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HISTORY OF ARCHITECTURE

The contribution of Greece: 7th - 5th century BC

No place or period has been so influential in the history of architecture as Greece in the 7th to 5th centuries BC. Here there emerge the various elements of the classical style which will recur at many periods of later history - delicately fluted columns, with shaped tops or 'capitals', supporting horizontal lintels (usually made up of two layers, architrave below and frieze above), and at the front of the building a triangular pediment, often decorated with sculpture, to conceal the shallow pointed roof behind.

Parts of this package go back hundreds of years (ultimately to the temples of Egypt), but the delicacy and balance is the achievement of the Greeks.

The pillar and capital are familiar in Greece from prehistoric times. They feature together, for example, in the sculpture above the Lion Gate at Mycenae, from the 13th century BC.

As late as the mid-7th century the pillars in Greek temples are still invariably of wood. But their capitals already divide into the distinct patterns which will become known as Doric and Ionic, the central pair in the classical 'orders' of architecture. Doric, the style of mainland Greece, follows the design featured on the Lion Gate at Mycenae. Ionic, developing in the Greek colonies of Asia Minor, is more influenced by eastern traditions.

The gradual substitution of stone columns for wooden ones begins in about 620 BC. This applies both to newly built temples and to the replacement of decayed wooden columns in existing buildings. The temple to Hera at Olympia becomes famous for its long process of change; one of the original oak columns is seen still in place, in an otherwise stone building, by a visitor in the 2nd century AD.

The architects of the earliest stone temples insure against collapse by using massively thick columns set rather close together. It is not until late in the 6th century that the defining elegance of the Greek temple begins to emerge.

Greek architecture in the colonies: 6th - 5th century BC

Many of the most impressive buildings from this early period are outside the Greek mainland. Between about 530 and 460 the people of Paestum, a Greek colony in southern Italy, build three great temples. All three survive, providing a powerful image of the sturdy confidence already achieved in the Doric style.

The famous optical tricks of Greek architecture are already in use: the gradual swelling of a column from top and bottom to its central point to avoid its seeming wasp-waisted (technically called entasis) and a similar gentle rise in floor level to the centre of the supporting platform, so that the row of columns does not appear to sag.

The last of the temples of Paestum, dating from about 460 BC, coincides with the greatest period of Greek architecture. In the mid-5th century the Greeks in Sicily build magnificent temples at Segesta, Selinus (now Selinunte), Agrigentum and Syracuse. At Syracuse the shrine to Athena is now the city's cathedral.

But the summit of Greek architectural achievement comes at this time with the rebuilding of Athens.

The Parthenon: 447-438 BC

The destruction of Athens by the Persians in 480 BC has reduced the acropolis to a pile of debris. The

Athenians rapidly build new retaining walls and fill the gaps with the rubble (later providing archaeologists with a rich haul of broken ornament and statuary). But reconstruction of the buildings on the summit, and in particular of the great temple to Pallas Athene (known as the Parthenon because the goddess is *parthenos*, a virgin), is delayed until a brief interval of peace in the middle of the century.

The Parthenon is to be of great size and dignity (it will house a vast new statue of Athena by the sculptor Phidias). The architect chosen for this important task is Ictinos. The building takes only nine years (447-438).

Ictinos brings together differing strands to create the outstanding achievement of the Greek style. The basic design of the Parthenon is Doric, the style of Athens and the rest of the Greek mainland. But Doric temples are severe, with little ornament. Ictinos borrows from the Ionic tradition two elements which suit his purpose.

Inside the building he uses Ionic columns. Thinner than the Doric version, they are less obtrusive; they later become normal for the interiors of Doric temples. More dramatically, Ictinos adopts the Ionic theme of exterior decoration. He enlivens his frieze and pediment with the sculptures which in themselves are another pinnacle of Greek achievement.

The Greek theatre: 4th century BC

An exclusively Greek contribution to architectural history is the raked auditorium for watching theatrical performances (appropriately, since the Greeks are also the inventors of theatre as a literary form).

The masterpieces of Greek drama date from the 5th century BC. At that time, in Athens, the audience sit on the bare hillside to watch performances on a temporary wooden stage. In the 4th century a stone auditorium is built on the site, and there is still a theatre there today - the theatre of Dionysus. However this is a Roman reconstruction from the time of Nero. By then the shape of the stage is a semi-circle.

In the first Greek theatres the stage is a full circle, in keeping with the circular dance - the *choros* - from which the theatrical performance has evolved. This stage is called the orchestra (*orchester*, a dancer), because it is the place where the chorus sing and dance.

Epidaurus, built in about 340 BC, provides the best example of a classical Greek theatre. In the centre of the orchestra is the stone base on which an altar stood, reflecting the religious aspect of theatre in Greece. The rising tiers of seats, separated by aisles, provide the pattern for the closest part of the auditorium to the stage in nearly all subsequent theatres - where these seats are still sometimes called the orchestra stalls.

The Chinese architectural tradition: from the 1st century BC

No architecture survives in China from the early dynasties (with the spectacular exception of the Great Wall) because the Chinese have always built in wood, which decays. On the other hand, wood is easily repaired.

When timbers of a wooden structure are replaced and repainted, the building is as good as new - or as good as old. The conservative tendency in Chinese culture means that styles, even in entirely new buildings, seem to have changed little in the 2000 years since the Han dynasty.

Documents of the time suggest that Han imperial architecture is already of a kind familiar today in Beijing's Forbidden City, the vast palace built in the 15th century for the Ming emperors. Carved and painted wooden columns and beams support roofs with elaborate ornamented eaves.

The painting of buildings provides ample opportunity for the Chinese love of rank and hierarchy. The *Li Chi*, a Confucian book of ritual compiled in the Han dynasty, declares that the pillars of the emperor's buildings are red, those of princes are black, those of high officials blue-green, and those of other members of the gentry yellow.

Minor improvements are introduced with the advance of technology. The colourful ceramic roof tiles of Chinese pavilions are an innovation in the Song dynasty in the 11th century. But in broad terms the civic buildings of China retain their appearance through the ages.

A good example is the magnificent Temple of Heaven in Beijing. Its colours, frequently restored, are so fresh that the building looks new. But the structure dates from the early 15th century, in the Ming dynasty, and its appearance on its marble platform is almost identical to Marco Polo's description of its predecessor in the 13th century.

Cement: c.200 BC

Builders in Greek cities on the coast of Turkey (and in particular Pergamum) evolve cement in about 200 BC as a structural material, in place of weaker mortars such as gypsum plaster (used in Egypt) or bitumen (in Mesopotamia). The secret of the new material is the lime which binds sand, water and clay.

The Romans subsequently use finely ground volcanic lava in place of clay, deriving it mainly from the region of Pozzuoli. Their cement, known for this reason as pozzolanic, is the strongest mortar in history until the development of Portland cement. When small fragments of volcanic rubble are included, the result is concrete - making possible the great arches and aqueducts of Roman architecture, and playing its part in Roman roads.

