

Cathedral: The Story of Its Construction Study Guide

Cathedral: The Story of Its Construction by David Macaulay

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Overview

In Cathedral architecture and construction come alive as human accomplishments. The drawings and a thoroughly researched but brief text clarify the technical aspects and terminology as well. A one-page glossary in the back provides a quick reference for architectural terms found in the text.

The book also introduces the social structure, materials, and working conditions of the medieval trade guilds.

The book provides excellent exercise for the developing imagination, presenting an incredible variety of viewpoints from which to examine a cathedral— angles not even available to someone standing in the real building. For example, Macaulay provides a bird's-eye view down through the unfinished choir and then takes the reader inside at triforium height, looking out toward the empty space where the nave will be. One page later the reader stands on a narrow scaffold up in the trusses of the roof. A head-on elevation sketch indicates exactly how high the scaffold is and—in terms of construction stages—how it got there. Macaulay's drawings are both meticulously detailed and highly imaginative in perspective.

About the Author

Although he has lived in the United States since age eleven, David Macaulay was born in Burton-on-Trent, England, on December 12, 1946, and he remains a British citizen. He graduated from and taught at the Rhode Island School of Design and still lives in Providence, Rhode Island. His first book, *Cathedral* won him instant critical acclaim and was named a Caldecott Honor Book. He took his place among the select group of authors of juvenile literature whose books are read with equal pleasure by adults, and all his subsequent books have maintained that standard. It is a matter of evident pride for Macaulay, in fact, that he has made the picture-book a genre not limited in appeal to younger readers. His books are translated into many foreign languages and continue to win awards.

Although Macaulay's prose is a model of clarity, he is primarily an illustrator, and he puts enormous time and energy into that craft. His intense research usually includes traveling to the site of a book, where he takes extensive photographs. This is followed by hours of sketching, much of it experimental or "doodling," before he arrives at the particular combination of perspectives that will tell, in relatively short space, the full story of a construction project. His drawings are incredibly detailed without being dry; indeed, even the "serious" drawings have a wittiness in the selection of detail and a constant freshness in the point of view.



Plot Summary

The book considers the planning and construction of a cathedral in Chutreaux, France; a fictional locale. The cathedral is built in the Gothic style on the site of a small Romanesque church which is demolished—the Romanesque crypt is retained. Although the cathedral is fictional, the methods used are historically correct and the timeline presented is possible, if optimistic.

A new cathedral is proposed by the Bishop of Chutreaux, France, c. 1252. The townspeople approve of the cathedral as a way to demonstrate their devotion to God. The Bishop is supported by local clergymen, known as the Chapter, who control the disbursement of funding. The Bishop hires William of Planz, a famous architect and cathedral builder, to design and start cathedral construction. William of Planz designs and presents the plans for the new cathedral, and they are approved in 1252. Craftsmen are hired and work teams are organized. The foundation is excavated and work begins; within a year, the first stones of the foundation are put into place. Simultaneously, stone and lumber supplies are stockpiled and a large area in the middle of the city is cleared to make room for the new, very large cathedral—indeed, it is planned to be the largest cathedral in France.

Some specialized materials for the roof are ordered from abroad, but most of the materials are produced locally or brought in from nearby forests and quarries. For the most part, construction work halts each year during the winter. Some special trades that can be performed inside continue throughout the cold months inside of specially-built workshops and forges. The construction of the cathedral walls is described in detail; the method used allows for many, large windows but requires the need of buttressing. This approach is typical of Gothic architecture. As the walls continue to rise scaffolding is put in place to allow access for the masons. A major portion of the cathedral, the choir, is completed within a few decades. This portion is then roofed as construction on the transept begins, and so the rest of the cathedral is completed.

During the cathedral construction there are several notable changes in personnel—the Bishop dies and is replaced, and the architect retires and is replaced. Later, the architect's replacement dies and is again replaced. Throughout this all construction continues until 1306 when funding for construction dries up. Over the next five years the Chapter raises funds and in 1311 work resumes. This five-year period is the only major work stoppage during the eighty-six years of cathedral construction. Eventually, bells are hung; gargoyles are set; the vaulted ceiling is completed; and the spire is completed. The cathedral doors are hung and the giant rose windows are put into place. Finally, in 1338 the cathedral is completed. Roland of Clermont, the Bishop at the time of completion, leads a celebratory parade through Chartreux and the citizens celebrate their new cathedral—the biggest and most-beautiful cathedral in all of France.

Pages 1 - 20

Pages 1 - 20 Summary and Analysis

The book considers the planning and construction of a cathedral in Chutreaux, France; a fictional locale. The cathedral is built in the Gothic style on the site of a small and damaged Romanesque cathedral which is demolished—the Romanesque crypt is retained. Although the cathedral is fictional, the methods used are historically correct and the timeline presented is possible, if optimistic. In the twelfth century the people of Europe believed that God was the most important force in their lives and they were very religious. Because of a prolonged period of financial prosperity and freedom from such things as the plague and famine, the people of Chutreaux decide to honor God by building a new cathedral. The cathedral would house the partial remains of Saint Germain, a knight of the First Crusade. Other cities nearby also build new cathedrals for similar reasons. The people of Chutreaux decide to build the longest, widest, highest, and most beautiful cathedral in all of France, knowing that it might take more than one hundred years to build.

The church in Chutreaux is led by the Bishop, but the funds are controlled by a group of clergymen known as the chapter. The chapter hires a Flemish architect named William of Planz. William has much experience working on other cathedrals in France, England, and Germany. William in turn is responsible for hiring the master craftsmen who work under him. William hires several master craftsmen, including: the master quarryman; the master stone cutter; the master sculptor; the master mortar maker; the master mason; the master carpenter; the master blacksmith; the master roofer; and the master glass maker. Each master craftsman then establishes a workshop for their respective trade and takes on sufficient apprentices and assistants to perform the work. Most of these skilled workers are drawn from the citizenry of Chutreaux. Besides craftsmen, many simple laborers perform heavy manual labor, and many of these individuals are drawn from the surrounding countryside. As the various workshops begin production, they require various specialized tools, including pickaxes, hammers, chisels, templates, levers, measuring sticks, squares, saws, and dividers. The metal components of the tools are fabricated by the blacksmith while the wood components are fabricated by the woodworkers. The stone cutter's workshop and the carpenter's workshop require the most specialized tools.

