

Gothic Architecture: Culture and Cathedrals

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Abstract

The Gothic era produced some of the greatest innovations in architecture through the construction of grand cathedrals reaching greater heights than ever before in history. Starting in the twelfth century and ending around the sixteenth century, Gothic art evolved through these centuries, but several key distinct design features remained the same throughout the era, with only slight variation between cultures and the varying geographical locations these buildings were constructed in. The development and utilization of the pointed arch, ribbed stone vaults, and flying buttresses stand out throughout history as true design landmarks of this era. Built with an inherent ideal of heavenly pursuit and creating a celestial space, towering ceilings and large glass windows sought to use construction techniques to draw humanity's eye to the Divine. The construction of these great cathedrals can be attributed to the powerful influence of the church's reach during the time period. Additionally, the construction of these grand structures created competition between towns and villages to build cathedrals that were higher and grander than neighboring predecessors. Cathedrals were the true landmark of the Gothic era as they spread throughout France, England, Germany, and Italy. Inspired by faith and engineering discoveries, the architects of the Gothic era created structural works of art that continue to influence visitors to this day.

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During the period of 1132 to 1500, an architectural movement evolved through new inventions in construction techniques with an aim to reach greater heights, thinner walls, and tall stained glass windows. In previous medieval structures as well as other previous design eras, such as Greece and Rome, the height of the building structures was limited to the support forces available for distribution within the columns and beams. Following the Romanesque design style, the term, 'Gothic' wasn't added to this time period until much later in the fifteenth century (Abercrombie & Whiton, 2008, p. 139). The Gothic style can trace its early origins to France during the middle twelfth century, spreading throughout England, Spain, and northern Europe through the beginning of the fifteenth century (Abercrombie & Whiton, 2008, p. 139). Ultimately, it was the Christian institutions at the time that "led to the conception and building of the many cathedrals that stand as supreme architectural achievements of human history" (Abercrombie & Whiton, 2008, p. 139). From the first Gothic cathedrals, to the utilization of the pointed arch or the flying buttress, and detailed ornamentation, this era produced various buildings that have remained valuable, historical works of art to this day.

Ideals and Origins of Gothic Design

Following the aspiration of expressing "otherworldly aspirations and beliefs," Gothic designers sought proportions that would express the infinite nature of the celestial divine (Abercrombie & Whiton, 2008, p. 139). The description, "Gothic" originated from an interaction between Abbot Suger, the visionary behind St. Denis, one of the first Gothic cathedrals, who called his architecture "modern" and his critics who scoffed and named it after barbarians known as the Goths, hence the title, "Gothic" (Building the Great Cathedrals, 2011). Expression of religious beliefs, concepts, and ideals were paramount ideals of Gothic

architecture, due to the heavy influence of the church's power at this time in history. Even the greater usage of light through stained glass windows marked a transition from Romanesque design to Gothic. In fact, "in a Romanesque church, light is something distinct from and contrasting with the heavy, somber, tactile substance of the walls" and the "Gothic wall seems to be porous" with light filtering through it, "permeating it, merging with it, transfiguring it" (Von Simson, 1988, p. 4) The design of these Gothic structures varied between the available resources in the environments and climates of Europe, with most cathedrals and structures utilizing different kinds of available stone, such as marble or colored stone (Abercrombie & Whiton, 2008, p. 139). Key design landmarks of this time period sought to exemplify these religious ideals.

Gothic Design Key Features

Building on the precedent of Romanesque design, Gothic design "points to the development of structural elements" which allow for "further development, particularly in terms of building height but also the width of the wall" (Vondráčková, Nývlt, & Němec, 2016, p. 1751). Several key features that mark the Gothic era different than its predecessors include the primary usage of the pointed arch, ribbed stone vaults, and flying buttresses. In considering the pointed arch, in the previously used "round, Roman arch, the stress line goes mostly sideways, pushing the columns apart. If it's too tall or wide, the arch starts to sag in the middle and collapses. But the pointed arch redirects the stress line down to the ground, rather than to the sides" (Building the Great Cathedrals, 2011). This revolutionary design feature allowed builders to reach greater heights, symbolizing an upward direction of focus to God.

Ribbed stone vaults also served a key purpose in reducing pressure from the arches, and "represent a combination of constructional and aesthetic significance" (Vondráčková,

Nývlt, & Němec, 2016, p. 1752). Not only did they allow for thinner walls, but these ribbed vaults also served as a symbol and imitation of clasped hands in prayer (Vondráčková, Nývlt, & Němec, 2016, p. 1752). Gothic architecture truly discovered innovative ways to advance design principles that were not only functional, but also carried great religious symbolism and served artistic functions as well.