Vitruvius: late 1st century BC

A Roman architect sets out the principles of his craft in ten volumes. He deals with all aspects, from general principles to materials, and from the orders of architecture to stucco work, painting, aqueducts and machinery. Written well before the greatest achievements of the Roman builders, this treatise is the most influential text in the entire history of architecture.

The architect is Vitruvius and the book *De architectura* ('On architecture'). Its precepts subsequently guide the classical revival in the Renaissance. Since then the proportions and theories of Greek and Roman architecture - as enshrined by Vitruvius - have remained the basis of architectural tradition.

Arch, vault and dome: from the 1st century BC

The greatest achievement of Roman architecture and technology lies in the development of these three architectural forms. The dome has long been a familiar concept (appearing dramatically in the passage grave on the Île Longue or in the *tholos* at Mycenae), but nothing has been made of it in the major architectural traditions. The spectacular temples of Egypt or Greece are exclusively trabeate, using flat horizontal lintels to span open spaces.

The arch has far greater capabilities than the lintel, for it can combine many smaller units (of stone or brick) to make a greater whole. In Greek architecture a single vast stone lintel can reach between columns at most 7 yards apart. A Roman brick arch can span 50 yards.

The arch, the vault and the dome are all applications of the same concept. The vault, or open-ended tunnel, is only an exceptionally deep arch. The dome is in effect a collection of arches all sharing the same centre. In each case the pressure of gravity on the material forming the arch will hold it together as long as the outward thrust is contained by buttresses.

The Roman achievement in all these forms is greatly assisted by their development of concrete. An arch or dome bonded into solid form by a strong inner layer of concrete sits as one unit, exerting its weight downwards rather than outwards. This makes possible such miracles as the 1st-century Pont du Gard or the 2nd-century dome of the Pantheon.

The Pont du Gard: AD c.20

The scale of Roman architectural ambition is superbly seen in the great aqueduct at Nîmes, known as the Pont du Gard ('bridge of the Gard'). Constructed in about AD 20, this gigantic structure is purely practical. It is a section of a channel bringing water from the river Eure to the new Roman town of Nîmes.

The water flows gently downhill for a distance of almost 50 km. The Pont du Gard, with its three towering tiers of arches, carries it over the deep valley of the river Gard - in itself a source of water nearer to Nîmes, but too low-lying to reach the town by gravity.

Roman bridges: 1st - 2nd century AD

Bridges are as much part of the Roman architectural achievement as aqueducts, and they present even greater constructional problems.

Some of the most impressive Roman bridges are over ravines. A fine surviving example, built for Trajan in AD 105, spans the Tagus in Spain, at Alcántara. Its two massive central arches, 110 feet wide and 210 feet above the normal level of the river, are made of uncemented granite. Each wedge-shaped block weighs 8 tons. During construction these blocks are winched into place by a system of pulleys, powered perhaps by slave labour on a treadmill. They are supported on a huge timber structure standing on the rocks below - to be removed when the arch is complete.

An equally remarkable feat of Roman construction is the building of bridges across rivers where no rock or island emerges from the water to carry the piers. An example survives in Rome - the Sant'Angelo bridge, built for Hadrian in AD 134 as an approach to his great circular mausoleum, now the Castel Sant'Angelo.

The building of such bridges is made possible by the Roman perfection of cement and concrete, and by their invention of the cofferdam.

The Pantheon: AD c.120

The roof of the Pantheon in Rome is the most remarkable example of the Roman genius in the most impressive of architectural forms, the span of a large dome. In an extra touch of flamboyance, the centre of this one is open to the sky - a detail which adds no great architectural complication but provides a visual thrill. The interior of the building is circular (placing round dome on square base is the next stage of sophistication).

The Pantheon, built by Hadrian in about AD 120 (demolishing an earlier *pantheon*, or temple to all the gods, on the site), has been in continuous use as a place of worship for nearly 2000 years. For most of that time it has been a Christian church, dedicated in 609 as Santa Maria Rotunda.

Basilicas, secular and sacred: 2nd c. BC - 4th c. AD

The Roman public hall, known as a basilica, is a rectangular building with side aisles behind the rows of columns which support the main walls. The focus of attention is at the end opposite the entrance, where a raised platform is sometimes set within an alcove or apse. A building of this kind is known from Pompeii in the 2nd century BC.

When Constantine establishes Christian churches as public buildings, in the 4th century AD, the basilica is the natural form for any such place of gathering; and the apse is ready made for the altar. The three great churches founded by Constantine in Rome are all basilicas.

Two of Constantine's churches in Rome, the basilicas of St Peter's and that of St Paul's, also have a new architectural feature - the transept, crossing the nave near the altar end and providing more space for pilgrims or clergy. Whether by accident or design, this addition turns the ground plan of such a church into a cross. Nave, aisles, transept and apse, with a flat or vaulted ceiling, become the basic ingredients of rectangular western churches.

From the 6th century onwards Eastern Christianity develops a different tradition - that of domed churches, as seen most spectacularly in one of the earliest and largest, Justinian's Santa Sophia.

Santa Sophia: AD 537

In Santa Sophia in Constantinople (completed astonishingly in only five years) the architects working for Justinian achieve with triumphant skill a new and difficult feat of technology - that of placing a vast circular dome on top of a square formed of four arches.

The link between the curves of two arches (diverging from a shared supporting pillar) and the curve round the base of the dome is made by a complex triangular shape known as a pendentive. Santa Sophia (or Hagia Sophia, the two being Latin and Greek for 'Holy Wisdom'), is not the first building in which a pendentive is used. But it is by far the most impressive.

Influence of Justinian's church

Following the example of Santa Sophia, it becomes the tradition for even the smallest Greek Orthodox churches to have a dome over the central space of the interior. In what becomes the conventional design, the dome sits at the centre of a Greek cross (one with four equal arms) formed by the nave and transept.

The walls supporting the dome are buttressed at ground level by side chapels, each with a domed or partially domed roof. The result is the non-linear, gentle and almost organic-seeming exterior of a typical Byzantine church.

In the interior of such a church, when funds are available, the dome is used for a rich display of mosaics. The favourite subject is Christ in Majesty (or in his Greek name Pantocrator, 'Ruler of All'), a vast figure seeming to bless the assembled congregation - though in an undeniably stern mood, with judgement in mind. A fine example is in the 11th-century monastery church at Daphni.

The relatively shallow dome of such a church, surrounded by a cluster of smaller curving roofs, prevents the dome itself from being a striking feature when seen from outside. That other very rich tradition, of the flamboyant dome, is pioneered instead in Muslim architecture.

Medieval castles: 9th - 13th century AD

In feudal Europe, where armed men are granted rights over often hostile territories, the castle becomes an important feature of the countryside. Such castles are often surprisingly flimsy affairs. It comes as a shock to read that William I, in his invasion of England in 1066, lands at Pevensey on September 28 and builds himself a castle before fighting the battle at Hastings on October 14.

It is of the mound-and-bailey variety, also called motte-and-bailey (from the Norman French *motte* for a mound). This is a design developed by the Franks in the 9th century and adopted by the Normans.

The construction of a mound-and-bailey castle is a simple matter of hard and rapid labour. A circular ditch is dug (when filled with water, it becomes a moat). The earth from it is piled inwards to form a mound, preferably adding height to an existing prominence. On top of the mound a tower is built, within a palisade.