William produces a floor plan and a wall elevation drawing on sheets of plaster. The drawings are presented to the Bishop and the Chapter and are approved. The floor plan is illustrated on page 12 of the book, and the wall elevation is illustrated on page 13 of the book. The floor plan not only shows the general outline but also shows the locations of stairs, doors, and windows; and illustrates how the new cathedral will interface with the existing Romanesque crypt. The various dashed lines between the piers on the floor plan show the ribs of the vaulted ceiling. The wall elevation shows the arcade rising from the floor, the triforium, the clerestory, and the vaulting. In most respects, the two drawings are typical of Gothic-period cathedrals. Once the design has been approved the



master carpenter takes about two hundred men into the forest of Chantilly and cuts timber for the construction of scaffolding, workshops, tools, and machines. The cut lumber is transported several miles by water to Chutreaux. Meanwhile, the master quarryman supervises about three hundred men cutting limestone in the Somme valley. The distant locale is equipped with workshops and a forge. Pieces of cut limestone are hoisted out of the quarry and then cut into shape to match templates provided by the master mason. The stones are marked for tracking and remuneration purposes.

Several weeks later laborers in Chutreaux begin to clear the site of the new cathedral. The old cathedral is demolished, save the crypt (note that an illustration of the old cathedral can be seen on page 3). As the new cathedral is much larger than the old one, many houses are also demolished—even a portion of the Bishop's palace is demolished. Once the site is cleared, the location of the apse and choir are surveyed and marked with stakes. The work site is then prepared by the construction of workshops and a forge to produce tools and nails. Finally, the new foundation for the apse and choir is excavated. As the new cathedral is to be enormous, the foundation is excavated to a depth of twenty-five feet. The complex series of foundation excavations are executed according to the surveying stakes. This initial segment of the book begins with the decision to build the cathedral and concludes with the excavation of the foundation. To date, over five hundred men have been involved and the project has taken about four months.



Pages 21 - 40

Pages 21 - 40 Summary and Analysis

Huge roof timbers are ordered from Scandinavia. Much of the new lumber from Chantilly and the cut stone from Somme begin to arrive at Chutreaux by ships sailing up the river. Carpenters hoist the materials out of the boats and carts transport them through the city to the work site. The foundation for the apse and choir is completed about six months of work. The winter halts construction for five months. In the spring of 1853 the Bishop of Chutreaux blesses the first foundation stone and it is lowered into the excavated foundations. Each stone is mortared together and as the mortar cures it binds the stones to each other. The masons place the stones while the mortar craftsmen mix and apply the mortar. The foundation is built to exacting standards—it must be level and straight to bear the massive weight of the huge cathedral that will be built on top of it. Once the foundation is completed the walls are begun. The walls are complex and consist of piers, or columns, that support the vault and roof. The space between piers is filled with tracery, a stone framework with glass windows. Solid walls span some portions of the cathedrals. Most of the solid walls are two vertical walls with a space between that is filled with concrete—solid stone walls would be too expensive.

The vault and ceiling put a downward strain on the piers and walls. To support the walls from buckling outward, William of Planz designed buttresses around the cathedral's outside walls. These buttresses look like large columns. The outward buckling force is then transferred from the piers and walls to the buttresses by arches known as flying buttresses. This typical Gothic architecture technique allowed the piers to remain thin relative to their height, allowing more space for windows. As the walls grow higher the workmen build wooden scaffolding. Because the scaffolding must go very high, it is hung from the top of the wall instead of rising from the ground. For example, the piers of the choir of Chutreaux will be 160 feet high and six to eight feet thick. The scaffolding in turn holds hurdles, or work platforms made from woven sticks. Workmen reach the hanging scaffolding by using the stone circular staircases built into the walls of the cathedral—Chutreaux has six such staircases, as well as a seventh spiral staircase leading down to the Romanesque crypt. Page 31 has an illustration of the construction of a spiral stone staircase.

Flying buttresses are stone arches that connect the cathedral's piers to the external buttresses. The flying buttresses must be built upon temporary wooden frames called centerings. The centerings support the stones of the flying buttress while the mortar cures. Once the mortar cures, the centerings are removed. The flying buttresses work by transferring downward forces from the walls, which tend to push outward, to the buttresses. Eventually the chapels in the apse are finished and the piers and buttresses of the choir are nearly finished. Many of the centerings are also completed. At this time the cathedral has been under construction for eighteen years. As always, winter interrupts most of the work for about five months. During this time the new stonework and new in-place mortar are covered with a matting of straw and dung to keep them



from cracking in the cold. By this time, however, some work continues inside the various workshops. Most importantly, the stone cutters work inside dressing stone and cutting tracery, capitals, and sculptures.

The walls of the choir are constructed in three phases. First, the arcade of piers rises eighty feet from the foundation. Next, the triforium, a row of arches and a narrow passageway, rises twenty feet. Finally, the clerestory, stone tracery and sixty-foot high windows, rises sixty feet for a total vertical rise of 160 feet. After five more years of labor the walls of the choir and aisle are completed and work begins on the cathedral roof. The roof is located above the vaulting, and consists of triangular frames. The frames are cut on the ground and then hoisted into place and reassembled. The frames are assembled by driving wooden pegs or tenons into pre-cut holes called mortices. The mortice-and-tenon construction method does not require the use of any nails but instead makes use of oak pegs. This second segment of the book begins with the excavation of the foundation and ends with the first segment of the roof over the choir and aisle. To date, the project has taken about twenty-three years, most of which is considered in the second segment.



Pages 41 - 59

Pages 41 - 59 Summary and Analysis

The construction of the roof continues as the frames are set up with trusses. The roof timbers are thickly coated in pitch to prevent them from rotting. Huge sheets of roofing lead are made on the ground and then hoisted into place. The lead sheets are used to cover the wooden frame making a weatherproof roof; they are attached with nails. Lead drain pipes are located around the roof and lead to stone gutters across the flying buttresses to down spouts located on the buttresses. The down spouts are stone sculptures made to look like frightening monsters—they are called gargoyles. When it rains, the water shoots out the mouths of the gargoyles. Page 43 illustrates a typical gargoyle, and page 44 shows an elevation schematic of a stone gutter leading across a flying buttress to a gargoyle down spout. In 1280, twenty-eight years after construction began, the choir of the cathedral is ready to receive the vaulted ceiling. Simultaneously, the foundation for the transept is begun. During the year, William of Planz decides he is too old to continue working and he is replaced by Robert of Cormont; soon thereafter the Bishop dies and is replaced. This period marks a huge transition in the personnel of the construction of the cathedral, but does not interrupt the work.