Additionally, another key feature of Gothic design that is considered a well-known landmark of the period is the flying buttress. This design aspect “is often considered the quintessential element of Gothic architecture – the most visible sign of the startling developments in building technology that took place between 1130 and the end of the twelfth century in France” (Nikolinakou, Tallon, & Ochsendorf, 2005, p. 1192). In the construction of a flying buttress, medieval builder’s research tool was mainly through observation. If the buttresses “required only the maintenance due to their constant exposure to the elements, the builder knew that working thrusts were being handled successfully. Cracking, displacement, or collapse, on the other hand, taught him that the limits of design were being attained” (Nikolinakou, Tallon, & Ochsendorf, 2005, p. 1194). With the elimination of the thicker support walls, the flying buttress redistributed the force of the building through a series of connected buttresses starting at the side of the building and directing the force out and downwards to the ground, away from the main structure. The flying buttress is a truly a work of engineering genius, especially without the access to modern-day computers and discoveries.

Although these design techniques have lasted well into the modern age by the historical preservation of remaining cathedrals, researchers have analyzed the designs of these buttresses of varying structures to test for future stability. At the core of their construction, “the structural function of the flying buttress is to transmit force from the upper walls and vaults of the main

vessel of a church over the aisles to the culées and exterior pier buttresses” (Nikolinakou, Tallon, & Ochsendorf, 2005, p. 1195). It was discovered that the structural system of the longer flying buttresses required greater force in order to keep the stones supported together, in comparison to several shorter buttresses paired together to distribute force. Even the angle of the flyer was taken into account for structural stability. The usage of the flying buttress was a great achievement in construction techniques, and through studying these aspects of Gothic design, one can understand the architects of the time period more clearly.

Contextual and Cultural Influences

In Gothic times, much of the power belonged to the popes and the clergy members. In fact, “before the emergence of Gothic cathedrals in the twelfth century, two main power structures shaped Europe: the Catholic Church and secular rulers, such as kings or emperors” (Lantham, 2019, p.1). Throughout the century, the Church claimed supreme authority and there was a constant shifting balance of power on both sides between the Church authorities and the monarchs of the period. To fund these grand cathedral structures, “the Church heavily relied on contributions from local church patrons to fund the cathedral’s construction” claiming, “expenses for the works are for the main part paid for from the alms and offerings of the faithful” (Lantham, 2019, p.6). Many citizens felt it was an honor to take part in the monetary support of constructing these towering structures as an opportunity to draw closer with the Divine.

Building of these new cathedrals created competition between towns, as the cathedral was not only a place of worship, but also a statement of wealth for the province in which it was built. During this time, “social institutions such as knighthood and chivalry and social organizations such as guilds of artisans and tradesmen combined elements of church and state” which promoted collective efforts and supported the “vast joint enterprise of cathedral

construction” (Abercrombie & Whiton, 2008, p. 140). Towards the end of the Gothic era in 1349 during the fourteenth century, the Black Death, a plague which killed a third of the population of England in the year 1349 alone, and by 1351 killed 75 million people across Europe, brought a slow decline to the “ambitious building programs of the Gothic period” (Abercrombie & Whiton, 2008, p. 140). The Gothic era truly brought about great architectural advances, and also displayed the growth and fall of the Church’s authority during these centuries.

Components of a Cathedral

In building these Gothic cathedrals, architects strove for “extreme dimensions and proportions,” promoting the “concrete expressions of strongly felt emotion, not expressions of logic or rationality” (Abercrombie & Whiton, 2008, p. 141). To display this, one key distinctive component of these cathedrals is the cruciform shape in which they were built, another aspect of design intended to promote Christian ideals. This cruciform was built with the “horizontal member shorter than the vertical member” with the “long vertical member corresponding to the nave, the main body of the church extending from the entrance” with the choir, apse, or ambulatory at the other end (Abercrombie & Whiton, 2008, p. 141).

The nave is flanked by side aisles separated by levels of buttresses countering the thrust above. These side aisles often had smaller chapels along the length of the aisles themselves. The height of the nave is divided into the lower level, the arcade, followed by the triforium and clerestory windows above there (Abercrombie & Whiton, 2008, p. 141). Gargoyles were also featured in these cathedrals and in its earliest form it was “merely an orifice in the parapet through which the water from the roof passed away” and eventually more ornamentation was added on and it became a notable design feature (Redgrave, 1882, p. 463). Rivalries developed

between towns and villages on which could achieve the highest size and beauty of their respective cathedrals.