An adjacent area is surrounded by another palisade, and sometimes also by a moat. This is the bailey, or outer courtyard, in which the garrison live and keep their livestock. A bridge crosses the moat to reach the more secure mound and its tower. In the first five years of the Norman conquest of England thirty-five such castles are established, nearly all of them of wood.

Where stone and time are available, it is clearly preferable to construct a castle of the stronger and non-combustible material. During the 12th century stone walls and towers become more common in European castles, together with more sophisticated forms of bastion and battlement.

One influence is the Byzantine castle architecture seen by the crusaders on their way east. They soon create in the Holy Land magnificently impressive examples of their own - such as the great Krak des Chevaliers, largely built by the Knights of St John and occupied by them from 1142.

In Europe the castle as a fortified garrison is seen in a highly developed form in the great series built in the late 13th century for Edward I along the coast of Wales, uncompromising in their purpose of keeping the Welsh in submission.

In subsequent centuries the castle evolves into something more akin to a great man's residence, his fortified palace. This is true of the famous French castles of the Loire, built in the 15th and 16th centuries. And it is true of the magnificent castles of exactly the same period in two very different cultures, in India and Japan.

Romanesque: 9th - 12th century AD

Romanesque, a word not coined until the 18th century, is first used to describe the architecture of western Europe from about the 9th to 12th century. It has become applied by extension to other arts, in particular sculpture. But the term remains most appropriate to architecture, where the round arches of Romanesque can easily be seen as what the name implies - a continuation of the Roman tradition.

The round arch is characteristic of much in Roman building - whether in their great aqueducts and bridges, in emperors' triumphal arches, or astride classical columns (as, for example, in the churches of Ravenna).

A perfect example of this continuity is the tiny baptistery at Fréjus in the south of France. This warmly reassuring little building, with its round-topped windows and striped interior arches on top of classical pillars, has the informal charm of many a small Romanesque church of the 10th or 11th century.

But it dates from the late 5th century - a period when the Germanic tribes are already in France, but far too early for there to be any architectural influence other than Roman in this region. This apparently Romanesque gem is pure Roman.

By the time of the period properly considered Romanesque, many variations of its Roman origins have evolved. Seeking out the sources of Romanesque is a complex academic exercise. One well-established line of influence comes through Ravenna to Aachen; Justinian's 6th-century church of San Vitale inspires Charlemagne's early 9th-century chapel.

Charlemagne's chapel in Aachen, with its classical columns and round striped arches, also recalls the little baptistery at Fréjus. And both are echoed in the full flowering of the Romanesque style, as seen in the 12th-century nave at Vézelay.

Vézelay is a pilgrimage church (the monks here have on show the bones of Mary Magdalene), and many of the Romanesque churches of France are on the great pilgrimage routes which develop at this period - particularly those leading to Santiago de Compostela in northern Spain.

An innovation of architectural significance in French Romanesque relates to the pilgrims. The ambulatory, a passage behind the altar following the curve of the apse, makes possible the addition of several small chapels to contain relics. The pilgrims can progress in their devotions from one to another. The cluster of little curved roofs at the east end, seen from outside, becomes a characteristic feature of many a Romanesque church.

The vaulted stone roof: from the 11th century AD

Romanesque in the north tends to be more massive in style than the delicate arches of Vézelay. A good example is the interior of Durham cathedral - the glory of English Romanesque (often given the alternative name of Norman architecture).

The chunky pillars of Durham, many of them decorated with deeply incised patterns, support a vaulted stone roof over the nave - a significant Romanesque innovation of this period. The construction of Durham begins in 1093, a few decades before the nave of Vézelay.

The vault, like the dome, is among the technical achievements of Roman architecture, but the Romans are content to cover their large rectangular buildings (or basilicas) with wooden roofs. This remains the case with the first Christian churches, based on the Roman basilica. And it is still the case with all rectangular Romanesque churches until the last few decades of the 11th century. Before that time naves are either covered with flat wooden ceilings or are open up to the timbers of the roof.

The problem with a stone vault, spanning a large space, is that it needs to be very thick and therefore heavy. This in turn requires vast side walls and buttresses. It is no accident that cathedrals such as Durham are massive.

Durham has one feature on its vaulted roof which in the longer term points to the solution. The vaults appear to rest on crossed ribs, ranged like a row of starfish along the ceiling. It is a very early example of 'rib vaulting' - though the ribs here may be largely decorative in intent, for the vaulting remains extremely thick.

Like the cast-iron struts of the Crystal Palace, stone ribs are capable of forming an independent structure - holding up a much thinner roof of stone to keep out the weather. This concept, of a light structural skeleton, will be developed to an extraordinary degree in the next few centuries by the builders of the great Gothic cathedrals.

Capella Palatina in Palermo: 1132-1189

The small palace chapel in Palermo, with its walls covered in bright pictorial mosaic, is one of the most exquisite buildings of the Middle Ages. Known as the Capella Palatina (Latin for 'palace chapel'), it is begun in 1132 and completed in about 1189.

The mosaics are in the Greek tradition, created by craftsmen from Constantinople. Christ Pantocrator is in the apse and cupola, in traditional Byzantine style. Round the walls are sequences of scenes from the Old Testament, and from the lives of St Peter and St Paul. This is a narrative convention which will later be much used in Italian frescoes.

The roof of the Capella Palatina, by contrast, is unlike anything in a Byzantine church. In vaulted wood, carved and painted in intricate patterns, it would seem at home in a pavilion of a Muslim palace or in a

covered section of a mosque. The sturdy round arches supporting the walls are from yet another tradition - that of European Romanesque. Classical pillars, inherited from an earlier period of Sicily's rich history, complete the influences seen in this eclectic building.

It perfectly encapsulates the merits of Norman Sicily.

Gothic: 12th - 15th century AD

Gothic, descriptive now of some of the most sublime creations of the European imagination, begins as a term of abuse. It is used by theorists in the Renaissance to blame the Goths for 1000 years of non-classical architecture - from AD 410 (when Rome is sacked by the Visigoths) to 1419 (when Brunelleschi uses classical motifs on the façade of a foundling hospital in Florence). The term is applied also to sculpture of the same period, much of it found on buildings.

Art historians later recognize a major stylistic division within this long period. The early part becomes known as Romanesque. Gothic, losing any pejorative sense, is reserved for a style which emerges in the 12th century.

The Gothic style, though also used in secular buildings, is most associated with the great cathedrals of Europe. There are certain immediately recognizable characteristics in any Gothic cathedral.

The interior gives an impression of lightness and height, with slender columns framing large tall windows and reaching up to support a delicately ribbed stone roof. The exterior is encrusted with a filigree of delicate ornament, again essentially slender and vertical, made up of a blend of elegant statues, bobbly pinnacles, the skeletal patterns of the stone tracery in the windows, and the open fretwork of flying buttresses.

