SOME PRINCIPLES OF ORTHODOX CHURCH ARCHITECTURE

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INTRODUCTION: THE THEOLOGICAL PRINCIPLES

At the heart of the Christian life is the Incarnation of God and the deification of the human person. “God became man so that man might become god” said St Athanasius the Great. This is a synergy of God offering Himself and man offering himself. The ultimate role of church architecture is to reflect this truth and to help our deification become a reality. Church design and construction is rooted both in heaven and in earth, in timeless principles and in the specifics of locality and time.

This means that a comparison of Orthodox churches throughout the world and in different periods shows that they have the same principles in common and that they are yet each unique, that they are indigenous and varied. A common experience of God unites them, while the local character, climate, building materials and community needs distinguish them.

We could say that the ideal community of traditional church architecture reflects the nature of the Holy Trinity, having no division and no confusion, one yet with distinctions. It reflects Pentecost, where the one Holy Spirit descends uniquely on each disciple as a tongue of fire, inspiring him to declare the same truth in the local tongue.

But to be architecturally indigenous is not something static or isolationist, an architectural form of nationalism. Architectural styles of a given region have never been static; church designers and builders have always drawn on features of surrounding cultures. Scholars of architectural history have, for example, identified a wide sphere of influence behind the ground-breaking churches of Hagia Sophia and Saints Sergius and Bacchus in Constantinople: vaulting techniques were drawn from Mesopotamia, and groin vaults from Imperial Rome; the centralised plan came from Armenia or Rome; the pierced basket-type capitals and carved decoration came from Parthian and Sassanian architecture.

A confident understanding of essentials is needed to assimilate diverse influences into a coherent unity. Both extremes of frightened conservatism and arbitrary cut-and-paste need to be avoided.

This paper aims to stimulate inquiry into how these principles of unity and diversity have been expressed in traditional church architecture, and briefly discusses some of the challenges facing the modern church designer. The purpose of this is practical: to help parishes and monasteries who are building new churches or are adapting non-Orthodox buildings, particularly in Britain.

There are three main types of church design: centrally oriented (octagonal, square or circular design); basilica; cruciform. To these we shall now turn.

CENTRALLY ORIENTED BUILDINGS

Centrally oriented temples are circular, octagonal or otherwise polygonal. We discuss this type here only briefly because history has shown it to be generally ill-adapted for the regular celebration of the Holy Liturgy. Its focus on the centre suits it best to martyria - where the emphasis is on the relics of the saint or the holy site - and baptisteries, where the emphasis is on the font. Examples of the former are the Anastasis Rotunda in Jerusalem (4th century), the quatrefoil[1] martyrium in Seleucia-Pieria, Syria (5th century), the octagonal-in-square martyrium of St Philip (?) in Hierapolis (early 5th century), and the octagonal with arms of St Simeon the Stylite, Syria (*c.* 480-90). Examples of the latter are the circular Lateran baptistery in Rome (*c.* 315), the octagonal Baptistery of the Orthodox, Ravenna (*c.* 400-50), and the lobed octagonal-in-square baptistery in Riva S. Vitale, Italy (*c.* 500).

Christianity affirms that we are on a journey closer to God and at the same time that God is already with us. Consequently the Divine Liturgy and accompanying services require churches with a certain forward movement - along the east-west axis - as well as an inwardly focused or incarnational feeling. It is for this reason that most Orthodox churches designed for the regular celebration of the Liturgy combine elements of the basilica with elements of the centrally oriented church. Hagia Sophia, Constantinople, for example, is essentially a dome (32 m. diameter) set in the centre of a slightly elongated square (71 by 77 m.), with two half domes extending to the east and west. Where a martyrium is regularly used for worship, sometimes a basilica is simply attached to the martyrium, as in the original Church of the Nativity in Bethlehem (*c.* 333). The Byzantine cruciform church has an apse and a narthex added to the square nave, thus subtly elongating its otherwise centrally oriented structure.

There do exist old churches designed for regular worship which use a polygonal design without much adjustment. But, for all their interest, I think that they are ultimately not successful for regular liturgical use. Perhaps the greatest of these is the octagonal church of San Vitale in Ravenna (completed 546-8). Its complex marriage of domes, vaults, niches, arcades, columns and ambulatory, together with the splendid mosaics, all make for a remarkable building. Vistas open up from all angles as one walks around. And yet one feels a little confused as to direction; as a worshipper one wants to face the altar which is the focus of the worship, and yet the ambulatory and the niches which open up all around draw one's eyes away from the altar.

It is significant that San Vitale and other churches around the time of Emperor Justinian (such as St Sergius and St Bacchus in Constantinople) were inspired in part by the centrally-planned audience halls of the Emperor's court. The Byzantine Liturgy was undergoing certain changes at this time under the influence of the complex court ceremony, and architects were trying ways of accommodating these liturgical developments into their designs.

[1] That is, a square with lobes or apses extending from each of the four sides.

THE BASILICA AND THE CRUCIFORM CHURCH

Broadly speaking, Orthodox churches designed for the regular celebration of the Liturgy fall into two types: the basilica and the cruciform. The basilica is the earlier design, and is a rectangular structure. It usually has a curved apse in the eastern end. It may or may not have two or four rows of columns running down its length. The isles formed by these columns have roofs lower than the main body of the church, and windows in the exposed upper wall, called the clerestory. The roof is most commonly of a hip design and of timber, and the ceiling is sometimes painted with designs. In some cases there is a stone barrel vaulted roof. More rarely, there can be one or more domes.

The basilica was basically adopted with little adaptation from a Roman secular building type, used variously for such purposes as law court, council chamber, covered market and gymnasium. The similarity of secular and liturgical basilica is such that it is sometimes difficult for archaeologists to tell them apart. The word basilica means royal, and so by extension the building was a city building. This fitted in with the Church's sense of itself being the City of God. In any case, the basilica was the only building of the pagan Roman empire which was suitable for large Christian assemblies, since the interiors of pagan temples were designed only for the priests and the sacrifices, not for the worshipping public. Another early symbolic reading of the basilica relates it to a ship. According to the "Apostolic Constitutions" (*c.* 400 A.D.) "the house of the believers is long in shape like a ship [hence nave from the Latin *navis*] and directed towards the east." Here the emphasis is on the transitory nature of our present life, of our movement towards the heavenly city to come. The basilica is primarily, therefore, a church plan which emphasises action, motion. By contrast the more centrally orientated churches favoured in the east emphasise contemplation or vision. To this type we now turn.

The basic form of the cruciform type is a cross floor plan with a dome over the centre. With time this basic cruciform shape tended to be set within a square floor plan, the areas between the arms having been filled in to make subsidiary spaces. Such a type is called a cross-in-square church or a square ambulatory church. The latter description sees the church as a square within a square, a central square with an ambulatory running around it.

The central dome of the cruciform church can be supported on a drum or may sit directly on the nave walls. The drum can be supported by columns or can rest directly on the walls and squinches or pendatives, which fill the upper corners of the square nave. Variations on the theme involve the number of domes (five is common), the type of roof over the interior dome (domical, pyramidal, conical etc.), the roof shape of the cross arms (curved, hipped), the proportions, the geometric shapes given emphasis (the onion shaped dome in Russia, for example, or the steep cone and heightened drum of some Georgian and Armenian churches), and of course, the materials used.

The cruciform style was more purpose-designed as a church than the basilica, and is therefore generally considered to be a richer and fuller expression of the Church's experience. It was probably conceived out of a

combination of the basilica (with its west to east movement), and centrally oriented mausolea and baptisteries (which were circular, octagonal, or variations thereof, and usually domed). There is much discussion among scholars as to the historical origins of this church-type, but since the purpose of this essay is the practical one of assisting contemporary design, it is not necessary to outline these various theories.

On the one hand the cruciform church's east-west arms offer the basilica's forward movement, with its sense of pilgrimage from the fallen world (the west) towards the age to come (the east). On the other hand its dome (with its emphasis on the interior) and its more or less cubic nave, intimately proportioned, create a sense of being present now in paradise, of God being present among the congregation. Pilgrimage and immanence are thus combined.

Another element of the cross-in- square which is symbolically rich is the transition from square to cross to circle (or cube to cross to dome) as we move up the church. This affirms the union of earth (symbolised by the square) with heaven (the circle) through the cross of Christ.