Early French Cathedrals

In France, “the 1132 Abbey Church of St. Denis near Paris had a nave height of 88 feet” and is considered the earliest Gothic cathedral. St. Denis was “designed by Abbot Suger, the kings' advisor from 1135 to 1144, and was completed in the 13th century during the reign of Saint Louis” (“Basilique cathédrale de Saint-Denis” 2018). As this church was one of the first to be constructed in the Gothic style, and as “a major work of Gothic art, this church was the first to place a great importance on light, a symbol of divinity, in religious architecture” (“Basilique cathédrale de Saint-Denis” 2018). The foundation for this abbey was built on the “grave of Saint Denis, a Bishop of Paris who died in 250 A.D.” and serves as the burial place of “43 kings, 32 queens and 10 servants to the monarchy. The basilica was raised to the rank of cathedral in 1966” (“Basilique cathédrale de Saint-Denis” 2018).

Another famous French cathedral built in the twelfth century 1163 is the Cathedral of Notre Dame de Paris. The vast scale of this cathedral reflects “the dramatic growth of Paris in the twelfth century and the city’s emergence not only as a major commercial and intellectual center north of the Alps, but also as the chief residence and administrative center of the kings of France”(Bruzelius, 1987, p.1). Not only was this cathedral culturally significant, but as it was “taller, longer, and wider than any Gothic church before it, Notre Dame incorporated numerous technical and structural advances” (Bruzelius, 1987, p.1). Another interesting fact about the construction of Notre Dame is that based on a manuscript called the *Historia Scholastica* written in the twelfth century by the chancellor of Notre Dame, biblical proportions were taken into account. It reveals that “to the builders of Notre Dame, the dimensions of Solomon's Temple

were profoundly important: 30 cubits to the first level, and 60 cubits to the second level. These biblical numbers are built into Notre Dame” (“Building the great cathedrals,” 2011). Additionally, the medieval priests of the Gothic era “seized on the idea that the supreme beauty of the universe is based on perfect proportions and ideal numbers. They saw God as the supreme mathematician, a divine geometer who used sacred dimensions” (“Building the great cathedrals,” 2011).

The third famous cathedral started in twelfth century France was Chartres cathedral, which began construction in 1194 at the end of the century. Located on the outskirts of Paris, it was completed in 1260 and is “considered to have ushered in the High Gothic period” with much of its fame originating from the one hundred and eighty stained glass windows, and its two distinct frontal towers (Abercrombie & Whiton, 2008, p. 146). Chartres possesses larger clerestory windows than previous cathedrals and has a nave height of one hundred and twenty feet (Abercrombie & Whiton, 2008, p. 146). With these enlarged stained glass windows, there was a great demand for an increased amount of exterior tiered buttressing to support the cathedral walls. (Abercrombie & Whiton, 2008, p. 146). Another distinct feature of Chartres Cathedral is the use of the medieval labyrinths throughout the nave of the structure. The design feature of the labyrinth “was a symbol of a pilgrim’s spiritual journey towards Christ, and walking it was thought to be an aid to meditation” (Abercrombie & Whiton, 2008, p. 146). The Chartres Cathedral is truly a masterpiece of twelfth and thirteenth century construction.

Late French Cathedrals

Three notable French cathedrals that began construction in the thirteenth century include Reims, Amiens, and Beauvais. Reims Cathedral is only slightly taller than Chartres with a nave height of one hundred and twenty-four feet, equivalent to a twelve-story building. In fact, “over

two thousand, three hundred stone statues carved into its walls describe biblical and mythological stories which enabled the largely illiterate population to learn these stories” (Centre, 2016).

Amiens Cathedral began construction in 1220 using chalk-white limestone and was completed around the year 1270 (Abercrombie & Whiton, 2008, p. 146). This building is sometimes called ‘the Bible of Amiens’ due to its “instructive carvings and windows” (Abercrombie & Whiton, 2008, p. 146). Amiens Cathedral was “finished in a relatively short time (slightly under 50 years) and, as far as is known, nearly entirely in accordance with the original design of Robert de Luzarches” (Prak, 1966, p. 210). One of the most remarkable aspects of Amiens is the “size and slenderness of its interior” with a forty foot wide, four hundred and seventy foot long nave, reaching to an impressive height of one hundred and forty feet, which is as tall as a modern fourteen story building (Abercrombie & Whiton, 2008, p. 148). Similar to Chartres Cathedral, Amiens also has a labyrinth present in the nave’s pavement which was “laid in 1288 and inscribed with the names of the cathedral’s three consecutive master builders” (Abercrombie & Whiton, 2008, p. 148). Truly, this cathedral was an amazing stone skyscraper of its day.