There is much argument about exactly where the most characteristic ingredients of Gothic first appear. A pointed arch is one of its distinguishing characteristics, as opposed to the Romanesque round arch, but this shape is not in itself a Gothic innovation - it can occasionally be found earlier in Muslim architecture. Equally rib vaulting over the nave, a feature of every Gothic church with a stone roof, is seen in the Romanesque cathedral at Durham.

Nevertheless these two features are intrinsic elements in the Gothic style. They make it possible for the building to become a lightweight skeleton of stone, into which decorative features may be inserted.

The features characteristic of a Gothic church include large windows, bringing in colour as well as light through the medium of stained glass. On the end walls of transept or nave there is now space for a particularly glorious innovation - the great circular openings known (from the petal-like arrangement of their stonework) as rose windows.

The two most striking exterior details of Gothic cathedrals are the tall recessed porches, rising to a high peak and providing ample surfaces for sculpture; and the so-called flying buttresses, in which the sideways thrust of a wall is contained by delicate filaments of stone (as if some masonic spider has been at work on the building).

The Gothic style first appears in France in the mid-12th century. It soon becomes a much wider phenomenon. All the great medieval cities of Europe have Gothic buildings, unless destroyed by war or other disaster. Nevertheless the earliest and greatest achievements are in France, during a relatively short period from the mid-12th to mid-13th century. It makes sense to describe the movement through the best French examples. (English Gothic, though known for its three distinct periods, is closely related to the French.)

The one great exception within the tradition is Italian Gothic, which needs a section of its own - for the colourful flamboyance of its churches, and the exceptional beauty of its secular buildings.

St Denis and Chartres: 12th - 13th century AD

On 11 June 1144 a distinguished company assembles in the new abbey church of St Denis, near Paris. The church has been built during the previous few years by Suger, the energetic abbot, who entered this abbey some fifty years ago as a bright 10-year-old from a poor family. He has since risen to a position of power as the confidant of the king, Louis VII.

Today Louis and his queen are in the congregation to consecrate Suger's new church. When they admire the tall pointed arches of the choir and apse, and the windows full of stained glass (including an image of the abbot himself presenting a window), they are marvelling at the birth of the Gothic style.

At this same time, in the 1140s, a famous movement begins in Chartres, the city now known for the finest of all Gothic cathedrals. Chartres has an outstanding relic - the tunic which the Virgin Mary is supposed to have been wearing at the time of the Annunciation. It inspires a sense of deep devotion in visiting pilgrims.

Construction of a new west front, to enlarge the cathedral, is under way. From about 1145 ordinary people of all classes lend a hand, dragging heavy wagons of stone from the quarry to the cathedral. Known as the 'cult of carts', this fashion spreads to other cities of France as an expression of Christian piety.

Fifty years later this pious effort at Chartres seems to be divinely rewarded. When the rest of the old cathedral is destroyed in a fire of 1194, the west façade - with its two great towers, and the triple entrance flanked by superb sculptures - miraculously survives (as does the Virgin's tunic). The cathedral authorities, gathering in the funds of the faithful, are inspired to build behind this façade an entire new cathedral in the Gothic style.

The soaring interior, with its vertical lines unbroken from the ground to the rib vaulting of the roof, is completed by 1222. The great windows are as yet blank spaces intersected by stone tracery. By 1240 they are filled with a blazing display of stained glass.

Chartres cathedral survives today as an outstanding example of three different aspects of Gothic - architecture, sculpture and stained glass. It is also a testament to the wealth and the energy generated by two closely linked passions of the Middle Ages, the cult of the relic and the love of pilgrimage.

Chartres is the large and public expression of this medieval impulse. An exquisite miniature version of the same theme is constructed in the years immediately following the completion of Chartres. The Sainte Chapelle in Paris, housing its own relic, refines the glories of full-scale Gothic to something more like a jewelled casket.

Sainte Chapelle: AD 1243-1248

All important relics in the Middle Ages are put on display to be venerated by pilgrims. In 1239 the king of France acquires a relic of such significance that he creates, to contain it, a perfect miniature Gothic church.

Western knights, occupying Constantinople since the fourth crusade, have been pawning some of the holiest Byzantine treasures to pay their armies. Louis IX, the king of France, redeems three of them from Venetian money-lenders. His greatest acquisition is the Crown of Thorns. Included in the same lot are a fragment of the True Cross and the head of the Holy Lance which pierced Christ's side.

To house these relics, Louis builds a new chapel, the Sainte Chapelle, in his palace on an island in the Seine - the Ile de la Cité, in the heart of Paris. The surprising outer shape of the building, unusually tall for its size, is because the king's apartments are on the first floor of the palace. He wants to be able to walk straight into his chapel. It occupies only the upper half of the structure.

This Gothic gem is completed in a very short time, between 1243 and 1248. Its interior - more glass than stone, with every panel of the windows stained and every inch of stone painted or gilded - is one of the marvels of the Middle Ages.

Italian Gothic: 14th - 15th century AD

Italy comes late to the Gothic style but makes of it something very much its own. To move from the west façade of Chartres cathedral to the equivalent in Siena or Orvieto, dating from two centuries later, is like seeing a play which has been adapted to the extravagant demands of opera. These two Italian façades of the early 14th-century, encrusted with ornament and bright with pictorial panels, glow in the warm Italian sun like enormous trinkets.

When Italian builders follow the northern Gothic style more closely, as in the 15th-century cathedral of Milan, they outdo their model with a glorious riot of pinnacles and tracery.

The most impressive Italian contribution to the story of Gothic architecture is in secular buildings. In 1298 the authorities in Siena publish regulations for the city's central piazza, the semicircular Campo. The height and style of the surrounding houses are to be carefully regulated. Over the next few decades the commune builds the town hall, the Palazzo Pubblico, on the straight side of the gently sloping semicircle (the great tower is completed in 1348). The other sides fill in, as decreed, to provide a sense of harmonious Gothic unity.

The Campo in Siena, so carefully planned in the 14th century, can lay good claim 600 years later to be the most beautiful public space in Europe.

The last flowering of Italian Gothic is the most beautiful style of all and is like nothing in any other city. It is the secular architecture of late medieval Venice. An exceptional example is the Doge's Palace, built in its present form between 1340 and about 1500.

The top-heavy appearance of the palace, with an almost solid wall resting on two storeys of delicate open arches, is caused by the need to accommodate a great council hall on the top floor. Amazingly, this imbalance does nothing to lessen the beauty of the building.

More typical of Venetian Gothic is the exquisite Ca' d'Oro, built between 1421 and 1440. There is a wonderful contrast and harmony between the wall with its nine inset windows on the right (stone with an occasional pattern of space) and the three tiers of balconies with their filigree arches on the left (space with an occasional pattern of stone).

This design blends the Gothic with other influences, deriving from Venice's connections with the Byzantine and Muslim east. The result is a beauty, purely Venetian, which can be glimpsed in many of the older houses on the city's canals. But while Venice is building the Gothic Ca' d'Oro, Florence is already busy with the architecture of the Renaissance.

Art and architecture in Florence: AD 1411-1430

Three Florentine friends, an architect, a sculptor and a painter, are recognized in their own time as being the founders of a new direction in art - subsequently known as the Renaissance. In the preface to an

influential book on painting, published in 1436, Alberti says that the work of these three has convinced him that the ancient arts can be revived.