The cruciform church also offers a rich symphony of interior surfaces well suited to wall painting and mosaic. Its more complex floor plan also provides a richer "stage" for liturgical movements than does the basilica.

The chief disadvantage of the cruciform church is its expense of construction relative to the basilica. There are arches and domes to construct, and the floor plan is more complex and the walls therefore more time-consuming of labour.

The chief advantage of the basilica is its cheapness of construction relative to the cruciform, due to its simplicity of shape - basically four walls with a simple hipped roof. Its potential disadvantages are its aesthetic plainness of shape, and the fact that the congregation can feel distanced from the liturgical activities at the east end due to the elongation of the nave. This last disadvantage is of course obviated with small basilicas. And the plainness can in part be overcome with wall paintings or mosaics, as for example in the church of St Apollinari Nuovo in Ravenna. For small chapels the basilican rectangular shape is quite adequate; its very smallness is sufficient to create that intimacy and interiority which tends to get lost as size increases.

The predilection in western Europe has been for the basilica design, in later centuries modified with the addition of transepts towards the east end with a tower over the crossing, and/or one or sometimes two towers at the west end. Domes and centrally orientated churches are a rarity. In the Gothic period the rounded Romanesque arch was abandoned in favour of the pointed arch, and interior surfaces which had been painted or covered in mosaic were abandoned in favour of geometric patterns created by structural elements such as clustered columns, vaulting ribs and fan vaulting.

From the Gothic onwards, the dominant trend in British and Northern European church design has been for long and high naves, their verticality further emphasised by the pointed arch and thin columns. Many of the Anglican churches available to the Orthodox in Britain are such churches,

either Victorian creations or neo-Gothic remodellings. The intuition of the Orthodox Church seems to be that this has created a church type which, for all its particular beauty, has an atmosphere which tends to be too impersonal, and not incarnational enough for its adoption. This is not to denigrate the great accomplishments of cathedrals such as Chartres or York Minster, but simply says that many aspects of their design are not appropriate to the Orthodox Church . When looking for ideas in western architecture we would therefore be inclined to look to the earlier Anglo-Saxon and Romanesque periods (little survives of Celtic churches).

THEOLOGY IN FORM AND GEOMETRY

Over the last century considerable research has been done on the theology of icon style - the reasons behind the various perspective systems used, the use of light and colour, and so forth. Little research, as far as I can see, has been done into the theology behind the forms of traditional Orthodox church architecture. If successful churches are to be built in the west, there needs to be a deeper understanding of those principles of proportion and sacred geometry underlying successful churches of the past. What follows is a very summary exploration into the correspondence between form and spirituality in a few aspects of traditional Orthodox churches, along with suggestions as to how these might be applied in our own times.

As we have discussed, there is tremendous variety in Orthodox churches, from the simple basilica through to multi-domed cruciform designs. However, most are a combination of the cube, the dome and the cross. Most of the following analysis therefore concentrates on this type, rather than the rectangular, basilica form.

The atrium

Early churches, such as St Peter's in Rome and Hagia Sophia in Constantinople, had a colonnaded atrium or courtyard at the entrance end of the church. This was a continuation of the Old Testament temple plan, and also of the pagan *temenos* or sacred precinct as well as of the secular Roman atrium. This atrium is to be considered as part of the whole church plan, and not just an adjunct to it. It had generally fallen into disuse, at least in its full colonnaded form, by around the eighth century.

The atrium serves various functions. First, it provides a mediatory role between the outside world and the inner sanctuary. Being open to the sky it is outside, while being walled or colonnaded it is also partakes, to a limited degree, of the main church building and its interior.

Second, the courtyard reinforces the transitional nature of the spiritual life. The Christian life is a progress from dissipation and fragmentation towards a healing and union of all our human faculties, and eventually of our union as whole people with Christ. This progress has been classically described by the Church fathers as a movement through the three stages of repentance or purification, then of illumination or perception of the mysteries of God within creation, and finally of union with God. The atrium can be seen, along with the narthex, as the place where the first stage, purification, is emphasised. The nave is associated with illumination, particularly

through the word (Scripture readings, sermons and singing are done here). And the altar is associated with union, particularly through participation in the Eucharist.

Because the atrium was associated with the first stage of purification there was usually a basin for ablutions placed in its centre (still visible in St. Dimitrios in Thessalonica). This often took the form of a fountain, as in the old St Peters in Rome which sported the famous *pigna* fountain. This was an enormous bronze pine-cone from which sprang jets of water falling into a porphyry basin. Over this was a marble baldachin with peacocks on its gables and dolphins on its eaves. It is likely that this structure was from a pre-Christian building. If so, it is a good example of the Church sublimating elements of its surrounding culture. Despite its probable pre-Christian origins, many of the symbols on this fountain were evocative of paradise for Christians of old: the fountain itself represent the fountain of life, the peacocks are eternal life, the pine represents the evergreen tree or tree of life, and so on. The atrium was in fact sometimes called Paradise.[2]

The fountain tradition continues in a modified form in the Athonite *fiali* in the courtyard. This is a large, usually stone basin of blessed water, surrounded by columns and surmounted by a roof, normally domed. On Athos it is filled with blessed water which is drunk after a Liturgy. In old atria the water was for ablutions before the Liturgy and other services.

Third, as part of the mediatory role mentioned above, the forecourt gives a place to pause so that one does not pass directly from the outside to the inside. From the courtyard one can get a glimpse of the inner church, with its candles and oil lamps and perhaps hear a little of the chanting before entering.

Fourth, the courtyard offers a place for large gatherings and certain liturgical acts, such as the opening of the paschal service and exorcisms before baptism (if there is no narthex). In this way it greatly increases the liturgical floor area of a community without the high cost of a completely enclosed building. In a modified way this idea was exploited in northern Greece during the four centuries of Turkish occupation. Since Christians were not allowed to have outdoor gatherings, they extended the roof line over the west courtyard so that, technically at least, gatherings there were still inside.

Finally, the atrium is a statement that the Church (and therefore the church building) does not exist to reject the world as such, to close its doors to the world which God has made, but rather exists in order to flow out to the world and transfigure it. The atrium does act as a kind of sieve which helps the faithful to leave behind the fallen world as they enter the temple, but it also acts as a river mouth, spreading the life-giving waters of the Liturgy out into the world. Or to reverse the image, the forecourt is the hands of the Church, receiving the material creation so as to offer it on the altar.

Some of these functions are alluded to in a passage from the early Church historian Eusebius (c. 263-c.340). This is one of the earliest known descriptions of a Christian church:

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[2] Titus Burckhardt, *Chartres and the birth of the Cathedral* (Ipswich, 1995), page 13.

> *The whole area that he [i.e. the architect] took in was much larger [than just the church building], and he gave the outer enclosure the protection of a wall surrounding the whole, to provide maximum safety for the entire structure. Then he opened up a gateway, wide and towering high, to receive the rays of the rising sun.*[3]*...He does not permit a man who has passed inside the gates to go at once with unhallowed and unwashed feet into the holy places within; he has left a very wide space between the church proper and the first entrances, adorning it all around with four colonnades at right angles, so that the outer walls turn the site into a quadrangle and pillars rise on every side. The space between these he has filled with wooden screens of trellis work...in the middle he left a clear space where the sky can be seen, so that the air is bright and open to the sun's rays. There he placed symbols of sacred purification, constructing the fountains exactly in front of the cathedral: these with their ample flow of fresh water enable those who are proceeding towards the centre of the sacred precincts to purify themselves.*[4]

How can the atrium be adopted to present-day use? Where space allows it can of course be made as it was in the early church - a paved area surrounded by columns. For cost's sake and for reasons of aesthetic appropriateness, brick or wooden columns or even a wall could replace the cylindrical columns used of old.

Given the British love of nature, and the strong tradition of cloisters and churchyards, one could replace the paved area with a garden intersected by paths. In the centre there could be placed the traditional basin for ablutions, or else some other liturgical feature, such as a *fiali,* a cross, a fountain, a font, or even a whole baptistery. Such a walled garden would then become symbolic of paradise, that is, the earth transfigured. This would help direct love of nature towards the Creator.