Beauvais was another great Gothic cathedral that strove to reach new heights that previous cathedrals had not achieved. Unfortunately, that desire for height came with a price and structural instability. Although Beauvais is considered the tallest cathedral in France standing at a nave height of one hundred and fifty-six feet, it remains unfinished to this day due to construction issues and partial collapse. In 1284, the choir vault collapsed only ten years after its completion along with several of the buttresses (Wolfe, 1976, p. 473). It is believed that

vibrations from strong winds, along with instability in its construction caused this destruction. Reconstruction efforts continue on the cathedral to this day.

Other European Cathedrals

There are many more great cathedrals spread across Europe, but three other Gothic churches worth briefly mentioning include Wells Cathedral in England, Cologne Cathedral in Germany, and the Cathedral at Siena in Italy. English cathedrals differed from French cathedrals in the fact that while French cathedrals were built in the heart of a town or village, English cathedrals were built to be set aside on a hill, clearing, or riverbank (Abercrombie & Whiton, 2008, p. 148). Additionally, the interior of an English cathedral generally lacked the extreme height of a French nave, but are longer in dimension (Abercrombie & Whiton, 2008, p. 148). Wells Cathedral, built in Somerset on the southwestern side of England was constructed in two phases, the first being 1185-1240 and the second being 1275 to 1350 (Abercrombie & Whiton, 2008, p. 148). The walls of Wells Cathedral were thicker than the French counterparts and due to structural concerns, utilized strainer arches, which are “a pair of arches with the upper ones inverted to form enormous X-shapes” (Abercrombie & Whiton, 2008, p. 148). These arches provide great visual interest and additional strength to the beautiful structure.

In Germany, Cologne Cathedral begun construction “in 1248, but the building of this Gothic masterpiece took place in several stages and was not completed until 1880” (Centre, 2008). This grand masterpiece of stone “is a High Gothic five-aisled basilica (144.5 meters long), with a projecting transept (86.25 meters wide) and a tower façade (157.22 meters high) with its nave standing 43.58 meters high” (Centre, 2008). Cologne Cathedral is one of the tallest cathedrals and is a work of Gothic art in architecture that has spanned centuries until its completion hundreds of years later.

Additionally, the Cathedral of Siena in Italy was built later in the Gothic era as “Italy was more resistant to France’s Gothic ideas than was the rest of Europe” (Abercrombie & Whiton, 2008, p. 148). The Italian cathedrals are not nearly as tall or as pointed according to French standards. The Cathedral of Siena was “erected between 1245 and 1380 in Tuscany and constitutes one of the greatest building programs of the Gothic era” (Abercrombie & Whiton, 2008, p. 149). The church’s present nave is three hundred and twenty feet long and was intended instead to be its transept with a much longer nave; however, it remained uncomplete due to the Black Death which occurred in 1348 (Abercrombie & Whiton, 2008, p. 149). Also, this cathedral deviates from French and England cathedrals through the usage of a dome instead of buttresses in the interior and the integration of colored marble within the interior (Abercrombie & Whiton, 2008, p. 148). This unique application of Gothic ideals and varying differences shows tribute to the influences of various cultures on design principles.

Gothic Ornamentation

Although each region’s cathedrals took slightly different approaches in applying Gothic ideals, Gothic design shares several of the same structural features in ornamentation. In fact, “even at its simplest, the Gothic style was a more decorative one than the earlier Romanesque” as it “accentuated the vertical dimension” (Abercrombie & Whiton, 2008, p. 154). Several key shared elements of ornamentation include foils, wood paneling, stained glass including rose windows, and tracery details on windows. Foiled ornaments could be seen in several shapes, the most famous being in the shape of a rondel with varying numbers of inner divisions. Other decorative ornamentations included statues of saints, prophets, royalty, or other religious figures, adding to the religious emphasis of Gothic design. In fact, “to the medieval mind nearly

everything was symbolic, and the ornament of the church was an encyclopedia in stone” (Abercrombie & Whiton, 2008, p. 154).