They differ considerably in age. The architect, Brunelleschi, is the oldest. The sculptor, Donatello, is about ten years younger. The painter, Masaccio, is about fifteen years younger again, though he is by a wide margin the first to die.

Brunelleschi is the pioneer who first consciously applies a Renaissance curiosity to the arts. Where the humanists visit Rome and other ancient cities to copy inscriptions, he notes the dimensions and sketches the details of the ruins and surviving buildings of classical antiquity. These include the columns and arches of Rome, but also the domes of Byzantine Ravenna and even of the baptistery in Florence - a Romanesque building of the 11th or 12th century which Brunelleschi and his contemporaries believe to be a temple of Mars adapted for Christian worship.

His aim is to abandon entirely the medieval heritage, even if lack of historical knowledge makes the break less absolute than he intends.

Brunelleschi and the Duomo: AD 1418-1436

Brunelleschi's greatest claim to fame in his own day is connected with a medieval rather than a Renaissance building. In his childhood Florence's cathedral (the Duomo, built during the 14th century) has had only a temporary covering over the central space where the nave and transepts cross.

The intention has always been to build a dome, but the Florentines have been too eager to impress the world with the scale of their cathedral. The space to be spanned is 140 feet across, some 35 feet more than the equivalent width in Santa Sophia. Nobody can think what to do. The years drag by until a competition is held, in 1418, to find a solution.

The competition is won by Brunelleschi. His long-standing rival Ghiberti takes second place. Ghiberti had beaten Brunelleschi in a competition, in 1401, to design bronze doors for the Baptistery in Florence. Brunelleschi's narrow failure to beat Ghiberti on that earlier occasion is part of the reason why he has concentrated more on architecture than sculpture.

It would be relatively easy to erect a dome above a massive temporary structure of scaffolding, but Florence is unwilling to foot the bill for this. Brunelleschi's success, and the main cause of his contemporary fame, is that he finds a way of building without any support from the ground.

His solution, using aerial scaffolding supported within the drum, involves a double skin for the dome, with the outer and inner structures held together by bonds of masonry. The double structure not only adds strength. It also enables the outer profile to be impressively high without the interior of the dome seeming too remote.

Pioneered by Brunelleschi, and completed in 1436, the double skin later becomes commonplace (it is used in St Peter's in Rome, and St Paul's in London has three layers). To the astonishment of Brunelleschi's contemporaries, there is enough space between the inner and outer skins to instal a kitchen for the masons.

Brunelleschi and the Renaissance style: AD 1419-1430

The creative blend of Brunelleschi's classical studies and his own imagination is first seen in a hospital for foundling children, of which construction begins in 1419. Although the ingredients of the façade of the Ospedale degli Innocenti are the familiar ones of Roman architecture (an arcade of columns, supporting rounded arches, beneath a row of rectangular windows surmounted by pediments), there is an entirely new feeling in the balance between them, the proportions, the sense of slender elegance.

This new Renaissance style, Brunelleschi's contribution to the story of architecture, can be seen in its purest form in another building in Florence - commissioned by a member of the Pazzi family of bankers.

Work begins on the Pazzi chapel in 1430. The columns and central arch on the façade of this tiny building are reminiscent of Brunelleschi's earlier foundling hospital. But here the mood of calm and perfect balance extends also to the interior.

Every surface, from floor to dome, is planned in an interacting display of curves, circles, arches, rectangles and small roundels. Texture and colour, as well as shape, create the pattern - contrasting the pale plaster of the walls, the darker grey of stone pillars and arches, and the bright ceramic reliefs (the blue and white ones by Luca della Robbia) in the roundels. This is not only a gem of the Renaissance. It is the beginning of interior design.

Inca architecture: 15th - 16th century AD

The Incas share with another much earlier civilization, that of Mycenaean Greece, a habit of building with massive blocks of masonry. But the precision of the Peruvian masons puts all others to shame. In their capital at Cuzco, or in subject cities where they wish to emphasize their presence, the Incas leave their trade mark in great slabs of stone, often of eccentric shape, fitting together with an uncanny and beautiful precision.

The modern city of Cuzco has grown upon and around its Inca origins. But Inca masonry can still be seen, underpropping churches or flanking streets, as a reminder of the great builders of the 15th century.

To the north of Cuzco, on the open hillside, are the three vast polygonal ramparts of Saqsawaman - a structure once believed to be an Inca fortress, but more probably a temple to the sun and an arena for state rituals.

Even more mysterious, in the jungle at the far end of the Urubamba valley, is the long-lost city of Machu Picchu. Its site is as dramatic as the story of its rediscovery. High on an inaccessible peak in the jungle, the Inca masons somehow contrive to place their vast dressed stones, even in this remote spot, with wonderful exactitude.

Age of the palace: 15th - 18th century AD

With the advent of strong European rulers, the need to live in the discomfort of a castle is removed. At the same time the mighty become increasingly eager to emphasize their status (both to their subjects and their rivals) by an impressive display of architecture.

The Italians of the Renaissance pioneer a trend towards palace buildings as architectural symbols of power and prestige. Florence takes the lead in the 15th century. A great square building within the city is begun for the Medici in 1444.

The Palazzo Medici presents itself as a vast town house rather than a fortified stronghold. Recognition that this is still a lawless age of feuding families is seen only in the relatively few openings to the outside world on the ground floor (and those few covered with metal grilles). By contrast the upper stories have plenty of spacious windows. And the centre of the building is a large and peaceful courtyard.

Equally grand palaces are soon begun in Florence for other families - for the Rucellai in 1446, the Pitti in 1458, the Pazzi in 1462 and the Strozzi in 1489.

Men of power in other Italian cities follow suit, making the Renaissance town palace an important element in Italian architectural history. Elsewhere in Europe, nation states are now emerging. In France,

Spain and Britain the notion of a palace fits very well with the self-image of the powerful monarchs of the 16th century.

In England Henry VIII moves between four palaces along the banks of the Thames. In France Francis I transforms the Louvre (from a castle) and Fontainebleau (from a hunting lodge) into palaces. In Spain Philip II builds the extraordinary monastery palace of the Escorial.

Architectural and political themes peak together in late 17th-century France. The ultimate in palace architecture is created by the most absolute of monarchs. The size and glitter of Versailles reflects very precisely the power and prestige of the Sun King, Louis XIV.

Rivals may attempt to match this architectural statement of French predominance (Schönbrunn, a summer palace in Vienna completed in 1730, states the case for the Habsburgs). But Versailles remains the supreme example of the palace as a gesture of power.

Age of the dome: 16th - 19th century AD

The tradition of the dome begins in the Roman and Byzantine empires (the Pantheon in the 2nd century AD, Santa Sophia in the 6th century AD) and is borrowed by Islam (Dome of the Rock in the 7th century AD).

During the medieval centuries it is Islam rather than Christianity which develops this most striking of architectural features. But by a coincidence both traditions achieve new marvels in this form, quite independently, during the 16th and the 17th centuries.