The vaulted ceiling requires much heavy stone and a unique device is used to raise the stone and mortar to the ceiling. The device is known as the great wheel, and it is essentially a man-sized wheel that is operated by one or two men who walk around the inside of the wheel—something like a modern cage wheel for guinea pigs. The axle of the wheel is attached to a lifting rope, and as the men walk so the axle turns and winds up the rope, lifting very heavy loads from the floor. The construction of the great wheel is illustrated on page 48 and its use is illustrated on page 56; note the magnificent scale of the partially-finished cathedral in the illustration on page 49. The vaulted ceiling is built 130 feet above the foundation. Wooden arches, like centerings, are placed from pier to pier to give the vaulted ceiling stone ribs support while the mortar cures. The ribs themselves carry the weight of the webbing, or ceiling stones. The ceiling will be constructed one bay at a time; each bay is the square area between four piers at the corners; two wooden centerings cross each other at the middle of the square. In 1281 the Bishop of Chutreaux dies, twenty-nine years after construction began. Meanwhile, the flying buttresses of the choir are completed and the centerings are readied for the first stones of the vaulted ceilings.

The stones that comprise the ribs of the vaulted ceiling are called vassoirs. They meet at the center of the bay in a crossing pattern and are locked together by a specially-shaped keystone. Details of the vassoirs and keystone are illustrated on page 54. After the ribs are completed, carpenters install lagging, or wood spanners, along the centerings. Masons then lay courses of light webbing stones over the lagging. The lagging supports the webbing until the mortar cures. Teams work simultaneously inwards from both walls. The choir and aisle vaulting is constructed at the same time. After the webbing has set hard workers put a four-inch layer of concrete over the top of



the vaulted to prevent cracking. Once the concrete has cured the centerings and lagging are removed and the bay of vaulted ceiling is complete. Construction continues through 1302 when the transept and most of its vaulting is completed. This third segment of the book begins with the first segment of the roof over the choir and aisle and ends with the completion of the transept. To date, the project has taken fifty years, twenty-seven of which are considered in this segment. Note that the illustrations throughout the section are particularly useful in understanding the construction techniques utilized.



Pages 60 - 80

Pages 60 - 80 Summary and Analysis

In 1302 the glass makers begin to make the colored glass for the huge cathedral windows. The glass itself is made from beechwood ash and washed sand melted together at very high temperatures. Various kinds of metals are added to different batches of glass to color the glass. The glass makers then take a molten lump of glass on the end of a large hollow pipe and blow it up like a balloon. When the balloon gets the right size, the end is cut off and the pipe is spun quickly around and around, spinning the glass outward into a large flat disk. The disk is removed from the pipe and cooled. It is then cut into shape using a tool called a grozing iron. The shapes are cut to the correct dimensions by using a template. The largest simple pieces of glass are about eight inches square but these smaller pieces are assembled into panes as large as thirty inches square, the pieces being held together by lead channels. These larger sections are then installed between stone mullions and iron reinforcing bars to create individual window panes as large as sixty feet high. Illustrations on page 61 show most of the steps of making the individual glass panes.

While the windows are being installed the underside of the vaulted ceiling is plastered and painted. The moldings and capitals are also finished and stone slabs are laid on the floor in a maze-like pattern. The book explains that finding the way to the center of the maze was symbolic of making a long pilgrimage to the cathedral in search of God's favor. All work on the cathedral stops in 1306, however, because the Chapter runs out of money. The cathedral is mostly complete and has taken fifty-four years to build thus far. Historically, many such work stoppages occurred in cathedral building—and often lasted dozens or hundreds of years. The people of Chutreaux are lucky, however, because their work stoppage lasts only five years. During this time they raise money by displaying the remains of Saint Germain and requesting financial donations. Work resumes in 1311 and by 1330 the nave is finally completed. Sadly, in 1329 Robert of Cormont dies after falling from the scaffolding of the vaults. He is replaced by Etienne of Gaston who will oversee the completion of the cathedral.

Four bells are cast for the cathedral. Each bell is unique because the clay mold used to cast the bronze bell is destroyed during the casting process. The process begins when a solid model of the bell is made in clay and plaster of Paris. Then the model is covered in about four inches of wax. The exterior of the wax is then carved into the decorations that will be on the outside of the bell. The finished wax represents the size, thickness, and shape of the bell. The wax is then coated in more clay and plaster of Paris. Once the clay and plaster mix sets, the whole unit is heated up and the wax melts and runs out leaving a cavity in the clay. Molten bronze is poured into the cavity and allowed to cool. The clay and plaster mold is then broken away revealing the finished bell. The bells are shipped to the cathedral and hoisted into the belfry. The belfry, located in the north tower, is strengthened by a heavy timber framework. Large ropes hang to the



ground from each bell; when the ropes are pulled the bells swing back and forth and ring. The ringing of the bells can be heard for miles.

The tracery of the cathedral's huge rose window is created. Vassoirs are cut into shape to form deep, arched gables over the three doors. A tympanum, or semicircular sculpted panel, is created to go above each door. The spire is completed in 1331; it rises above the intersection of the nave and the transept. The spire has a wooden frame covered with lead sheets, and it features ornate decorations and sculptures. The cathedral's three huge doors are built—the center door is almost twenty-five feet high. The doors are made from planks joined together by ribs, and they are fastened with nails, bolts, locks, and hinges. By 1332 the front, or west end, of the cathedral is nearly complete. The pieces of the rose window are put in place and the tympanums and vassoirs are installed above the doors. The rose window's enormous thirty-two foot diameter is filled with hundreds and hundreds of pieces of colored glass. By 1338 the cathedral is completed. A great procession winds through the city of Chutreaux, departing from the cathedral and arriving once again at the cathedral. The interior has been decorated with banners hanging from the triforium and burning candles on every pier. A thanksgiving celebration ensues, complete with a singing choir. The Chutreaux cathedral, the longest, widest, highest, and most beautiful cathedral in all of France, has taken eighty-six years to build, thirty-three of which are considered in this segment. Of those eighty-six years, all but five saw extensive construction activities. This section of the book concludes with a one-page glossary defining thirty specific terms used in the body of the text.



Characters

The Bishop of Chutreaux

The Bishop of Chutreaux is not named, but under his guidance the townspeople decide to build a new and glorious cathedral. Under the Bishop's guidance, the clergymen of the town hire William of Planz to design the new structure. The Bishop dies in 1281, twenty-nine years after construction begins. He is interred in a new tomb within the old Romanesque crypt. He is succeeded by Roland of Clermont. The Bishop is illustrated on page 6; his tomb is illustrated on page 51. In the history of the cathedral, the unnamed Bishop is the most significant individual—he oversees the planning and inception, arranges for the initial funding, selects the architect, approves the design, and rallies public support. He even gives up a portion of his personal estate to clear the way for the construction. Although he survives for only about one-third of the entire project's timeline, the Bishop does see the completion of the choir and aisle, sees the first sections of roof, and sees the vaulted ceilings begin to take shape. It is clearly a legacy of which he can be proud.