Communal rooms such as the parish hall, classrooms and kitchen could also lead onto this courtyard. As well as being a very practical arrangement, this is an iconic way of relating the parish or monastery's daily activities to its worship.

If left as an open paved courtyard, the space could be used for church fairs and other church activities open to the general public. As such it would operate as missionary interface between the parish and the world. The Jewish temple's 'Court of the Gentiles' operated in this way.

The narthex

The first chamber of the church proper is either the exo-narthex or the narthex. In this funerals are performed, and some of the lesser services like the Hours and Compline. In the early Church the catechumens and those

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[3] It would therefore seem that this church, as with many very early churches, was oriented not towards the east but towards the west, thus allowing the rising sun to enter by the entrance opening which was to the east.

[4] Eusebius, "The History of the Church", trans. G.A. Williamson (New York, 1965), bk. 10,4:42ff., 393.

under penance remained here rather than in the nave during services. And so, like the atrium, it represents a place of purification and preparation. As a place of preparation it is often a darker place, with few windows. This helps to quieten and prepare the soul for an encounter with the deeper mysteries of the faith which are experienced in the nave.

In the exo-narthex are often depicted scenes from the Old Testament. There are also cases (as in the Portaitissa chapel at Iviron Monastery, Mount Athos) of depictions of righteous pagans like Socrates or Plato who have to some extent prefigured Christianity in their writings or lives.

The narthex is usually a long narrow space, oriented on the south-north axis. This is probably whence it got its name, from the Greek word “narthica” or reed, with its long narrow and hollow stem.

On the subject of the adaptation of existing churches, one can make a narthex by adding a subsidiary screen within the nave. I have done this with two churches for whom I have made icon screens (Rugby and the Lake District). These churches were too large for their small mission parishes. So this second, wooden screen served a number of functions. First, it made a more intimate nave for a small congregation. Second, it created a narthex where funerals, the preliminary rites of baptism and so on can be performed. Third, since these communities have no hall, the space so created doubles as a meeting place for after-Liturgy gatherings and other meetings.

A narthex, like the atrium, helps to soften aesthetically the transition from the outside to the inside. This is particularly so in cases where the exo-narthex is an open or glazed porch.

The nave and apse: dome, cube and womb

As already noted, the typical arrangement of the cruciform type church has a dome surmounting a drum which in turn rests on a more or less cubic nave. The nave has on its east end a curved or polygonal apse surmounted by a half dome. The other arms of the cross may have vaulting or hemispheres for the roofing, which double as buttresses for the central dome. A combination may also be used (as in Hagia Sophia, which has hemispheres on the east and western ends, and massive arches on the northern and southern ends). Such a union of the cross and dome was intuited in early Christian monograms to be found in the catacombs, which have a cross within a circle, and of course also in the Celtic cross with its circle placed over the crossing of the radii.

The themes of the wall paintings or mosaics found on the interiors of these geometric forms tell us their theological significance. Taken together, these themes, and therefore their corresponding geometric forms, reveal the whole economy of salvation, which results in the union of God and man, heaven and earth. What follows is an outline of this theological schema.

In the dome represents heaven. On it is usually depicted Christ the Pantocrator. He is the conductor of the whole universe, the one who “holds” (*crator* in Greek) all things in his hands. He is both the Creator and, through His incarnation, the recapitulation of creation. Below him, in the drum, is usually depicted angels and/or the prophets and patriarchs. The angels are

the first created beings, the prophets and patriarchs the representatives of the pre-incarnational period.

In the pendatives, which structurally and visually help unite the dome to the cubic nave, are found the four evangelists. As writers of the four Gospels they represent the declaration of the Goods News - the incarnation, death and resurrection of Christ.

The cubic nave (representing earth) surmounted by the dome represents earth united to heaven. It is paradise with the tree of life in its midst. It is a walled garden, and so one often finds the soldier martyrs depicted on the lower register, for they guard paradise (the word paradise is a Persian one, meaning a walled and, usually, a royal garden). On the upper registers are depicted scenes in the life of Christ. Below that are various saints. This shows that the whole life of Christ finds its fulfilment in the saints, in the deification of human persons.

The incarnation is attested to by the womb-like apse, on which is usually depicted the Mother of God with the Saviour. Although rarely done, she is sometimes depicted alone, in which case her image is to be regarded as part of the entire iconographic scheme, and so related to Christ who is depicted in the dome. Through Mary, Christ in heaven enters the world as man. The apse is towards the east, where the sun rises, and so is doubly fitting as a place to depict the Incarnation. The troparion hymn for Christmas draws out this symbolism when it says that “they who adored the stars through a star were taught to worship Thee, the Sun of Righteousness, and to know Thee the Dayspring from on high...”

Of course the central place of the sanctuary, and therefore of the whole church, is the altar. St Germanos of Constantinople calls the altar the “border of heaven and earth.”

In the apsidal walls we usually find the depiction of the Apostles’ Communion or the Fathers of the Church liturgizing. It is through Holy Communion that the faithful personally experience what has already been completed by Christ through His incarnation. The Apostles’ Communion image also gives the faithful a lively sense that the Holy Liturgy in which they are presently active is in fact a participation in the one and only Liturgy of that mystical supper. Traditionally, the bishop’s throne is set at the head of the curved apse as a sort of glorified stone bench. Seating for the other clergy continues around the rest of the apse wall.

Sometimes on the arch leading into the apse we see Gabriel depicted to the left and the Mother of God on the right - that is, the Annunciation. The Archangel’s declaration and Mary’s agreement therefore pass through the actual space of the church temple, from one side of the apsidal opening to the other. This shows that the church’s space is itself sacred space, and that the people in it continue to be part of the salvific drama as they say ‘yes’ to the good tidings. This principle of involving architectural space in iconographic space can be used to great effect when placing other iconographic depictions. Or *vice versa*: when drawing up designs, builders can create spaces and forms in anticipation of their iconographic use.

We mentioned the eastern side of the church symbolising the Incarnation. The western end, towards the setting sun, often has depictions

of the Last Judgement. Immediately above the door there is frequently depicted the Dormition of the Mother of God.

We can see from the above summary description that the vertical element in the cruciform church is very rich in theological meaning. It provides a wide variety of surfaces and forms arrayed vertically as well as horizontally. The basilican design, for all its grandeur and the advantages of its simplicity, is poorer in these. A degree of vertical narrative is possible in the basilica through bands of iconographic depictions on the side walls, but these lack the power gained when they are linked to corresponding changes in architectural form, as happens in the more complex church designs.

The iconostasis and altar

Common to all churches, basilican and otherwise, is some sort of partition between the altar area and the nave - variously called the iconostasis, icon screen and templon.. Nowadays this consists of a three doored screen with icons of the Saviour, the Mother of God, saints and, usually, of liturgical feasts. This iconostasis aims to reinforce on the horizontal axis what is depicted on the vertical axis - namely the incarnation of God (Christ born of the Virgin) and the deification of the human person (the saints). As a wall, the iconostasis shows us that we are not yet in heaven, that we are on a journey. And simultaneously, as an array of icons and as a wall with doors, it shows how heaven and earth have been united in Christ.

This at least is the theory. In reality, in many cases the screen has become so massive that many argue that it serves only to separate the faithful from the holiness of the sanctuary and Holy Table rather than to unite them with it. When designing a screen these two roles of partition and unification need to be kept in balance, without one dominating the other.

The nature of this partition has changed over the centuries, so that in our times it is possible to draw on a wide variety of traditional arrangements, selecting those best suited to the pastoral and other needs of the Church community. Because the congregation face this screen throughout all the services it plays a very dominant role in setting the theological and spiritual atmosphere of those services. It is therefore imperative that the screen's design is based on a good understanding of its theology, its history and indigenous customs and materials. The iconostasis has particular importance for those communities who have to make do with a church not designed for Orthodox worship, because it is one of the few architectural elements - and often the only - which they have the freedom to develop; conservation planning regulations usually limit what they can do to the rest of the structure. The iconostasis therefore deserves some space in this paper.

First, a summary description of the screen's historical development, and then a discussion of some of the issues to be considered in designing a screen.