Rome achieves the most impressive dome of the 16th century, with the completion of St Peter's in 1590. This cathedral (still today the largest in the world) uses the dome as its main architectural statement to anyone viewing the building from the outside - and, in particular, from a distance.

As with the Dome of the Rock in Jerusalem, 900 years earlier, the dome and its drum form half the height of the building.

From this inspiring example in Rome, and that of Florence's cathedral in the previous century, it becomes a western convention that a dome adds importance to a building, enabling it to preside over a townscape. Usually this special gravitas is spiritually based (St Paul's in London, the Invalides in Paris, both late 17th century) but it may also be secular (the Capitol in Washington).

In the centuries following the completion of St Peter's, domes become a familiar feature in all major western cities. They tend, because of their symbolic function, to be heavy and somewhat portentous. But at the same period the Islamic world is proving that domes can be graceful, colourful and even lightly floating in spite of their bulk.

The superb Islamic domes of the 17th century fall within two very different groups, even though both descend from the same tradition. In one group, associated particularly with Persia, the gentle curves of the dome are sheathed in ceramic tiles - usually blue. This style reaches its perfection in Isfahan.

The other theme, associated with India, concentrates all attention on the subtle shape of the dome itself, making its surface as sheer and simple as possible. For this, white marble is the perfect material. The style is encapsulated in the Taj Mahal.

Glazed domestic windows: 15th - 17th century AD

A window is in origin just an opening in a wall of a house to let in air and light, but the aperture needs closing at certain times if the house is to remain habitable. The story of the window, until recent centuries,

is a balance of convenience between light and heat.

In Roman buildings thin translucent sheets of marble or mica are sometimes used to let in light without opening the room to the air. Fragments of glass found in a bronze frame in Pompeii suggests that glass windows are already in occasional use in the 1st century AD. And stained glass is one of the glories of Gothic cathedrals from the 12th century. But the domestic glass window first becomes a practical proposition three centuries later.

Paintings of the 15th and 16th century reveal that simple houses of the time have nothing but wooden shutters to hinge across the window opening. Sometimes the shutters are divided into two or three separate sections, offering a practical control of the balance between light and air; part of the aperture can be shuttered and the rest left open, depending on the weather.

In the 15th century a refinement can be seen in the richer houses. The top third of the aperture is now glazed with small circular panes of glass set in a fixed metal frame. The lower part of the window has the usual hinged shutters. Thus some light is guaranteed, but control is not lost. This combination can be seen in Van Eyck's *Arnolfini Marriage*.

In the next stage, completed by the 17th century in the houses of the richer classes, the entire aperture is glazed and at least part of it is capable of being opened. The fashion for glass windows (expensive and therefore a status symbol) is seen in extreme form in Hardwick Hall, built in England in the 1590s. The house's appearance gives rise to the jingle 'Hardwick Hall, more glass than wall'.

In vast windows of this kind, the broad aperture is first fitted with a grid of stone (formed of vertical mullions and horizontal transoms). Within each stone rectangle, a metal frame holds small circular or diamond panes of glass.

In windows such as those at Hardwick Hall, the opening sections have to be on the casement principle; a rectangular frame, holding the glass panes, is hinged along one side and opens like a small door. Hinged windows of this kind become standard from the 17th century in countries of southern Europe. The so-called French window is a large-scale example.

In northern countries it is more common to hold the panes in a sash - a rectangular wooden frame which fits into a groove. At first a sash is held in position with pegs. But in about 1670 the modern form of double-hung sash window is developed in England (such windows are first used in significant numbers in the remodelling of Ham House in Surrey).

In a double-hung sash window a frame holding a large area of glass is easily raised up or down because a weight on each side, concealed in the wall, balances the sash by means of a cord running over a pulley. With windows of this kind, the façades of ordinary town houses in England and Holland will soon include almost as much glass, proportionally, as Hardwick Hall.

With both casement and sash windows the old hinged wooden shutters remain in place - in conjunction now with glass, to provide warmth or darkness when needed. The ancient clash between the demands of light and warmth has been resolved.

Indian and Japanese castles: 16th - 17th century AD

By a coincidence of history some of the most spectacular castles of the world date from the same period in India and Japan. These buildings of the 16th and 17th century are fortified palaces, with superbly decorated pavilions rising above secure walls.

The Indian tradition develops from the example of Hindu princes and is brought to a peak by the Moghul emperors. The Japanese castles evolve from the small fortresses of local feudal chieftains, which are a

practical necessity during the civil wars of the Ashikaga shogunate.

The best early example of an Indian castle is the fortress of Gwalior, built in the early 16th century. The entrance road, climbing a steep hill, makes its way through heavy walls to an elevated plateau and an exquisite palace of carved sandstone and decorative tilework.

The great 17th-century forts of Rajasthan, such as Amber and Jodhpur, follow the same pattern of delicacy within massively strong defences. The theme is taken to its most famous conclusion in the Red Forts of Delhi and Agra, where the Moghul emperors and their harems dwell in white marble pavilions surmounting vast red sandstone walls.

The greatest of the Japanese castles are created in the late 16th century by the warlords Nobunaga and Hideyoshi, who restore unified rule over Japan after the anarchy of the previous period. The splendour of their castles, richly decorated with carved and painted ornament, reflects their power.

The most impressive surviving castle of this period is at Himeji, rebuilt on earlier foundations for Hideyoshi. Five storeys of pavilions, forming a pyramid of white walls and elegant oriental roofs, seem concerned only with the pleasures of peace - until one notices the height of the sturdy walls on which they perch.

Age of the villa and country seat: 16th - 18th century AD

With an increase in prosperity and stability in western Europe, from the 16th century, rich men feel the need for a house in the country - either as somewhere to move for a brief stay (sometimes as little as an evening) from their usual residence in the town, or as a comfortable home on their estates in place of the castle or fortified manor of earlier times.

The architect who most brilliantly meets these needs is Andrea Palladio. Born in Padua and trained originally as a mason, he acquires the Renaissance passion for the architecture of ancient Rome and the works of Vitruvius.

Palladio's skill in applying his classical principles brings him commissions for public buildings in Vicenza and churches in Venice. But it is his villas for private patrons which win him lasting influence and fame. Most of these villas are built in Venice's hinterland, the Veneto. Palladio's designs for them become widely known after he publishes *I Quattro Libri dell'Architettura* ('The Four Books of Architecture') in 1570.

The purpose of this work is to explain the principles of Roman design, following the example of his master, Vitruvius. But the second volume contains several of Palladio's own designs. It becomes widely used as a pattern book.

The single most imitated aspect of Palladio's style is his use of columns and pediment as a portico in front of a house (his model being the Pantheon in Rome). In broader terms the balance and the relative simplicity of classical design are his hallmark.

Palladio's most striking influence is seen in the great houses of 18th-century England. By then part of his appeal is in reaction against a very different and far from reserved style which has intervened during the 17th century - that of the baroque.

Baroque as a style: 17th - 18th century AD

Europe in the 17th century, and in particular Roman Catholic Europe, revels in a new artistic style embracing architecture as well as painting and sculpture. In many contexts, such as church interiors, the baroque combines all three arts in an unprecedented way to create a sense of emotional exuberance.