William of Planz

William of Planz is a Flemish architect of wide repute. He has participated in the design and construction of cathedrals in France, England, and Germany, and is hired by the clergymen of Chutreaux to design and commence construction on the Chutreaux cathedral. William designs the cathedral in 1252 and then supervises construction as the architect and master craftsman for twenty-eight years, finally retiring in 1280. William is illustrated on page 6 of the book. William's design is typical of Gothic architecture and consists of a floor plan schematic and a wall elevation segment—both are produced on large sheets of plaster. The design is approved by the clergymen with apparently little alteration. William hires, in 1253, a master quarryman, a master stone cutter, a master mason, a master carpenter, and a master blacksmith. These trades are all needed from the beginning of the project. William hires, about 1270, a master sculptor; and, about 1275, a master roofer. These trades are needed only later in the life of the project. The only master craftsman that William does not have a hand in hiring is the master glassmaker, who joins the project only about 1302, twenty-two years after William has retired. William's successors, Robert of Cormont and Etienne of Gaston, follow his plans carefully, making no substantial alterations in the cathedral's design. Although William serves for only about one-third of the entire project's timeline, he does see the completion of the choir and aisle, sees the first sections of roof, and sees the vaulted ceilings begin to take shape. Next to the Bishop of Chutreaux only, William's influence on the cathedral is supreme—it is clearly a legacy of which he can be proud.



Robert of Cormont

Robert of Cormont replaces William of Planz as the cathedral's master builder in 1280. Robert appears to continue on with William's original design. Sadly, in 1329 Robert dies after falling from the scaffolding of the vaults after serving as the master craftsman for forty-nine years. He is replaced by Etienne of Gaston. Robert hires, about 1302, a master glass maker—the only master tradesman hired by someone other than William of Planz. Robert serves for over one-half of the entire project's timeline, and sees the completion of the transept, sees most of the roof installed, and sees much of the vaulted ceilings installed. Robert persists as the master builder through the financial difficulties from 1306 through 1311.

Roland of Clermont

Roland of Clermont is appointed Bishop of Chutreaux in 1281. He sees the completion of the cathedral in 1338 and leads the celebratory procession, after serving as Bishop for fifty-seven years. Roland is not illustrated in the book and his legacy appears to consist mostly of carrying on the projects—including the cathedral—of the Bishop that preceded him. Roland oversees the completion of the project and during his oversight the first glass craftsmen are hired and the first windows are installed. Roland also oversees a five-year period of financial difficulties, from 1306 through 1311, when the construction project halts due to lack of funds. Roland raises the funds by causing the relics of Saint Germain to be put on public display.

Etienne of Gaston

Etienne of Gaston replaces Robert of Cormont, after the latter's death, as the cathedral's master builder in 1329. Etienne appears to continue on with William's original design. Etienne sees the completion of the cathedral in 1338 after serving as the master craftsman for nine years, or only about one tenth of the project's life. During his tenure he sees the nave completed, the bells installed, the spire erected, and the entrance way—complete with rose window and doors—completed. Presumably armed with his new reputation, Etienne travels to a new locale to begin work on another temple, much like William of Planz had done nearly ninety years earlier.

The Chapter

The Chapter is the collective name of a group of six clergymen in Chutreaux who control the funds of the church. Under the direction of the Bishop of Chutreaux, the Chapter hires William of Planz to design the Chutreaux cathedral. The men of the Chapter are illustrated on page 6 of the book, and they appear as serious and capable men. Their decisions throughout the book are subtle but taken with obvious care because the funding they initially arranged was sufficient for fifty-three years of continuous construction. The funds needed for the final twenty-seven years of



construction are raised in a mere five years: obviously the fiscal oversight of the Chapter is excellent and sufficient. Although the individual men of the Chapter presumably change during the cathedral's construction, the book does not mention these alterations.

The Quarrymen, the Stonecutters, and the Masons

During 1252, William of Planz hires a master quarryman, a master stonecutter, and a master mason. These men in turn take apprentices and hire assistants skilled in their respective trades. Most of these men are drawn from Chutreaux's citizenry. For example, the master quarryman employs about three hundred men in the quarry. The various tradesmen are assisted by unskilled laborers as needed. The three trades listed share interrelated but distinct tasks during the construction of the cathedral, and all three trades listed are required throughout the entire construction project. The quarrymen are responsible for cutting blocks of stone out of the limestone quarry in the Somme valley. The stonecutters take the blocks of quarries limestone and cut it into the shapes specified by the masons. The masons specify the shapes using templates; they then take the completed, cut, stones and place them into the cathedral at the proper location. The quarrymen and the stonecutters are paid for each piece of stone they work with; they cut symbols into each stone so that it can be tracked (a marked stone is illustrated on page 17). The masons work closely with the master mortar tradesmen when laying the courses of stone. The original master craftsmen are illustrated on page 8; some of their tools are illustrated on pages 9 through 11, and various craftsmen of these trades can be seen throughout the book.

The Mortar Makers

During 1253, William of Planz hires a master mortar maker. The master mortar maker in turn takes apprentices and hires assistants skilled in making and using mortar. Most of these men are drawn from Chutreaux's citizenry. These tradesmen are assisted by unskilled laborers as needed. The mortar makers work closely with the masons during the construction phase of the cathedral, and the trade is required to the end of the construction project. The many stones of the cathedral are cemented together with mortar. The mortar is prepared at the work site and the mortar tradesmen place the mortar onto the stones set by the masons. Thus, the mortar and mason tradesmen work in close teams to build the bulk of the cathedral. The original master mortar maker is illustrated on page 8, and various mortar craftsmen can be seen throughout the book, especially on pages 26 and 55. The mortar makers also apply the layer of cement to the top of the vaulted ceiling, as illustrated on page 56.

The Carpenters and the Blacksmiths

During 1252, William of Planz hires a master carpenter and a master blacksmith. The men in turn take apprentices and assistants skilled in their respective trades. Most of



these men are drawn from Chutreaux's citizenry. For example, the master carpenter employs about two hundred men in the initial tasks during early cathedral construction. The various tradesmen are assisted by unskilled laborers as needed. The carpenters' initial task is a huge lumber gathering expedition to the forests of Chantilly where many trees are cut to stockpile the lumber needed for scaffolding and tools. Meanwhile, the blacksmiths set up workshops and forges to begin work. The carpenters and blacksmiths then work together closely to fashion a stockpile of specialized tools needed during cathedral construction. During construction the carpenters are responsible for constructing the hanging scaffolding and hurdles; they also construct the frames and trusses used in the roof and the lagging used during the construction of the vaulted ceilings. The blacksmiths also make nails. The original master craftsmen are illustrated on page 8; some of their tools are illustrated on pages 9 through 11; the forest cutting in Chantilly is illustrated on pages 14 and 15; and blacksmiths working in a forge are illustrated on page 20.