The partition existed from the first centuries of the Church, but only as a low partition, perhaps around one metre high, with a central opening in front

of the altar. It is not known for certain if all, most, or just a few of the very early "house churches" had such a barrier, but archaeological finds do show they existed early on. The foundations for one exist, for example, in a house turned into church in Salon, Dalmatia, dated to around 300 AD. Given the Jewish temple tradition and that of virtually all other religions of having some form of demarcation between the central sacred space and outlying areas, it is probably safe to assume that the majority if not all the early churches had such a demarcation.

From the time of the legalisation of Christianity in 313 AD until the iconoclastic period (beginning 726), this low partition tended to project out into the nave, becoming three sided. This was in response to liturgical developments. The Greek archaeologist A.K. Orlandos has in drawings reconstructed two such fourth century screens as he believes they existed, one in a church at Daphousiae in Locris and another at Olympia, both in Greece. The first is a three sided low carved wall with a simple opening for the entrance to the altar. In the second church the front partition stretches between two pillars, and has two smaller columns either side of the central opening, surmounted by an arch. The side walls are thick undecorated extensions of the pillars' plinths.

As time went on in this period, further columns tended to be added to the wall, with an architrave placed on top. According to Thomas Matthews' reconstruction, such a screen existed in the sixth century Hagia Euphemia in Constantinople.[5] This church and others also had a walled walkway from the screen's central opening to the ambo (the slightly raised platform from where was read the Gospel).

From the time of the restoration of icons in 843 until the fall of Constantinople to the Crusaders (the Middle Byzantine period) we see icons of the Saviour, the Virgin and John the Baptist being placed upon the architrave. As an alternative to this, or sometimes as well as these icons, we see images of the Saviour and the Virgin on the piers either end of the screen and dividing the sanctuary from the chapels either side. Such a screen can be seen at Torcello Cathedral, Venice, built as a Byzantine basilica in the 1100's. Pier icons can be seen as frescoes at St. Panteleimon in Nerezi, Macedonia (1000-1100s) and in the Protaton church at Mount Athos (13th century).

In the late Byzantine church (1261-1453) we see icons of the Saviour, the Virgin and saints being placed in the spaces between the columns of the screen itself. Osios Lukas in Greece (11th century) as it can be seen now has such a screen, with the openings to the side chapels still left without doors.

In the post-Byzantine Church, that is, from the fall of Constantinople to our own times, we see the extension of the screen upwards and also sideways, to enclose the side rooms. It is in Russia around the beginning of the fifteenth century that the very high screen is developed, with up to five tiers of icons. Although this number of tiers is not usually reached outside Russia, there was throughout the Orthodox world a tendency for increased

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[5] T. Matthews, *The early churches of Constantinople*, Pennsylvania State University Press, 1977, page 65.

height, often including, as in Athos, crucifixes two or more metres high surmounting the screen.

What are we to make of these developments when choosing a screen type in our own times? Clearly the preferences of the community itself is a major factor. But on a broader scale there are other theological factors which ought to be considered. Many people say, for example, that high screens create too much of a visual and a psychological barrier between the faithful and the sanctuary, making the Liturgy too much of a spectacle performed by the clergy and observed by the faithful. And even then, so much of the liturgical action happens behind the screen, such as the proskoimedia, making even these events invisible to the faithful.

Another issue is that a high screen obscures the apse and its iconography, so destroying the important symbolism of the “womb” through which Christ become man and dwells with us. One such example is the later screen at St. Catherine’s, Mount Sinai, which obscures the ancient apse mosaic of the Transfiguration.

I have seen a number of small private chapels where considerations of space and personal preference have led to the omission of the screen altogether. In its place are two stands (analogia) with icons of the Saviour and the Mother of God, placed where these icons would have been if there were a screen - that is, either side of the entrance in front of the Holy Table. This has allowed a more intimate participation by the congregation in all aspects of the Holy Liturgy. This arrangement is in essence a return to the house church design of the first centuries.

I am told that there also exist churches in the middle east which have retained this primitive chancel wall arrangement. Among these are St George’s Saydnaya in Syria, St John of Damascus in Balamand, and other monasteries near Tripoli.

Most contemporary congregations would probably feel the reduction of an iconscreen back to the primitive chancel wall is too radical a step. In this case the aim would be to keep the iconscreen as low as possible - for example, with just the bottom row of icons, and just high enough to allow the comfortable passage of clergy (including the bishop’s mitre!) - about seven feet.

Whatever arrangement is chosen, it is important to know that the iconscreen has not always been as it now is, that over the centuries the church has always been very creative and flexible in its design.

Light

Christianity is very much a way of light, of participation in God as uncreated light. For this reason Byzantine architects gave great importance to the play of light in their churches (as indeed did the Gothic architects, although using it in different ways). There are various important elements regarding lighting.

The church should give a sense of light originating from within. A Byzantine poet said this is precisely the effect of Hagia Sophia in Constantinople: “the space is not illumined by the sun from without, but rather the illumination originates from within.” While western models, from the Gothic period onwards, generally let light in directly through large, and

often huge, windows in the walls, Byzantine churches have tended to emphasise the lighting from windows higher up, and particularly in the drum. Side windows are by comparison smaller, with the possible exception of the choir transepts, which can have largish windows to allow the choirs to see the music clearly.

Another way of reinforcing this sense of interior light is through the use of reflective materials such as gold mosaic, gilded icons, polished brass and silver, and coloured stone floors and walls. Also, the oil lamps and candles dotted around, with their light reflecting off the surrounding surfaces, illuminate the space from many different angles. This helps approximate the sense of all pervading light - Divine light, coming from the omnipresent One, having no one point source.

For the Byzantines the way to appreciate something beautiful was not to gaze at it fixedly, but to let the eyes wander over it. Only then, gradually and naturally, would a unity emerge from the diversity. Beauty was therefore an appreciation not only of the oneness but also of the diversity within God's economy. This can be likened to the ascetic/mystical teaching of the Church Fathers, who say that after purification, one needs to perceive, through illumination, the many essences or logoi within the diverse array of created things. Only then are we ready to be united with the One, who is the source of the many logoi.

This practice of moving the eyes around was also related to the primitive idea that a beam of light actually came from the beholder's eye, and it was this light reflecting off the surface of the object which allowed us to see it. Therefore, in order to appreciate the object in its fullness one needed to move the eye around - somewhat like scanning a scene with a torch.

Scriptures use crystal and precious stone imagery to describe the New Jerusalem. This has implications not only for a church's geometry, as we shall see below, but also for its use of light. The church building should suggest something of a jewel's capacity to incarnate light, to crystallise or solidify it. The ultimate expression of this is perhaps mosaic. Then there is the gilding on icons, polished metals, and polished stone. The aim is always to marry light and mass, to show the latter transfigured by the former.

Acoustics

It so happens that much in the cruciform church makes for marvellous acoustics. The curved apse and half dome in particular (a feature shared by the basilica) offer excellent sound projection for the clergy as they face east but need to be heard by the faithful to the west behind them. The apse acts as a type of amphitheatre or megaphone. Domes in the roof also help to throw the sound back down. Curved or polygonal ends of the north and south projections of the nave, where the choirs normally chant, also help sound projection.

Byzantine churches often have ceramic pots imbedded in their thick walls at acoustically important points in order to aid resonance. (It has been suggested that these may have been added also in order to reduce the weight of the walls in critical areas.)

Materials play a very important part for successful acoustics. Most traditional churches are made of stone and/or brick, with lime plaster. These

certainly make for good sound quality. Personally, I find concrete an unsympathetic material aesthetically and acoustically, but I don't have scientific knowledge of the actual acoustic differences between stone or brick and concrete.

Proportions are very important for the satisfying resonance of a building. There is a whole philosophy based on the truth that the same mathematical principles underlie harmonic music and pleasing geometrical shapes. To this subject of proportion we now turn.