This mood is very different from the dignified and often severe masterpieces of the Renaissance. The term *barocco* is first used to suggest disapproval. It is thought to derive from a Portuguese word for a misshapen pearl. Certainly unbalance and excess are the qualities which baroque artists indulge in and turn to advantage.

The Roman Catholic world is the natural home of baroque, because its mood suits so well the message of the Counter-Reformation. Protestant reformers can be caricatured, not too unreasonably, as argumentative, dour, unsentimental, hostile to images, and distrustful of any authority except that of holy writ.

The Catholic church by contrast enjoys an aura of centuries of authority and prestige, has long used art and music with great skill to touch the emotions of the faithful, and much prefers a good show to a good argument.

Following the example of the new St Peter's in Rome, numerous churches built and decorated in the 17th century put baroque at the service of the church's message. The faithful are welcomed by rows of saints, gesticulating eagerly in stone from alcove or roof line.

Inside a baroque church, light falls on mingling curves of columns and altars and sculpted groups, breaking up the solidity of side walls and often leading the eye up to an illusionistic ceiling - in which angels and people of fame or virtue stream upwards into the distant clouds of heaven. There is nothing half-hearted about baroque (at any rate until a slight loss of nerve in the 18th century results in the development known as rococo).

Bernini and baroque Rome: 17th century AD

In the transformation of Rome into a baroque city, no one plays a part comparable to that of the sculptor and architect Giovanni Lorenzo Bernini. In 1629 he is appointed architect to St Peter's, the creation of which has given a new excitement and dignity to the ancient city. Over the next forty years he provides magnificent features to impress the arriving pilgrims.

The first, completed in 1633, is the vast bronze canopy held up by four twisting columns (profusely decorated with the Barberini bees, for the pope at the time is Urban VIII). This structure, known as the Baldacchino, is at the very heart of the church - above the tomb of St Peter and below the dome.

The Baldacchino rises above an altar at which only the pope conducts mass. Visible between the columns, from the point of view of the congregation, is Bernini's other dramatic contribution to the interior of St Peter's. This is a golden tableau, a piece of pure theatre, above the altar at the far end of the church. Its central feature is the papal throne of St Peter, held aloft among the clouds.

Sculpted golden rays stream up from St Peter's throne towards heaven. In an extra dimension to the illusion they are joined by real rays of golden light, shining from the afternoon sun through an amber window in which the holy dove spreads his wings. This glorious blend of sculpture and architecture is achieved between 1657 and 1666.

During these same years Bernini's great contribution to the exterior of St Peter's is also under construction. The open space in front of the church, where pilgrims gather to hear the pope's Easter address, needs to be enclosed in some way to form a welcoming piazza.

Bernini achieves a perfect solution in the form of an open curving colonnade. The four concentric rows of columns provide covered walkways and a shape for the piazza, but they do so without closing it in - for there is no back wall. Meanwhile the balustrade above the columns is an ideal pedestal for the gesticulating stone saints who are an indispensable part of monumental baroque.

Dutch and English town houses: 17th - 18th century AD

Dutch prosperity in the 17th century results in a very satisfying design of town house. Merchants are eager to have their homes and premises in the limited space fronting the canals of Dutch towns.

With numerous middle-class competitors for the available land (as opposed to the small number of noblemen holding power and wealth in other areas of Europe), the typical Dutch town house, several stories high, has a narrow brick façade and generous areas of glass - made possible by the new design of sash windows. Terraces of such houses, widely surviving today in Holland, provide the charm of the canals of Amsterdam and many other Dutch towns.

In 1689 a Dutch prince, William III, becomes king of England. His accession to the throne prompts a fashion for the Dutch style. England, like Holland, is rapidly becoming more prosperous. Streets of town houses are being built in London and many provincial towns, such as Bath.

The English version of the Dutch house is more severe and classical, particularly when built in stone (as in Bath), but it has the same elegance deriving from a repeated vertical alignment and a generous display of sash windows. Known in England as the Georgian style, and carried to colonial America, terrace houses of this kind constitute an extremely successful pattern of urban living.

Palladianism and the English stately home: 18th c. AD

Britain in the early 18th century is the scene of a strong reaction against the self-indulgence of baroque architecture, replacing it with the clear-cut classical lines of Palladio. The style of the great Venetian architect is known in England only from his four books of designs (the *Quattro Libri*) and from the London masterpieces of an enthusiast returning from Italy, Inigo Jones. These are the Banqueting House in Whitehall (1622) and the Queen's House in Greenwich (1629-40).

Inigo Jones's pioneering work in the Palladian style remains very little imitated for the rest of the 17th century, a period dominated by baroque.

Baroque still prevails in the early 18th century as the preferred style for any grandee planning a magnificent country seat. The most obvious examples are two buildings designed by Vanbrugh and Hawksmoor in partnership - Castle Howard for the earl of Carlisle in 1700-26, Blenheim Palace for the duke of Marlborough in 1705-22.

But while Castle Howard and Blenheim are under construction, the prevailing fashion changes. A collection of classical designs in the Palladian style is published in 1715, under the title *Vitruvius Britannicus*, by a British architect, Colen Campbell.

Vitruvius Britannicus launches a new fashion in 18th-century England. In 1717 the earl of Burlington employs Campbell to remodel his London house in Piccadilly in the Palladian style. In 1722 Robert Walpole commissions him to build Houghton Hall, a large Palladian country house in Norfolk.

Significantly, in this transition period, Walpole adds cupolas at the corners of Campbell's design, giving a touch of baroque. Perhaps he feels the need for a little more of the grandeur of Blenheim or Castle Howard.

Aristocrats all over Britain soon follow the fashion, providing themselves with Palladian or neoclassical mansions in which they can enjoy their surrounding estates. Country seats spring up with pillared porticos to impress the outside world and with interiors graced by columned halls (like Roman basilicas) or domed reception areas (echoing the Pantheon). The stately home becomes a feature of the British countryside.

The demand keeps many distinguished architects extremely busy (none more so than Robert Adam towards the end of the century). Meanwhile the proud owners also require a surrounding landscape of equal elegance, to delight the eye from the windows of the house.

Landscape gardening is a very ancient profession. Potentates have always wanted to beautify their surroundings, from the hanging gardens of Babylon to the formal vistas of Versailles. But the landowners of Britain add a new element in the 18th century.

Instead of the formal arrangements fashionable in earlier periods, they now want a landscape which looks natural - but rather better than nature on her own can achieve in the agricultural regions of England or Scotland. This requires a new sort of landscape gardener (pre-eminent among them Capability Brown), who will create lakes and waterfalls, wooded slopes, ancient temples and romantic ruins to achieve an impression of the effortlessly picturesque.

Neoclassicism: 18th - 19th century AD

Ever since the Renaissance, successive generations of artists and architects have turned to classical models for inspiration. Even at the height of baroque (the least classical of styles in mood or line) contemporary grandees are often depicted in togas. Military heroes, however foolish they may look, strut in the stiff ribbed kilt of the Roman legionary.