The Sculptors, the Roofers, and the Glassmakers

During 1270, William of Planz hires a master sculptor; during 1275 he hires a master roofer. During 1302, Robert of Cormont hires a master glassmaker. The men in turn take apprentices and assistants skilled in their respective trades. Most of these men are drawn from Chutreaux's citizenry. The various tradesmen are sometimes assisted by unskilled laborers as needed. The sculptors are responsible for fashioning the statuary, ornaments, and decorations found around the cathedral, as well as for fashioning the gargoyles, or down spouts, of the cathedral's water drainage system. The roofers are responsible for making sheet lead and installing it on the cathedral's roof and spire. The glassmakers are responsible for making colored glass and fashioning it into windows; they also assist in installing the windows into the cathedral. All of these crafts are very specialized and employ fewer men than most of the other crafts involved in the construction. They are also all hired at a later stage of the construction because their skills are not needed throughout the life of the project. Sculptors at work can be seen in the illustration on page 67; the finished lead roof of the choir and transept is easily visible in the illustration on pages 58 and 59; and glassmakers are illustrated on page 61 and window installation is illustrated on page 62.

Saint Germain

Saint Germain was a knight who fought in the crusades. His partial remains—a skull and a forefinger—were sent back to Chutreaux from the Holy Land and are the basis of both the old and new cathedral's holy relics. During the pause in construction from 1306 to 1311, the remains of Saint Germain are put on display in Chutreaux to raise funds for the completion of the cathedral construction.

Objects/Places

Romanesque Crypt

The old Chutreaux cathedral sat over an ancient Romanesque crypt wherein various bishops and other important people were interred. During the new cathedral planning it was decided that the Romanesque crypt should be retained. The crypt remains undisturbed during construction, which does lead to some complications—for example, see the foundation excavation illustration on page 21. The Bishop of Chutreaux dies in 1281 and is interred in the Romanesque crypt.

The Floor Plan and the Wall Elevation

William of Planz presents his cathedral design to the Bishop of Chutreaux and the Chapter on two large sheets of plaster with drawings. The first drawing shows the basic floor plan, and is illustrated on page 12. The second drawing shows a typical wall elevation section, and is illustrated on page 13. The plans are approved without substantive change and the finished cathedral follows the plans closely. For example, compare the floor plan to the cathedral illustration on pages 74 through 75, and the wall elevation to the tracery being constructed on page 29.

Template

A template is a piece of wood cut into the shape of a desired stone or piece of glass. The template is then used to cut the stone or piece of glass to the correct shape and size for installation into the cathedral. The architect designs the template, a carpenter creates the template from the design, and either a mason or a glassmaker uses the template to product the finished stone or glass component. A template is illustrated on page 10, and templates can be seen being used in the illustrations on pages 29 and 60.

Workshops and Forges

Through the construction phases workshops are built and dismantled at various work sites. Some workshops are intended to house the various craftsmen, especially during the winter months of cold temperature. Other workshops are built off-site to organize various work activities—for example, the workshops illustrated on pages 14 and 16. Forges are built inside some workshops; forges are more costly than typical workshops as they must include chimneys, bellows, a hearth, and many other specialized tools. A typical forge is illustrated on page 20.



Scaffolding and Hurdles

Once the cathedral structure exceeds a few feet in height, scaffolding is required to allow the craftsmen to reach the working course. The scaffolding used is constructed by the carpenters and runs the length of the wall under construction. Because the cathedral is so high, scaffolding cannot stand from the ground up. Instead, during the latter phases of construction the scaffolding hangs from the top of the wall and is reached by using spiral stone staircases built into the cathedral. Working and walking surfaces, called hurdles, are placed along the scaffolding to support the craftsmen and their tools. Note that working on the scaffolding is not entirely safe, as illustrated by Robert of Cormont falling from the scaffolding to his death in 1329. Various types of scaffolding are seen throughout many illustrations in the book—a good example is found on page 33.

The Great Wheel

The Great Wheel was a lifting device appearing essentially like a man-sized wheel. It is operated by one or two men who walk around the inside of the wheel—something like a gigantic modern cage wheel for guinea pigs. The axle of the wheel is attached to a lifting rope, and as the men walk so the axle turns and winds up the rope, lifting very heavy loads from the floor. The construction of the great wheel is illustrated on page 48 and its use is illustrated on page 56.

Buttresses and Flying Buttresses

The cathedral piers were very thin for their height, allowing more space for window glass but reducing their strength—and thus they needed additional support. Buttresses are vertical towers that rise outside the external wall of the cathedral and render needed support to the piers and walls. The buttresses were connected to the piers by an arched span of stone called a flying buttress. The flying buttresses were also used as channels for water runoff, and most buttresses featured one or more gargoyles at the down spouts. Buttresses and flying buttresses are visible in many of the illustrations in the book—a good example is found on pages 64 and 65.

Gargoyles

Gargoyles are carved stone statues of various monsters. The statues are hollow and used as water down spouts on the cathedral drainage system. When it rains, the water is channeled off the roof and into the down spouts making the gargoyles appear to be spitting a stream of water toward the ground. Gargoyles, common in Gothic architecture, are visible in many of the illustrations in the book. A detailed drawing is found on page 43.



Bells and the Bell Tower

The cathedral has four bells hung in a single tower. The tower is reinforced with lumber to bear the weight of the bells. The bells are connected to a long rope that descends to the floor; when the rope is pulled the bells swing back and forth and ring. The cathedral bells can be heard for many miles and are rung in various ways for various celebrations. The process of casting the bells is detailed in the illustrations on page 66; a cutaway diagram showing the bells being operated is on page 72.

Rose Window

A rose window is a huge circular window set high on the cathedral wall as a central ornamentation. The Chutreaux cathedral's main rose window is thirty-two feet in diameter. The rose windows are composed of many thousands of pieces of colored glass. The main rose window's construction is illustrated on page 73 (note the scale of the craftsmen); the main rose window and a rose window on the transept are visible on pages 74 and 75.



Setting

The story begins in 1252 in Chutreaux, a fictional French city, and ends eighty-six years later, upon completion of the cathedral. It is the era of the late Crusades, a time of relative peace and prosperity in France, and civic and religious leaders are cosmopolitan enough to know what is going on throughout Europe and beyond. The Flemish architect and master builder hired for the Chutreaux cathedral has built cathedrals in England and Germany as well as France.

This is a time when structures of soaring imagination and sophisticated design are put together with relatively simple tools and chiefly with the labor of many hands. As the narrative progresses, one of the most magnificent buildings in the world rises in the midst
Illustration by David Macaulay for *Cathedral* by D. Macaulay. Houghton Mifflin: Boston (1973).

of thatched-roof cottages crowded within the walls of this typical medieval city.