Proportion

Matila Ghyka writes in "The Geometry of Art and Life":

> *We generally associate the terms 'rhythm' and 'eurhythmy' with the Arts working in the time dimension (poetry and music) and the notion of Proportion with the 'arts of space' (architecture, painting, decorative art). The Greeks did not care for these distinctions; for them, for Plato in particular, rhythm was a most general concept dominating not only aesthetics but also psychology and metaphysics. And rhythm and number were one. For them, indeed, architecture was not only 'Frozen Music' (Schelling), but Living Music."*[6]

One reason that church designers have used laws of geometry is the *anagogical* function of geometry, that is, its ability to "draw one up" to a contemplation of higher realities. In this understanding, the material world has its order and beauty from God, who arranges all things with due harmony, a harmony which can be partially expressed in mathematics and geometry. A study of these mathematical laws can therefore lead us closer to the Source of beauty. Conversely, an understanding of these laws helps an architect to design good buildings consistently. These anagogical buildings consequently lead those who use them upwards, closer to the divine. Without this understanding of proportion, design becomes a more chance affair, depending entirely on intuition.

So a church should *reflect* the order of nature. But there is also a tradition that a church building can *restore* the order of nature, an order in part broken by the fall of man. That this is possible is suggested by a Scriptural text central to Christian cosmology: "The creation [*ktiseos* in the Greek, which also means building] waits in eager expectation for the sons of God to be revealed...in hope that the creation itself will be liberated from its bondage to decay and brought into the glorious freedom of the children of God" (Romans 8:19,21). God created humankind to be a conductor of creation together with Him. If we start conducting the orchestra of creation out of time then an element of cacophony enters the cosmos; it begins to change from cosmos to chaos. By contrast, when we live harmoniously, and understand the inner harmony of the creation as it is in God (not in its fallen, cacophonous state) and fashion things consonant with these harmonies, then we lead earth back to its Paradisiacal state.

Ugly and discordant buildings are therefore a form of apostasy. They jeopardise the cosmic symphony. They are part of and contribute to the

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[6] Quoted by Sergei Kadleigh in a manuscript for lectures given at the Royal College of Art. London, 1953-57 "The Foundations of Architecture and Art".

ecological crisis. Sacred buildings, designed and built with love and understanding, sing the music of paradise and so help re-tune the terrestrial choir.

Mathematics, as with most sciences, has in our secular age become divorced from aesthetics. But this is a false dichotomy, which needs to be rectified if we are to make consistently successful Orthodox churches in the 21st century. Anthemius and Isidore, the designers of Agia Sophia in Constantinople, were not in fact architects but mathematicians, the greatest geometricians of their day. This in large part explains the pleasing proportions of Agia Sophia - this at a time when mathematics was still a sacred science, a study of harmony and proportion. The historian Procopius describes Anthemius not as *architektonike* but as an engineer (*mechanike*). According to his contemporary Agathius, Anthemius's craft (*techne*) was "the application of geometry to solid matter". Likewise for the medieval western mind, in the words of the scholar von Simson, "what counted in a work of art was not the humble knowledge of the craft but the theoretical science that laid down the laws to which the craft had to conform."[7] The true architect was therefore really a "scientist" who knew, through a rigorous study of the quadrivium (arithmetic, music, geometry, and astronomy) how to apply the laws of geometry to building design. These laws in turn were derived from the laws by which God created the cosmos, which gave it both its beauty and its stability. Here, the words of the Scriptures were important: "You have ordered all things in measure and number and weight" (The Wisdom of Solomon 11:20).

What evidence is there for a Byzantine system of sacred proportion applied to architecture?

The most popular source for the study of mathematics by Byzantines was the *Isagoge* by Nicomachus of Gerasa, who was a Pythagorean of the first century A.D. He researched the harmonies and mystical meanings of numbers and was a theorist of music. For him mathematics was a reflection of the divine harmony. His work continued to be drawn upon and to have commentaries written about it in the Byzantine period by, for example, Iamblichus in the 4th century, Proclus in the 5th, and Asclepios of Tralles and John Philoponos of Alexandria in the 6th. Even in the 14th century George Pachymeres uses extracts from Nicomachus for his introduction to arithmetic.[8] And more generally, Michael Psellos in the 11th century affirmed the usefulness of mathematics for philosophy because it linked the realm of abstract thought with the realm of matter.

St Gregory of Nyssa and St Gregory Nazianzen had earlier established the distinction and relationship between the two realms, naming them *noetos* and *aisthetos,* the one known through the mind or *nous* and the other through the senses. St Gregory Nazianzen importantly says that in the human person God has brought the two worlds together. Commenting on

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[7] Otto von Simson *The Gothic Cathedral* Princeton Un. Press, 1974), page 31.

[8] Gervase Mathew, *Byzantine Aesthetics* (London, 1963), p. 26.

Genesis 2:7, he says that man is a “second world, a microcosm, a new angel, a mingled worshipper,...visible and yet intelligible”.[9]

Sacred geometry was considered by the Byzantine architects as a practical means of revealing this union of the visible and invisible realms. In his commentary on the first book of Euclid’s *Elements,* the 5th century writer Proclus states very clearly the correspondence between the two worlds. He characterises one form of progress from visible beauty to the invisible divine source of beauty as “a transition from harmonies that are perceptible to the senses to those harmonies that are imperceptible”. Understanding mathematical harmonies was thus considered a sort of school house of the mind and senses, which in turn helped the soul and spirit to enter the harmonies of the noetic realm.

Nikoloas Mesarites in his *Description of the Church of the Holy Apostles* (written somewhere between 1198-1203) writes that not only pleasing forms but also harmonious colours derive their success from mathematical laws: “Tones and harmony take their beginnings from arithmetic, the mediator and transmitter between them is geometry” (XLII,8).

In his treatise *De musica* the western St Augustine of Hippo developed explicitly and in some detail the relationship between music, architecture and proportion. He says that good music is the result of science rather than art, since it is based on mathematical laws of modulation. For him the most noble ration is 1:1 since it has symmetry and the two parts have the most union and consonance. Following on these in rank are the ratios of 1:2, 2:3 and 3:4 - that is, the octave, the fifth and the fourth. He went on to apply Pythagorean and Neoplatonic number systems to illustrate how God formed and sustained order in the universe, an order formed by these laws acting upon the chaos of mere matter to form the cosmos of ordered matter. His basis for this correlation of divine order and geometry was the Biblical passage already quoted above: “You have ordered all things in measure and number and weight”

Designers of Hagia Sophia and other seminal churches in Constantinople and elsewhere were primarily geometricians, schooled in the sacred geometry of Euclid and Pythagoras. Eulalius designed the Holy Apostles in Constantinople, and Julianus Argentarius probably designed San Vitale in Ravenna and also Sts. Sergius and Bacchus back in the City.

Of course, the Scriptures themselves are the prime inspiration for the Church, and so the proportions which the Bible gives of the various divinely inspired temples must have been considered significant by medieval church builders. Solomon himself considered the proportions as having eternal significance when he wrote “You have commanded me to build a temple upon your holy mount...a resemblance of the holy tabernacle, *which you have prepared from the beginning*” (Wisdom of Solomon 9:8). These proportions were then a resemblance, an icon, of the heavenly tabernacle. And even this heavenly tabernacle was “from the beginning”, an eternal idea in the mind of God.

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[9] St Gregory Nazianzen, *Orations,* 45, section 7, quoted by Gervase Mathew (see above).

The measurements for Solomon's temple (given in 1 Kings 6) were as follows (in cubit units for length, width and height respectively): overall dimensions 60:20:30; portico 10:20:30; the Holy Place (to which the Christian nave is more or less equivalent) 40:20:30; and the Holy of Holies (the sanctuary) 20:20:20. Reduced to their lowest denominators, these are the ratios of 1:1; 1:2; 2:3; 3:4, already mentioned above.

The measurements for the earlier tabernacle of Moses were as follows (given in Exodus 25): the enclosure 100:50; the tent 30:10:10(presumed height); the Holy Place 20:10:10; the Holy of Holies 10:10:10. The Ark itself was 2.5 x 2.5 x 2.5 cubits. The temple seen by Ezekiel in his vision (see Ezekiel 41) has the same measurements as these for the Holy Place and the Holy of Holies (again, no heights given). These again reduce to the proportions 2:1 and 1:1, with the tent's proportions of 3:1 in fact being broken down to 1:1 and 2:1 inside.

