.

With the emergence of Gothic engineering and design, several windows were combined into one to fill in the larger space of the clerestory, and the leading was made heavier. Leading became both a structural element and an important ingredient in the window design itself. In glass windows structural considerations came to dictate the character of the design as the area of glass increased.

True stained glass is known as crown glass and is always blown. The bubble is cut while the glass is still molten and laid out on sheets, which are then twirled as cooling begins. The twirling builds up the glass at the outer edge, which accounts for the name crown glass. Colors are made from minerals, oxides, acids, and from ground up, heat-resistant precious or semi-precious stones. (St. Denis, for example, has blues and blue-greens made with ground sapphires.)

The next process is called waxing up. Pieces of crown are laid out on sheets of clear glass attached with melted wax. More color is added, and some details are etched in. Nuances of shading are achieved with hydrofluoric acid solution. The first firing, at 600 degrees, fixes the color permanently, and the warm colors are given a stain of silver chloride to give them an amber tone. At this point they are fired for the last time. After being laid out on the cartoon, the glass is cut and leaded into sections, which can be shipped or handled with convenience by the workmen who will install the window.

Almost all of the finest crown glass was, and still is, made in monasteries in France and Belgium. The glass designed in the period from about 1150 through 1400 maintained a high regard for the character of the architecture and the function of the window as a wall. By 1400 the period of architectural purity and integrity of material was over. The problem of integrating glass design was always present in later Gothic revivals in the nineteenth century, as many churches and university buildings built during that period testify. The designer becomes entranced with making his window design look like an Italian painting with three-dimensional perspective and shading. Glass is glass and painting is painting, for one thing, and naturalism detracts from the architectural purity and

unity. The achievement of the High Gothic stained glassmakers has seldom if ever, been equaled in terms of design, use and function of color, and relationship to the building itself. The soaring spiritual effect of the cathedral is enhanced by the mood established by the colored light.

Among the great Norman cathedrals, the glass of Chartres and Amiens, and possibly Rheims, stand out. Cologne and Strasbourg are examples of German churches with fine glass. The little jewel of the stained glass-maker's art is the small Sainte Chapelle in Paris. The ratio of structural members to the glass skin makes this church the most skeletal of all, a fact largely determined by the small size of the building. The glass is absolutely magnificent.

Painting, except in the field of manuscript illumination, was not a significant part of Gothic expression in the north of Europe until the early fifteenth century. The art of book illumination spread from the monastaries to urban churches, universities, private learning centers financed by dukes and princes, and private book shops such as Jean Pucelle's House of the Dragonfly (the sign that Pucelle used as the hallmark to identify his work). Increasingly books were secular as well as religious in keeping with a growing humanistic trend. Several important scientific treatises, including the works of Roger Bacon, appeared. In addition to their historic importance, they are of great artistic merit. In most instances the Irish interlace of earlier times is combined with the linear characteristics of Gothic, and the two balance beautifully. *Beau Dieu*, done for the Cathedral of Amiens, and the *Pontifical of Metz* (both about 1300) are excellent examples.

Perhaps the greatest monument of the period is the book of hours, *Tres Riches Heures de Notre Dame*, commissioned by the Duke of Berry. Although other artists, whose names are unknown, began the commission, the major portion of the manuscript was done by the Brothers Limbourg of the Netherlands. When the duke died in 1416, the Limbourgs returned to Zuider Zee and the book was forgotten about until 1485, when Jean Colombe completed it. The book contains calendars, canon tables (mass schedules), beautiful Gothic madonnas, references to the chivalric code, and a wealth of genre material of the time.

The calendars are of particular interest because of the illustrations that accompany them. By Renaissance standards they seem naive, but they nevertheless break away from flat Byzantine space and make an attempt to depict natural anatomy. They also reflect the growing curiousity about the natural world and the relation of people to it. In this way they become a link between the late fourteenth century and the astonishing naturalism of the Van Eyck brothers and other artists of the mid-fifteenth century.

The line of demarkation between the Gothic style and the Renaissance is very fuzzy, to say the least. It is true that the Gothic spirit prevailed longer and more clearly in the north of Europe than in Italy, where changes came much more quickly. The aforementioned van Eyck brothers and the Master of Flemalle, Robert Campin, for example, worked in the Flemish-

Gothic style in the fifteenth century, but since these dates are outside the time frame chosen for this chapter, they are better considered in comparison with the Florentine Renaissance in the next unit. Although the painting styles of such artists as Cimabue, Duccio, the Lorenzetti brothers, and the great Giotto are in a way a transition to the Italian Renaissance and as such are often called Proto-Renaissance, it seems a good idea to consider their work as the final extension of Gothic. Likewise, such artists as Simone Martini and Steven Lochner, working at the rival papal court at Avignon (France), seem more Gothic than truly part of the Renaissance.

The Avignon papal court, established in 1305 at the beginning of the so-called Babylonian Captivity of the papacy, served as a gathering point for artists and craftsmen imported from all over Europe. In 1378 the Great Schism burst wide open, and there were no fewer than three popes for a time, each pronouncing excommunication on the other two. Pope Martin V was eventually able to gather enough support to return the papacy to the Vatican, but the power and prestige of the Chair of Peter was compromised seriously and these events were to play a role in the challenge of the claim to apostolic succession during the Protestant Reformation two centuries later. In the face of these dislocations, continuing wars, and plagues that wiped out nearly fifty percent of the population of Europe, it is difficult to imagine any kind of art activity taking place.

The Avignon court spawned what is known as International Gothic, with such important artists as Lochner in Germany, Simone Martini, an Italian who worked in Avignon and other cities where Avignon influence prevailed, and Pisanello in Lombardy. Painting, taking the direction set by book illuminators and sculptors, became very ornamental but also reflected a close observation of nature.

In the areas of Siena and Padua in Italy, a school of painting often known as the Italio-Byzantine style and sometimes as Italian Gothic developed in the second half of the thirteenth and the first half of the fourteenth centuries. The principal artists were Bonaventura Berlinghieri, Duccio Buonisegna, Giovanni Cimabue, Pietro and Ambrogio Lorenzetti, and, of course, Giotto di Bondone. The last, in his Arena frescos and late commissions in Florence, became a powerful force on developments in painting in the early Renaissance and is an important pivotal figure in the transition.

All of these painters were heavily influenced by the icon style of Byzantium (by now Greek Orthodox). With the above noted exception of Giotto's late work, all work is primarily in an "ornamental" rather than a "real" space--figures and forms are flattened, rather stiff and static, with no attempt to create a correct scale to such elements as buildings, mountains, trees, and the like. A great deal of medieval symbolism appears in the form of inserted panels that do not provide a setting, or theater of space, for a true narrative to take place. While there is some attempt at representational perspective and the effects of natural light in the form of shading (chiaroscuro), the overall character is still non-naturalistic and decorative. In the Italio-Byzantine style