Social Sensitivity

It would be difficult to describe the building of a cathedral without reference to Christianity, but Macaulay does not focus on the religious motivation of the people of Chutreaux. He balances the idealism of building to glorify God with the universal and more human desire "to build the longest, widest, highest, and most beautiful cathedral" in the country. The text introduces the bishop and the clergymen in charge of the construction, but the book sticks to the business of building thereafter. The references to medieval religious beliefs are presented matter-of-factly and nonjudgmentally. For example, when the chapter runs out of money and decides to raise some by displaying "the remains of Saint Germain," Macaulay simply states, "The people of northern France and southern England would gladly pay to see such relics." Macaulay neither belittles nor ignores the religious inspiration, though his book concentrates on the social and artistic effects of such inspiration.

Literary Qualities

In building a cathedral, medieval society constructed a symbolic narrative of its religious history, telling the story of Christian salvation through its walls, portals, and stained glass windows. In writing *Cathedral*, Macaulay constructs his own historical narrative, objectively chronicling the architectural and artistic achievement of a fictitious medieval community. Through simple prose and detailed drawings he reveals the goals and motivations of this community. He shows, for example, that those who first undertake the project of building the cathedral realize they will not live to see its completion. But because they believe that their work is a sacrificial act—glorifying God and earning them access to heaven—they willingly participate.

For young adult readers, then, the value of the literary techniques used in *Cathedral* lies in the book's straightforward narration and fascinating illustrations, which provide a glimpse into the complex social structure and philosophy of the Middle Ages.



Themes

How They Build It

The main theme of the book addresses the methodology utilized to construct the Chutreaux cathedral. The processes of determining to build, designing the structure, and performing the work are all considered. The types of craftsmen that perform each type of work are presented and considered. The key individuals in the process are identified, often by name, and their specialized tasks are considered. Many of the individual steps required are discussed in some detail. Construction designs and techniques are discussed. Even the construction materials used for various building components are noted and discussed. Nearly every drawing in the profusely illustrated book supports this theme as well—the drawings either show craftsmen performing a specialized task with specialized tools, diagrammatically present how specific tasks are accomplished, or illustrate the finished result of a specified process. Perhaps the best example of this is presented on page 61, where craftsmen are shown performing all of the basic steps of making colored glass and cutting the glass into panes; page 62, where craftsmen are installing the panes into the cathedral; and pages 64 and 65, showing the installed windows in the partially-completed structure. Another good example is found in the illustrations showing how the bronze bells are created, on page 66—this sample has supplementary text describing the process in a step-by-step fashion. The primary theme of the book is therefore a presentation of "how they did it" during the construction of the cathedral at Chutreaux.

The Single Goal

The preface of the book states of the new cathedral that "its almost uninterrupted construction...represents a somewhat ideal situation" (p. 4). The construction of the new cathedral takes about eight-six years and suffers only a single interruption, from 1306 to 1311. This interruption comes about because of a lack of funding. The situation is ideal especially in comparison to similar, but historic, cathedrals constructed during this time period that often took two or three times as long to complete, and had schedules filled with work stoppages arising from a variety of causes. The timely completion of the cathedral is due to the single-minded dedication of the populace and clergy of Chutreaux. Over any such lengthy period could easily see notable changes in public opinion or official focus, and such a shift would have meant a length—perhaps permanent—hiatus from construction. Yet the people and clergy of Chutreaux remained focused on the vision of the Bishop of Chutreaux who first suggested the old, lightning-damaged cathedral be replaced by a larger, beautiful cathedral: the largest and most-beautiful cathedral in France. The theme is illustrated by the fact that the vast majority of the masters, craftsmen, and apprentices were drawn from the local populace; the fact that nearly all materials were locally procured; and the fact that the single interruption was dealt with by a concerted fundraising activity. The theme is additionally supported by the fact that many townsfolk gave up their houses for the new cathedral's grounds,



and that they held a huge celebration when the cathedral was completed. The single goal of the combined people of Chutreaux shows what can be accomplished in unity, and forms a major theme of the book.

Craftsmanship

The art of craftsmanship is a major theme in the book. Nine separate crafts are enumerated, including quarrying, stonecutting, sculpting, mortar making, masonry, carpentry, blacksmithing, roofing, and glass making. The guild structure of the trades is hinted at—a master craftsman employs journeymen and apprentices, while common laborers are used only for manual labor. The various tradesmen do not cross craft; the entire project is guided by a master builder. The exacting methods used in construction are discussed and illustrated, and the very tedious but painstaking processes are presented in an open and accessible way. For example, vaulted ceilings are not merely built. Instead, they are designed, then scaffolding and supports are positioned, then the ribs are constructed from vassoirs, then the webbing is built upon lagging. Once the entire bay is completed the mortar dries and a cap of concrete is put into place; then the supports are removed and the ceiling is painted. Note particularly how the painters repaint the stone seams a different color so they stand out as perfectly aligned. The construction of the vaulted ceiling is illustrated on pages 54 and 55; the application of the concrete cap is illustrated on page 56; the plastering and painting of the ceiling is discussed on page 63. This is but one example of many aspects of fine craftsmanship that are considered in the book. The excellent craftsmanship is demonstrated by the fact that the cathedral progresses through eight-six years of construction without a single failure in materials or workmanship being noted. Craftsmanship forms a major theme throughout the book.



Themes/Characters

Young adults often read biographies or fictional stories that emphasize outstanding individual achievement. The Gothic cathedrals stand as the supreme reminders that people accomplish great things not only individually, but collectively, cooperatively, and cumulatively through history.

The story's one "protagonist" is the building itself, a triumph of collective will and endeavor. The few other characters, such as the bishop and the three master builders, are mentioned only in the context of their contributions to the cathedral's construction. While the obstacles to completion of the cathedral are never large enough to introduce drama or suspense, the book tells a powerful story through the gradual and steady filling of that initially empty space in the illustrations.



Style

Perspective

The non-fiction book is written from the perspective of some decades or even centuries after the events described. It is presented in a typical journalistic third-person point of view, and the entire book is notably devoid of fictive elements such as characterization or plot—a few individuals are noted by name, though they are not supplied with much biographical data; there is no plotting beyond the construction of the cathedral and the events surrounding it. Instead, the book is tightly and successfully focused on the construction of a single fictional cathedral that is representative of a class of buildings constructed during a given historic period. The book presents the processes and techniques used during the construction in an accurate and understandable way. The book presents a strong mix of text and illustrations that are easy to interpret—both text and pictures focus on similar topics on a given page and make the book very easy to read and understand; when text can provide the best description, text is used but when a picture does the job better, an illustration is provided. The book is free of sentiment and instead briefly establishes why cathedrals were built and then extensively considers how they were built. The book is aimed at an audience that is unfamiliar with ancient craftsmanship and techniques, and can be successfully understood by any high-school level reader. Some specialized words are used, but they are always defined within the text. Furthermore, there is a glossary at the end of the book.