Now, the proportions given above correspond to the perfect consonances of the musical monochord which are double and half, triple and third. This correspondence was presumably known in the eastern Church, and was certainly important for the architects of the Gothic cathedrals - Abelard spells it out explicitly.[10]

It is pertinent that the Scriptures begin with a garden - with its primarily vegetative imagery - and end with a city, the Heavenly Jerusalem, described using crystalline imagery. The picture of this city is of light "solidified" or crystallised into jewels: "It shone with the glory of God, and its brilliance was like that of a very precious jewel, like a jasper, clear as crystal" (Rev. 21:11). Its very shape is that of a crystal, being cubic. The proportions discussed above therefore have their application not only as number and musical proportion but also as solid geometry, as crystals. This has direct significance for architecture which is the design of solid forms - functional crystals if you like.

Let us now turn to a summary description of the more important laws of geometry as they effect architecture.

Pythagoras is accredited with the discovery of the theory of harmonics, although it was Plato who committed these to writing. Plato explained in his *Timaeus* that two strings plucked sound most pleasant when they are equal in length, or when one is plucked at 1/2, 2/3, or 3/4 the length of the other. As already mentioned, the 1:2 proportion is today called the octave (because the one note is the same note as the other but at a higher pitch and passes through all eight intervals of the scale). The 2:3 proportion is called the fifth, reaching through five intervals, and the 3:4 proportion is called the fourth.

From the following we see that these musical harmonies have their equivalent in geometric and arithmetic harmonies, and so can be expressed in architecture. 2:3 = 0.666... which is close to the golden mean (0.618...). 3:4 corresponds to the Pythagorean triangle (a right angled triangle whose longest side is 5 units long and shortest 3 and 4 units). 1:2 = 0.5 is the proportion of a rectangle made of two equal squares, and which has a diagonal of $\sqrt{5}$ length, which is also the joint length of a square and two golden rectangles (i.e. O.618 + 1 + O.618). The golden rectangle

[10] See von Simson (above), pages 37-39.

itself of course has its sides in the golden mean proportions of 1:0.618 (or conversely, 1:1.618). The golden rectangle is used extensively throughout ancient architecture.

Plato expressed this unity in a system called 'Lambda' after the triangle which they form. Summarily put, through mathematics he ends up with a series of 34 terms linked in geometric, arithmetic and harmonic proportion (the golden mean is also involved in these intervals).[11]

A simple means of arranging architectural proportions is a modular method, where all the main dimensions are multiples of a given module. The scholar J. Posmourny has, for example, deduced that the churches of the Great Moravian Empire have their floor plans based on the module of their semi-circular apse, which is by and large twelve Roman feet (i.e. 354 cm.) internal diameter.[12] That is to say, the dimensions are multiples of the module. The greatest architects of the twentieth century - Le Corbusier and Frank Lloyd Wright - both affirmed that the basis of their work was an in depth study of proportion and symmetry, and Le Corbusier's proportions arose from a modular system which he developed, based on the golden mean.

Besides numerical and musical proportion , Plato also explored in his "Timaeus" the proportions of solid geometry. This work was known and read in the Byzantine world, and so we can presume that it had a bearing on their church design. An overview of Plato's understanding of this area would not therefore be amiss in this study.

Plato showed that the two basic triangles of 60 - 30 degrees, and 45 degrees generate the only possible five regular polyhedra, now called the "Five Platonic Bodies". It is significant that these two triangles can be bought in any art shop, being still the standard set squares used by draughtsmen and architects - or at least those few who still use pencil and paper!

Plato identified the only five regular polyhedra as the tetrahedron, the octahedron, the icosahedron, the cube and the dodecahedron. (He held the first four to symbolise, respectively, fire, air, water and earth. The dodecahedron he believed to symbolise the harmony of the cosmos.)

All five of these polyhedra can be inscribed within a sphere and also within a cube. The sphere is a symbol of unity, but within this sphere there can also be inscribed the cube, and within this cube the above five polyhedra, which themselves have their own particular unity being regular and symmetrical. And so we have unities within unities. We have an organic

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[11] This precise correlation between musical and numerical proportion was blurred with the introduction of "well tempering" keyboard instruments, introduced by Andreas Werkmeister in 1691 and popularised by J.S. Bach in his preludes and fugues for "the well-tempered clavier". Up to this time keyboards were tuned "purely", in accordance with the overtones of a chosen note (usually C, in which case the keys were tuned to the scale of C major). Of course, if the player shifted to another key while playing, things wouldn't sound right. So Werkmeister introduced the idea of "tempering", that is, he adjusted the intervals so that they didn't correspond precisely to the natural intervals one gets when tuning according to overtones.

[12] Referred to with illustrations in V. Vavrinek (Prague) "Miscellaneous Notes" in *Byzantinoslavica*. 25 (1964), pages 288-301.

system of microcosms within microcosms. This is the geometrical, and therefore architectural, equivalent to the musical scale. For example the sphere and cube - or the circle and the square in plane geometry - correspond to the octave in music (that is, the doubling or halving of vibrations).

The architectural implication of this harmony of solid shapes is the importance of scale. Each part of the whole building needs to be to the same scale - or to use the musical equivalent, according to the same mode. A portion of a building, like a capital, should reflect the whole, and will do this when it is designed according to the same geometrical proportions as the whole. Attention to this scale explains why a small Byzantine church can have a similar effect on us as does a large one: they share the same geometry and proportions, they are composed in the same “key”.

An interesting example in nature of how geometry affects the quality or “mode” of something is graphite and diamond. These two substances are chemically identical, both being pure carbon. The one is soft and slippery, the other the hardest known natural substance, and yet the only difference between them is the geometrical structure of their molecules.

The successful design of a building requires an understanding of the effects of geometrical shapes on the soul, just as a musician understands the effect of different musical modes on the mood of the hearer. Architects working within a sacred tradition are composing shape in much the same way as a musician composes music. In this sense sacred architecture, as we have already noted, is as much a science as an art. It is first rooted in an accurate understanding of what is, of the laws of the cosmos and the spirit. This scientific knowledge is the necessary basis upon which the architect’s intuition and creative ability can then work in order to design a church which both has a timeless quality and is responsive to the needs of its particular users.

Through its correlation of number and human experience, geometry offers a meeting point of philosophy and science, of idea and material, of the invisible and the visible. This is why geometry played such a major role in the researches of Pythagoras, Plato, Aristotle and after them, the Byzantines. For this same reason geometry plays a vital role in expressing the Incarnation in church architecture; it crystallises the invisible. While not treating them as a rigid and mechanical system, we would do well to study these principles of proportion more deeply and apply them to contemporary church design.

In what ways can proportion be used for churches? First, in the floor plan. As we have seen, the most important set of proportions are the ratios of 1:1, 1:2, 2:3 and 3:4. and of course the golden mean. An atrium, for example could be in a 1:1 ration to the nave, while a narthex might be 1:2.

In the elevation (side) plan, transitions of one element to another can be made to occur at proportionate levels. A study by G. K. Wagner of four Russian churches built around 1400, for example, shows that these were designed to a modular system of four sections. The first quarter line passes just above the top of the door. This transition line is reinforced by an architrave moulding, and in the Andronikov Monastery church, by capitals. The second quarter line (halfway) gives the height of the nave before the

drum begins. The drum takes all of the third quarter, while the dome and its cross fill the final quarter. The golden mean ratio is also evident in the proportion of the width to height of the west front's middle and side sections formed by blind columns. The churches also fit nicely within a triangle, the sides of which touch the base of the stairs, the top edge of the cubical nave and then of the drum, and end at the tip of the cross. This triangular frame lends the buildings a sense of stability.

As hinted above, the line of transition from one module to another can be further demarcated by the discerning use of lesser architectural features, such as a line of decorative brickwork, a moulding, capitals or windows.

THE EXTERIOR: TRANSFIGURED MASS

As a rule, despite their sometimes complex general forms, Orthodox churches (as compared to western medieval churches) have relatively plain and unadorned exterior surfaces. Hagia Sophia in Constantinople is a prime example. The emphasis is very much on the splendour of the interior, with its icons, gilding, wall paintings and metal oil lamps. It is a design of asceticism, reflecting the adornment of the inner person rather than the embellishment of the outer. Perhaps it is also an affirmation of the physicality, the "massness" of the building, as compared to, say, the Gothic, which through its large windows, thin columns and flying buttresses tries to dematerialize rather than transfigure the mass.