During the 18th century a quest for classical authenticity is undertaken with new academic vigour. There are several reasons. Archaeological sites such as Pompeii are being excavated. And interest is shifting from the Roman part of the classical heritage to the Greek.

Ancient Greek sites in southern Italy (in particular Paestum) and in Sicily begin to be studied in the 1740s. In 1755 Johann Joachim Winckelmann, a German archaeologist and a key figure in the Greek Revival, publishes a work on Greek painting and sculpture in which he argues that the art of Greece provides the best example of ideal beauty.

The avant-garde greets this notion with enthusiasm. Over the next century Greek themes increasingly pervade the decorative arts. Greek porticos and colonnades grace public buildings. Greek refinement becomes the ideal for neoclassical sculptors and painters.

In architecture there has already been a strong classical revival early in the century, particularly in the Palladian movement in Britain. Robert Adam, returning from Rome in 1757 with a multitude of classical themes and motifs in his head, creates an eclectic style very much his own - in which classical severity and rococo fancy are subtly blended to satisfy his customers.

By the turn of the century these pleasant fancies seem too frivolous. A more rigorously Greek style becomes the architectural fashion in many parts of Europe.

A version of the Parthenon rises from 1806 in Paris, on Napoleon's orders, to become eventually the church of La Madeleine. Another Parthenon begins to be built on Calton Hill in Edinburgh in 1822 as a memorial to the Scots who have died in the Napoleonic wars (it remains uncompleted). The design chosen for the new British Museum, on which work begins in 1823, is a Parthenon with extensions.

So the 19th century acquires, through neoclassicism and the Greek Revival, a conventional style of considerable vigour. Architects of important new buildings, whether churches, parliaments or banks, will now consider a sprinkling of Greek columns as one serious option. The other, resulting from another 18th-century revival, is to go Gothic.

Gothic Revival: 18th - 19th century AD

The Gothic Revival begins at the same time as the first stirrings of neoclassicism, in the mid-18th century. Though entirely different in their results, the two movements share a similar impulse. After a century and a half of baroque each looks nostalgically to the past for a purer source of inspiration.

However the Gothic revivalists do so at first in a more frivolous mood than the earnest archaeological advocates of neoclassicism. Indeed the most famous early example of the Gothic Revival, Horace Walpole's Strawberry Hill (begun in 1750), can also be seen as a branch of rococo - an attempt by a fashionable host to find a new decorative theme to amuse his visitors.

A growing interest in the mysterious Middle Ages, as an antidote to the dry certainties of rationalism and the Enlightenment, is reflected also in the literary field in the first stirrings of the Romantic movement. In 1762, while the fan-vaulted gallery is being built in Strawberry Hill, the literary world is bowled over with enthusiasm for a newly discovered medieval Celtic poem, Ossian's *Fingal* (a fake, as it turns out).

Horace Walpole is a significant figure in both these aspects of the Gothic Revival. Strawberry Hill is complete by 1776. Walpole's *Castle of Otranto*, an early prototype of the Gothic novel as a spine-tingling tale of medieval villainies and wronged innocence, is published in 1764.

The light-hearted approach to the Gothic Revival survives into the early 19th century. Then, as with neoclassicism and in keeping with the times, a greater solemnity sets in. Gothic becomes one of the main 19th-century styles for public buildings (town halls and law courts as well as churches).

In competition with the Greek Revival, the Gothic style has economy on its side. The stone lintels required to span a large opening in a Greek temple are expensive. It is soon realized by cost-conscious architects that pointed Gothic arches can be built in brick and cheaply clad in stone. More than 2500 Anglican churches are built in England and Wales between 1821 and 1850, and nearly all of them are Gothic.

The eclectic century: 19th century AD

The 19th-century fascination in Europe with the architecture of the past begins with Greek temples and Gothic cathedrals, but soon extends to encompass a bewildering range of other historical styles - Egyptian, Byzantine, Romanesque, Venetian Gothic, Muslim Indian, and even, in a final convulsion, the many Renaissance styles which are themselves a response to earlier periods.

This most self-confident of centuries takes what it likes from these many sources, mixes and matches them, develops and distorts them to create magnificent buildings. The effect is of its time, but the ingredients are not. Only one feature of 19th-century architecture is entirely new in the west - the use of cast iron.

Glass, iron and prefabrication: AD 1837-1851

The public first becomes aware of the glorious potential of cast-iron architecture in the 1840s, when extraordinary conservatories are erected at Chatsworth and in Kew Gardens. But the technology derives from factory construction in the 1790s.

With Boulton and Watt's steam machinery in operation, conventional factories using timber for joists and floors are prone to disastrous fires. The occasional use of cast iron for structural purposes goes back many centuries in China, for temple pagodas, but it is an innovation in Britain when William Strutt builds the first fireproof mill at Derby, in 1792-3, with floors on shallow brick arches supported on cast-iron pillars.

Strutt's mill still contains some massive wooden beams, but an entirely wood-free factory is constructed at Ditherington, near Shrewsbury, in 1796-7. Arched brick floors, on cast-iron beams and pillars, become the standard factory and warehouse interior of the 19th century.

The next and most glamorous stage in cast-iron architecture is linked above all with the name of Joseph Paxton. As superintendent of the duke of Devonshire's gardens at Chatsworth, he builds there in 1837-40 a great conservatory, shaped like a tent (277 feet long and 67 feet high) but consisting entirely of cast iron and glass.

In a ducal garden this building is not much visited, but it astonishes all who see it. Queen Victoria notes in her diary in 1842 that it is 'the most stupendous and extraordinary creation imaginable'. Two years later a similar building is commissioned from Richard Turner and Decimus Burton for the royal gardens at Kew. Since 1841 these gardens have been open to the public, so the beauty of the Palm House, completed in 1848, becomes more widely known than the Chatsworth conservatory.

But it is Paxton's building for the Great Exhibition of 1851, the astonishing Crystal Palace, which reveals to the millions the potential of the new architecture.

The Crystal Palace is gigantic compared to its predecessors in cast iron and glass. It is five times as long as the Palm House in Kew and nearly twice as high; or, put another way, it is longer than the palace of Versailles and higher than Westminster Abbey. But even more significant is the famous speed of its design (one week of detailed drawing, after a preliminary jotting by Paxton on a piece of blotting paper) and of its construction (six months).

The reason, and the reason for its lasting architectural significance, is that Paxton's building is the first thoroughgoing example of prefabricated architecture (a concept perfectly suited to cast iron, and pioneered seventy years earlier for the bridge at Coalbrookdale).

The statistics of the Crystal Palace are bewildering (3300 iron columns, 2150 iron girders, 250 miles of sash bar, 293,635 panes of glass), but the crucial detail is that these all conform to a basic 24-foot module. The manufacture of the pieces can be subcontracted to several foundries and glass factories; assembly on site is like putting together a giant's dolls' house. Hence the fact that this palace of glass is created, from scratch, in less than 200 days. As if to emphasize the point, it is dismantled in 1852 and moved to another site at Sydenham - where it stands until its contents catch fire in 1936.

The modular steel-frame tradition of late 20th-century architecture has in this building its most distinguished ancestor.