Tone

The book is presented in an easily accessible tone and format. While the text is typically cataloged as juvenile non-fiction, it covers construction processes presented in a simple but accurate way, and the book is suitable for readers of a wide range of age. Processes, methods, and events are presented in an unemotional and professional manner which allows a great deal of confidence to be placed in the narrative structure. The narrative contains a large amount of information which is aided by numerous excellent illustrations. The book is written to illustrate a process rather than make judgments; thus, the cathedral is built to honor God and the book thereafter focuses on the manner in which the cathedral is constructed. The author is aware of the history of the time period but does not overly focus on it—for example, some of the laborers are said to be returning from the crusades, but the crusades are not directly discussed. The successful tone allows the material to be presented with maximum clarity and aids materially in accessing the book.

Structure

The 80-page book includes front-matter including an explanatory preface, a single large section detailing the construction of the cathedral, and a one-page glossary defining

thirty specific terms used in the body of the text. The book includes at least eight-six line drawings or schematics intended to display the cathedral during various phases of completion as well as technically illustrating the processes of construction. The text and the line drawings are closely associated on each page so that nearly every phase of construction and nearly every construction technique discussed are illustrated. Many of the illustrations are two-page spreads showing the cathedral and the surrounding city of Chutreaux. The line drawings are consistently good and clear, and they aid materially in understanding the complicated materials and construction techniques discussed in the text. The large-format pages and black-and-white drawings are especially suitable for the type of information portrayed.

The cathedral's construction proceeds chronologically, from the inception through the design and then actual construction. The decision to build the cathedral occurs in early 1252; site preparation begins May 1252; the foundation cornerstone is laid April, 1253; and construction completes August, 1338, construction lasting eighty-six years. The book focuses on the inception and elaboration phases, paying particular attention to the types of working skills required and several of the construction techniques used to build cathedrals. The text uses some specialized vocabulary referring to the trades and objects utilized during cathedral construction.



Quotes

The cathedral of Chutreaux is imaginary, but the methods of its construction correspond closely to the actual construction of a Gothic cathedral. The story of its almost uninterrupted construction, however, represents a somewhat ideal situation. For owing to either financial or structural problems or both, the completion of many such undertakings was delayed for as long as two hundred years. (p. 4)

In the thirteen century God was good to the people of France and especially to the people of Chutreaux. They had no wars to fight and the plague was gone. The weather was good for the farmers so there was plenty of food to eat, and business was good for the city's merchants. For these blessings and to help insure that He would continue to favor them, the city of Chutreaux wished to thank God. The people began to dream of building Him a new cathedral. (p. 5)

Each workshop required specific tools. All the metal tools were made by a blacksmith, and the wooden pieces were made by skilled woodworkers. The two main workshops and those than required the most tools, were the stone cutters' workshop and the carpenters' woodshop. (p. 11)

A workshop was built for the stone cutters along with a forge, where the blacksmith could make new tools to replace the old ones as they wore out. Laborers helped the stone cutters lift large pieces of stone out of the quarry. Then the stone was cut, chiseled, and hammered by the stone cutters so it would match the patterns or templates supplied by the master mason. Each stone was marked three times, once to show its future location in the cathedral, once to show which quarry it was from—so that the quarry man would be paid for every stone he extracted—and once to show which stone cutter had actually cut the stone, so that he would be paid as well. (p. 17)

For the construction of the roof, large pieces of wood, some sixty feet long, had to be ordered from Scandinavia. Soon the wood and stone, which had been floated down the river from the quarry, began to arrive at the city's port. They were hoisted out of the boats with derricks and windlasses built by the carpenters and put into waiting carts that carried them through the town to the site. (p. 22)

For the small areas of solid wall the stone mason would actually construct two parallel walls of cut stone. Then, using a piece of wood or chain as reinforcement, he would fill the space between them with concrete, a mixture of mortar and small stones. It would have been too expensive to build walls of solid stone. (p. 29)

In November, as in every previous winter, the finished stonework was covered with straw and dung to prevent the frost from cracking the mortar before it had completely dried. Most of the masons went home for the winter because mortar work cannot be done in cold weather. Other work continued, however, for temporary workshops were built against the finished walls of the choir to house the stone cutters, who could no



longer work outside. There they cut stones and tracery, carved capitals and sculptures in preparation for the return of the masons in the spring. (p. 37)

Meanwhile, on the ground, the roofers were casting lead sheets that would cover the wooden frame, protecting it and the vaults from bad weather. They also cast the drain pipes and gutters. The stone cutters and sculptors carved the stone gutters and down spouts that were to be installed in the buttresses. These down spouts, through which the water from the roof fell to the ground, were carved to look like frightening creatures. They were called gargoyles and, when it rained, they would appear to be spitting water onto the ground below. (p. 43)

Two devices were used to lift the stones and concrete to the roof for the construction of the vaults. The first was the windlass and the second was the great wheel. The windlass, which had helped lift the timbers of the roof, was already in place and was used to raise the great wheel. The wheel was large enough so that one or two men could stand inside. Through its center ran a long axle to which the hoisting rope was fastened. As the men walked forward both the wheel and the axle turned, winding up the rope. This method enabled them to lift very heavy loads. (p. 48)

One by one the cut stones of the ribs, called voussoirs, were hoisted onto the centering and mortared into place by the masons. Finally the keystone was lowered into place to lock the ribs together at the crown, the highest point of the arch.

The carpenters then installed pieces of wood, called lagging, that spanned the space between two centering. On top of the lagging the masons laid one course or layer of webbing stones. The lagging supported the course of webbing until the mortar was dry. The webbing was constructed of the lightest possible stone to lessen the weight on the ribs. Two teams, each with a mason and a carpenter, worked simultaneously from both sides of a vault—installing first the lagging and then the webbing. When they met in the center the vault was complete. The vaulting over the aisle was constructed in the same way and at the same time. (pp. 54-55)

The glass was cut into a square shape with a grozing iron, a steel rod with a sharp point at one end, to the right shape and size for the window. The pattern for the window had been drawn on a whitewashed bench so that the glass could be cut to the exact size and shape simply by laying it over the pattern.

After several pieces of glass had been cut, they were joined by strips of lead. Single pieces of glass were usually no larger than eight inches by eight inches, but sections as large as thirty inches square could be made when held together by the lead. These sections were inserted between stone mullions and the reinforcing bars to create windows as high as sixty feet. (p. 60)

At the foundry in Chutreaux four large bells were cast in bronze. A model of the bell, as if it were solid, was first made of clay and plaster of Paris. It was covered then with a coat of wax of the same thickness that the finished bell was to be, and the required decoration on the outside of the bell was carved on the wax. This was then covered by



a layer of clay and plaster compound.