Any adornment that is present in most traditional churches aims to represent mass transfigured rather than dematerialised - a subtle but theologically vital distinction. And so any carvings present are relief carvings (Georgian churches often, for example, have carved reliefs placed apparently randomly within the walls). Later Byzantine churches often used dog-tooth designs in brick. These preserve the basic outline whilst allowing interaction of the building surface with the natural light. Many plastered Russian churches break otherwise plain walls with simple low relief arches. Also, the undulations in the plaster create an interplay of light and shadow, and in this way interact with the light around. At the most fundamental level of surface treatment, often quite course undressed or semi-dressed stone has been used, which itself is a form of subtle surface decoration. The variations in colour, texture and outline of such stone make the wall play with the light around.

Subtle imperfections of form and colour give grace to a building. This is in contrast with cast concrete, whose surfaces and edges are usually straight and flat - too mechanically 'perfect' to sit comfortably with the soul. And to most people the look and touch of concrete is also unappealing; its uniformity is tiring to the eyes and touch. To help mitigate this, as discussed below in the section on materials, concrete is often covered with another material - render, stone, brick or paint.

One way of making concrete more organic is to cast it into rounded and curved forms. This has been done successfully by Le Corbusier in his Ronchamp chapel. It remains to be seen if this approach can be successfully applied to Orthodox churches.

Carving: the west portal

One area where contemporary Orthodox churches can draw on early western traditions is the tympanum and associated portal carving. This is particularly rich in the Romanesque period. A lot of theology can be expressed in these relief carvings above and around the west entrance door. It is also a place where Celtic design can be successfully incorporated. Titus Burckhardt discusses the symbolism of Romanesque church portals in his book "Sacred art in East and West".[13] The following is drawn from this chapter.

The portal is a microcosm of the whole church, with the recessed entrance or niche representing the church's interior. The arch or tympanum corresponds to the dome, and so to the heavens, and the columns correspond to the cubic nave and so to the world. A door is a place of transition, a means of moving from one place to another, and so by implication symbolically represents a move from one mode of being to another. It shares in two places at once, the outside and the inside, and so represents Christ: "I am the door: by me if any man enter in, he shall be saved..." (John 10:9). Architecturally, the door itself therefore corresponds to the sanctuary and altar.

These symbolic features tend to be the inspiration behind the portal carvings we see in Romanesque churches. The dominant image is usually that in the tympanum, where are found variations on the theme of Christ in heaven. It may be Pentecost - Christ sending the Holy Spirit from heaven to earth, as at Vezelay in France - or Christ enthroned and surrounded by the four living creatures, as at Chartres, or the Apostle John's vision of heaven, as at the Abbey Church of St. Pierre, Moissac (*c.* 1120).

There is tremendous scope within these broad parameters for different theological and mystical emphases. The Romanesque carvers exploited this potential. Moissac is a good example. Below and beside Christ enthroned we find the twenty-four elders. Some hold cups, symbols of reception of grace through contemplation, while others hold lyres, symbols of participation in grace through works.

On the two pillars supporting the lintel of Mossaic are carved the Apostle Peter holding keys and the prophet Isaiah. Isaiah prophesied the incarnation through the virgin birth, which is the basis of our entrance to the Kingdom of God, and Peter represents the Church, the sacramental means of our entrance. Both these saints are therefore bound up with the descent of God to earth (we recall that the pillars represent earth, but because they are next to the door, they also participate in the image of the door as Christ).

The central pier has three pairs of lions, one on top of the other, each lion crossing its partner, with a circular flower in between. Burckhardt surmises that these recall the royal throne carvings of Sumerian art, probably brought to France via the Islamic art of neighbouring Spain. The three pairs are, he suggests, the stages of world history culminating in the age to come - Christ enthroned. They also represent the equivalent on the personal scale: the three faculties of the soul - desiring, incensive and

[13] Titus Burckhardt, *Sacred Art in East and West* (London 1967), pages 77-100).

rational - united in service of God. Or again, the three stages of purification, illumination and union leading us upwards to Christ.

The lintel and the outlying strings of vaulting (the archivolts) display fantastic flowering ornaments, the lintel designs emerging from the mouths of two beasts. Clearly Celtic and Anglo-Saxon designs can be adapted for use here, just as it seems the Romanesque carvers freely drew on Islamic motifs. Celtic iconography is very rudimentary in figurative work, but rich in geometric, vegetative and zoomorphic work. By using such designs a British Orthodox church can affirm its roots in the ancient Church in these lands.

Domes and roofs

Apart from most basilicas, Orthodox churches generally have one or more domes. The question arises of whether a dome visible from the outside is harmonious and appropriate in Britain. Each church design of course needs to be considered in the context of the local architecture and climate, and in some cases a visible dome might be appropriate. But other options for roofing a dome need to be considered.

Personally, I think that in most cases in Britain pyramidal (or sometimes conical) roofing over domes is more suitable than exposed domes. In most instances this would be a wooden structure clad in whatever material is best for the area (such as slate, plain tile or copper). This would sit over the dome.

There is a long tradition of this pyramidal or conical roofing over a dome in other Orthodox countries, particularly in Georgia. It has various advantages. First, many feel that a dome tends to look foreign in Britain (although there are notable exceptions, such as St Paul's, London and other Wren churches, and numerous civic buildings such as the Council Chambers of Birmingham). Second, a pitched roof sheds snow better than the squat domes common to Balkan Orthodox churches. (This could be why Russia developed the onion dome, with its steeper pitch than the hemispherical Byzantine prototype). In general, hemispherical domes easily develop weather-proofing problems in wet climates. Third, with a roof distinct from the dome, one can reduce the mass and therefore weight of the hemisphere since it does not have to bear the weight of the weather-cladding. This in turn reduces the outward thrust on the walls which accompanies heavy domes (or at least those which are not of pre-stressed concrete).

If the roof's pitch is kept fairly low - around the 45° mark - then the incarnational effect is retained. If allowed to get too steep the roof begins to point *outside* the church. Increase pitch also increases the surface area and therefore the cost of materials and labour. The church also retains a sense of lowliness, of humility if the pitch and therefore the height of the roof is kept low.

One material which could be considered for the dome itself is insulation or breeze block (a light, aerated block). This would be best laid on its side rather than upright, the broad side facing radially towards the centre of the dome as do the tile bricks used in most Byzantine domes. Breeze block or its equivalent is light, offers excellent insulation, is load bearing and is easy to cut by hand saw. Its lightness means that the hemispherical form over

which blocks are laid need not be so massive as that required for cast concrete. This reduces the cost also. The dome's interior can be easily scored so as to create a good holding surface for plaster in preparation for fresco or mosaic.

BUILDING MATERIALS

As already discussed, it has been the tradition of the Church, beginning with Pentecost, to express the life of the Spirit in an indigenous way - in the language of her liturgy, her music, the style of her icons, and of course, in the details of her church architecture. In this way the Church transfigures all that she lays her hands to, affirms all that is good in the cultures she finds herself in. A major way this is done in her church construction is to use, whenever possible, indigenous materials, particularly for the exterior. Russia, for example, with its wealth of forests, often made her first churches on a given site out of wood. For greater permanence these were often later replaced with stone or brick structures. In places like Greece where it is more plentiful, stone is more commonly used. English churches are generally of stone of course, and this usually from local quarries.

There are exceptions to this preference for local materials: when for example an emperor wanted to make a particularly splendid church then rare stones and other materials were often brought from great distances and at great expense. Yet even here, these exotic materials tended to be for the inside of the church - the exterior was so often of more humble local material.

Concrete

The major challenge of contemporary church architecture as far as building materials go is the use of concrete - reinforced concrete in particular. Reinforced concrete is a new material which the Church needs to consider very carefully before using for its temples, if it decides to at all. Its chief novelty lies in the fact that it works in tension (because of the metal reinforcing, especially if pre-stressed) as well as in compression (because of the dense concrete). Metal by itself has these qualities, but unlike concrete it cannot be poured into the large moulded forms needed for architecture.