Conclusion: The Lasting Impact of Gothic Design

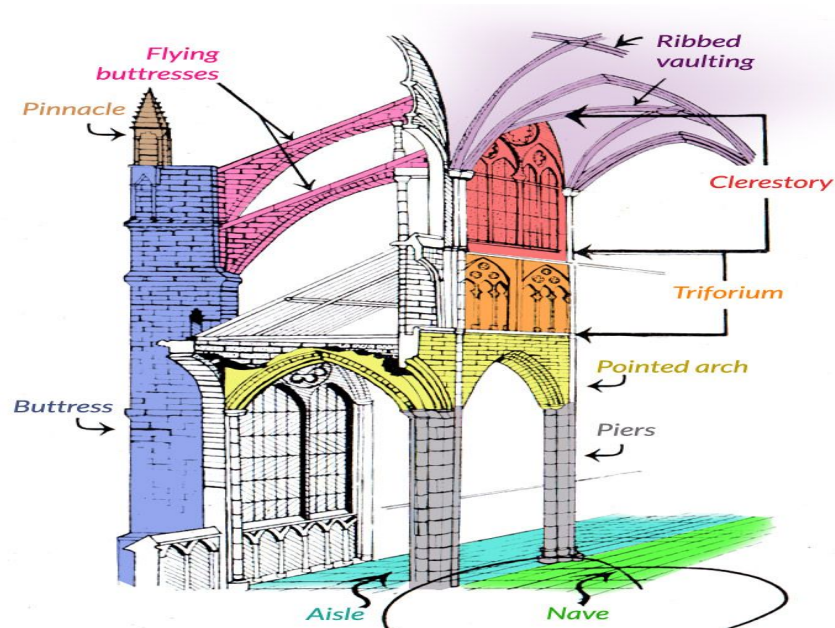
In an analysis of Gothic architecture, art, and design, the accomplishments in engineering achieved by Gothic builders is still an impressive work of genius in the modern day. In transitioning from the Gothic era to its eventual successor in the Renaissance movement, many of the ideals held by the Gothic designers of building to emulate the Divine through celestial spaces were gradually exchanged in pursuit of a humanistic focus as religious fervor waned (Abercrombie & Whiton, 2008, p. 163). In the Middle Ages, the Roman Catholic church held great power throughout this age, including the Gothic era. As the Gothic era came to an end, so did the supreme power of the Church as more corruption and misconduct was exposed, which gave way to the humanistic focus of the later Renaissance era. For several centuries, Gothic design forever changed construction methods from its engineering discoveries that allowed Gothic architects to build higher, thinner, and even more ornate structures. This era was truly marked by heavy religious emphasis and ideals, the dramatic utilization of the pointed arch, flying buttresses, and tall stained glass windows which ultimately created a celestial space within these grand cathedrals all across Europe.

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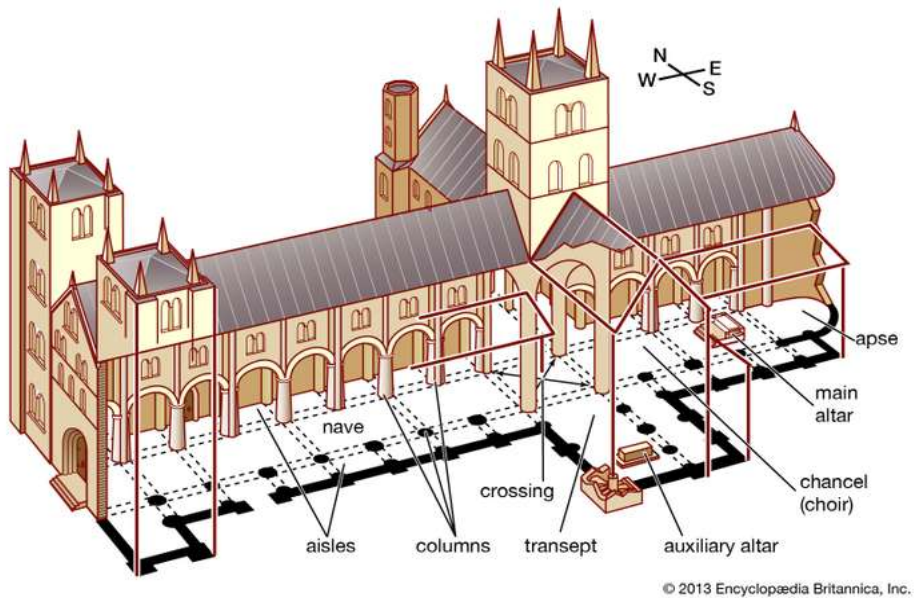
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Appendix A: Diagrams



Key Interior Gothic Architecture Labelled Diagram 1



Key Interior Gothic Architecture Labelled Diagram 2

Appendix B: French Cathedrals



Above: Abbey of St. Denis Cathedral



Cathedral of Notre Dame, Paris,



Reims Cathedral



Chartres Cathedral

Appendix C: Other European Cathedrals



Above: Cologne Cathedral, Germany



Above: Cathedral of Siena, Italy



Above: Wells Cathedral, England