When the whole construction was heated the wax melted and ran out, leaving a cavity between the outer shell and the core. This was the mold into which molten bronze was poured. When the metal cooled the mold was destroyed and the bell was prepared for shipment to the building. (p. 66)

A heavy timber framework was constructed in the north tower. From it the bells were carefully hoisted and fastened into place. Four ropes hung down from the bells. When they were pulled the bells would rock back and forth, causing the hammers inside to hit the sides of the bells. The ringing could be heard for miles.

The masons put together the pieces of the rose window and installed the tympanums and voussoirs over the doors. Then the window makers came and filled the rose window's thirty-two-foot diameter with hundreds of pieces of colored glass. (pp. 72-73)

Huge colored banners had been hung from the triforium and all the candles on the piers were lit. As the choir began to sing, the building filled with beautiful sounds and the people, most of them grandchildren of the men who had laid the foundation, were filled with tremendous awe and a great joy.

For eight-six years the townspeople had shared one goal and it had at last been reached.

The people of Chutreaux had constructed the longest, widest, highest, and most beautiful cathedral in all of France. (pp. 77-78)

Topics for Discussion

In the planning phase, the Bishop of Chutreaux proposes the cathedral but a group of clergymen known as the Chapter must approve the funding for the project. Why is it generally a good idea to separate the responsibility for planning projects and the responsibility for funding projects into separate political organizations? In your country, what government organization generally plans projects? What government organization generally funds projects? Does this seem like a good arrangement? Why or why not?

After William of Planz retires Robert of Cormont takes over as the master builder. Robert does not alter William's plans and instead he focuses on constructing the cathedral. After Robert dies Etienne of Gaston takes over as the master builder. Etienne completes the cathedral according to William's plans. How does the common vision of the master builder's contribute to the successful completion of the cathedral?

The new cathedral retains only a single component of the old cathedral—a Romanesque vault. Why do you think The Bishop of Chutreaux would chose to retain an old vault instead of building a new vault? Discuss.

Nearly every person depicted in the book is male; this is especially true of the various illustrations showing craftsmen at work. Is the book sexist? Or does the book simply attempt to accurately portray a certain period of time in a certain culture? Discuss.

Which tradesmen did you find most interesting: quarrymen, stonecutters, sculptors, mortar makers, masons, carpenters, blacksmiths, roofers, or glass makers? Why? Have you ever had experience doing any of the types of craftsmanship discussed in the book?

Have you ever visited a Gothic cathedral? Did the building's basic design assist you to feel closer to God? Why or why not? Discuss.

The book indicates the people of Chutreaux built the cathedral "to thank God" (p 5). How does a cathedral demonstrate a people's dedication to God and religion? Do you think that God viewed Chutreaux's actions as a worthy sacrifice? Why or why not?

Would you rather be a clergyman, a master builder, a master craftsman, an apprentice, or a laborer? Why?

In your opinion, who contributed the most to the successful construction of the Chutreaux cathedral: the Bishop of Chutreaux, Roland of Clermont, the clergymen of the Chapter, William of Planz, Robert of Cormont, Etienne of Gaston, the common people of Chutreaux, or someone else? Discuss your opinion.



Essay Topics

1. Why would the people of Chutreaux begin a project that none of them would live to see finished? Can you understand and explain their motivation?

2. Consider the tools that were used in building the cathedral. What machines were used, and how did these increase the power that the workers could exert?

How would the same tasks be done today?

3. Can you think of any modern building projects that require the widespread cooperation and dedication in a community that a cathedral did in the past?

Do you know of any projects where you live that have stirred up widespread enthusiasm?

4. Gothic cathedrals were the first buildings to use enormous amounts of glass in the walls. What architectural advances made this possible?

5. What have you learned about the structure of society in the Middle Ages?

In what ways was it like contemporary European society? In what ways was it different?

6. If the windows of your classroom were to have stained-glass pictures to last for all time, what do you think should be shown in the pictures? How do you think such a decision should be made?



Ideas for Reports and Papers

1. Visit a large church in or near your hometown. How many features of a Gothic cathedral can you find and identify? Use the glossary on the final page of Cathedral and the drawings on pages 12 and 13 as guides.
2. Choose a real Gothic cathedral and write a research paper about it. Examine its history and its special architectural features.
3. Write a report or research paper on one of the crafts mentioned on page 9 of Cathedral. See the books by Gimpel, James, and Murray listed in the next section.
4. Macaulay suggests a religious significance for the maze pattern in the floor. Many other features of religious architecture are given such significance also. Write a paper on architectural symbolism. See Georges Duby's book listed in the next section.
5. A medieval cathedral was much larger than it needed to be for ordinary worship services. For what other purposes was all that space used? What would a typical day in the life of the finished cathedral be like?



Further Study

Branner, Robert. Gothic Architecture.

Great Ages of World Architecture Series. New York: George Braziller, 1961. A good basic reference for students. Well illustrated.

Burger, Nash K. "Cathedral" New York Times Book Review (December 16, 1973): 10. This is the best of the short reviews that followed publication of the book.

Duby, Georges. The Europe of the Cathedrals, 1140-1280. Geneva: Skira, 1966. The particular value of this book lies in the way it connects architectural features with theological ideas. It also has the loveliest color photographs of any books listed here.

Gimpel, Jean. The Cathedral Builders.

New York: Grove Press, 1983. Relatively accessible to younger readers, this book is helpful for student reports on the different types of workers employed in building a cathedral.

Harvey, John. The Gothic World, 1100-1600. London: Batsford, 1950. This book provides social background for the Gothic era.

Horizon Magazine. Master Builders of the Middle Ages. New York: Harper, 1968.

An excellent resource for high school students, this book focuses on European cathedrals, describing Chartres in particularly rich detail.

James, John. The Contractors of Chartres. 2 vols. Wyong, Australia: Mandorla, 1981. James has paralleled Macaulay's purpose almost precisely but in much greater detail.

Jantzen, Hans. High Gothic: The Classic Cathedrals of Chartres, Reims, Amiens. Translated by James Palmes.

London: Constable, 1962. This would be an excellent source for an advanced student conducting extensive research. It is illustrated with both photographs and cross-section drawings and carefully explains methods of construction.

Murray, Stephen. Building Troyes Cathedral. Bloomington: Indiana University Press, 1987. Similar to James's work.

Wilson, Forrest. Architecture: A Book of Projects for Young Adults. New York: Van Nostrand-Reinhold, 1968. Thirtythree hands-on projects for junior high students that illustrate structural principles.



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