Non-reinforced concrete is not a new thing. It was extensively used in Roman building (as in the Pantheon in Rome) although their concrete was not as strong as the modern. It was what is now called hydraulic lime. Their basic method was to contain the concrete within two skins of stone and /or brick; the strength was primarily in the concrete core rather than in the visible stone or brick. For some reason, this Roman concrete was to all intents and purposes abandoned by the Church as a building material. Early church architects preferred to rely on blocks and mortar for strength. A major factor in its abandonment must have been the development of single skin brick domes in the fourth century. Their lightness compared to concrete allowed much greater spans.

So what are the pros and the cons of reinforced concrete for church use today?

The arches, vaults and domes which are so familiar to us in traditional churches were a response to the structural needs which arose from the fact that brick and stone only have compressive strength and virtually no tensile strength. The arch and the dome are the only viable ways of spanning a large space with blocks. These forms transfer horizontal thrusts downward into purely compressive forces. Before the advent of the arch and its derivatives, the Classical Greeks had to space their columns and other vertical supports very closely, and use massive stone blocks to span even these short distances. And despite this these lintels still often cracked and even collapsed altogether.

And so the aesthetically pleasing and theologically rich forms of the arch, vault and dome (plus some other traditional shapes) have arisen as a response to the tensile *weakness* of stone and brick; the structural weakness of these traditional materials is their aesthetic strength.

One can also mention that because stones are moved about by hand, at least in the final stages of setting, they tend to be cut into manageable dimensions; they retain a human scale. There do exist some churches made of very large ashlar blocks, especially in Syria, but this is the exception. And so again a ‘disadvantage’ of stone (in this case, the inconvenience of its density and therefore weight) is also its aesthetic strength. The need to use relatively small blocks gives even large buildings a human dimension.

Reinforced concrete, on the other hand, is so strong that you can span vast areas without any supports and even without any arching. Long, straight horizontal lines and masses therefore become possible, and in fact economically preferable due to the lower cost of making flat shuttering rather than curved. And because it is cast *in situ* rather than carried as blocks, it tends towards monolithic forms, in contrast to traditional block structures which reduce expanses of surface and mass to a more restful, human scale. And so the structural strength of reinforced concrete is its potential aesthetic weakness.

Most people prefer a stone or brick church to a concrete one, but the fact remains that, at least in the short time scale, concrete is cheaper. In earthquake areas planning laws may even require reinforced concrete. So what does one do?

Of course one can try and get the best of both worlds, by making traditional church forms but with the cheaper and more convenient material of concrete. This is the approach taken by virtually all contemporary church builders in Greece. Sometimes they paint these structures white, in imitation of rendered stone buildings, and sometimes clad them in stone. But this approach has a great danger of artificiality. It copies forms which had functional as well as aesthetic reasons in the traditional material, but which are in large part redundant in concrete. This is an issue which needs to be looked at.

If cladding is the option chosen, one has to be very careful how it is done. Using thin stones set upright so as to cover a large area quickly creates a very artificial “crazy paving” effect. The thinness of these stones is especially evident in the corners, where thick key stones are found in a solid stone building. Unless a lot of space is allowed for the cladding - say around 30

cm or more, depending on the stone used - this method will always looks contrived.

An alternative to cladding, which I have seen used well at Iviron, Mt. Athos, is to revert to the old Roman technique of traditionally built stone walls filled with concrete (nowadays possibly also reinforced) in the core. This is combined with modern poured and reinforced concrete in invisible places, such as in basements. As much as possible one wants authenticity, not superficial effect.

If concrete is to become an enduring and successful material for churches it will be because forms and techniques are developed which combine aesthetically beautiful and theologically rich structures with the particular characteristics of concrete, rather than forcing it to imitate other materials. That is, a concrete church should work well liturgically, theologically and aesthetically in a way that is true to the nature of concrete.

But can this be done? Many would argue that reinforced concrete is of its very nature too cold and impersonal ever to be used successfully, at least for churches. Personally I agree. This material and its accompanying techniques have been developed in our age in response to the need for large civil and commercial structures, which need to be built quickly and relatively cheaply. It is well suited to such things as bridges and high-rise apartments and offices. The question then arises whether of its very nature this material tends a building towards the impersonal and massive.

What is certain is that the Church needs to look very closely at the pros and cons of reinforced concrete before either adopting it or rejecting it. Perhaps a middle way is needed, where it is used only for certain areas like basements or crypts to keep costs down without sacrificing aesthetics.

Stone

For many, stone is aesthetically the ideal building material for churches. It is entirely natural, and so has all the grace and interest which comes with a natural material's variation in colour and shade. Stone can be cut or carved into regular shapes (called ashlar or dressed stone) or can be used in its natural rough state. Most stone can of course also be carved into decorative forms.

Stonework is among the most expensive means of building, due both to the cost of the stone itself and the large labour involved in either dressing the stone or in laying it if it is used undressed. However, in some areas there will be no other option as planning authorities will demand it. If there is sufficient stone found naturally on the building land itself, then of course the extra cost of laying it would be offset in part or whole by the stone itself being free.

In virtually all cases in Britain, building regulations will require one or more additional skins for insulation. A common system used is to connect by metal ties the exterior stone wall to a load bearing concrete block or brick wall. There is then a cavity followed by insulation board, followed finally by insulation block such as breeze block, which is then plastered to form the final interior surface.

Brick

Brick can be treated as a variant on dressed stone. As with stone, there will be cases where this be required by planning authorities. It is generally cheaper than stone, since the bricks are usually lower in cost and their regular shape makes laying much quicker than with undressed stone.

The monotony accompanying regular brick can be broken in a number of ways. Patterns can be made by using different coloured brick. The late Byzantines specialised in laying bricks in various configurations such as dog-tooth and herringbone. One can also combine stone with the brick. Care is needed in the choice of brick itself, as many modern products are extremely uniform in colour and texture and therefore dull and mechanical of themselves.

Wood

Wooden churches can be considered as an option in certain limited situations in Britain. There are three main systems: log, half-timbered and cladded frame. Common cladding methods are horizontal weatherboard or ship-lap, plain vertical boarding with battens over the joins, wooden shingles, and slate or clay tiles.

If the building plot is in a forested area perhaps a log construction would not look out of place. There are craftsmen in Balkan and Russian lands who can make log buildings quickly and therefore at a reasonable price. There are also companies in these countries who prepare the logs as a sort of kitset.

There are three variations on log construction. The most primitive system uses the rounded log. The faces which meet can be left rounded and the spaces caulked, or the underside can be cut concavely to receive the underside log, or both sides can be cut flat. The second option has the inside and/or the outside surfaces planed flat. More complex tongue and grove systems of locking the logs might also be used. The third option is to cover the outside surface in another material. In New Zealand I have seen a thin metal coating with an enamelled paint finish integrated with the planed log face, somewhat in imitation of ship-lap. In Russian villages one often sees the entire original log house sheathed in weather boarding.

Advantages of log construction are its good insulation value, relative ease of construction, flexibility (you can easily add to it),and the aesthetic warmth of exposed wood.

Practical disadvantages are the fire risk (and so presumably higher insurance premiums), the tendency for it to look foreign in Britain, and the danger of woodworm (though the logs can be pressure treated before construction). There are also limitations imposed on interior iconography. Wall painting and mosaic, for example, are not really options with this construction, unless one creates a false interior skin with materials such as plaster on metal lath. But this could be criticised for being somewhat artificial, an attempt to force onto the wooden structure a form of iconography which developed out of stone or brick buildings.

The alternative to log construction is the more commonly used system of wooden frame (usually 3”x2”) sheathed inside and out. This shares most of the same pros and cons as log construction.

It is of course possible to combine brick or stone with wood, somewhat in the manner of many old barns. The stone base keeps the wooden area away from the ground and dampness. In general, wood will tend to have its greater application not in churches but in subsidiary buildings - church halls, monastic cells and so on.

CONCLUSION

A church is above all a place of worship. The requirements of the Liturgy and other services must be kept paramount. The community which uses the church will also have specific needs which need to be catered for. Perhaps, for example, it needs a community hall, which due to lack of space needs to be integrated with the church rather than be accommodated in a separate building. In such a case a crypt could be a solution.

When a community begins to discuss a new church design, it quickly finds that it is not just discussing shapes and designs, but theology, pastoral priorities and mission. Church architecture is not just about theology, it *is* theology. It is theology in form, just as iconography is theology in colour.