Hagia Sophia

One of the world’s most remarkable buildings, Hagia Sophia has been claimed by East and West and has acted almost as a cultural bridge between them. It can be approached from many perspectives, such as architecture, structure, history, myth, decoration and from the point of view of its influence on world architecture. Built more than 14 hundred years ago, needless to say it has lost a lot of its dazzling effects, but is still one of the most remarkable buildings of any time. In spite of the great structural and decorative changes that it has undergone and in spite of the different environmental conditions in which it is placed today, it still comes down to us close to its original form and continues to exert a great influence on any visitor.

There have been many studies conducted on Haghia Sophia from the point of view of its structure, as a great structural feat from which architecture can still learn a lot, but also from the point of view of restoration in the hope of being able to protect this great edifice which is under constant danger of corrosion. Since its building in 537 in the era of Justinian, Hagia Sophia has undergone many restorations and constructions to protect its structure. Over time, its structure has undergone distortions due to seismic and other structural problems. Yet, for a building which has been alive since 1500 years its monumentality has not lost anything.

History:

Constantine who was urged by his mother to officially accept Christianity, moved the capital also away from Rome, because for several centuries Rome had suffered from the struggle against this new faith. Other cities in the Mediterranean, such as Antioch in the SouthEast of Asia Minor, or Alexandira on the African coast had become even more populous and popular than Rome. In Constantine’s time, Christianity was better established in the East. Christians gathered in churches like the church of the Golden Octagon in Antioch and in Nicomedia’s large church. It was in 324 that Constantine chose Byzantion as his city and it was named Constantinople. This was then the new Rome and the capital of Christianity. Till then Roman emperors had often left Rome to live elesewhere, and likewise Constantine was not someone who settled, before he made Byzantion his city.

At first it was the church of Hagia Irene which served as the cathedral of Constantinople. In 350 Constantinus, son of Constantine built a new church called Hagia Sophia. This early Hagia Sophia had a single basilican form in the example of the first Christian Church in Rome, the great Lateral church, built by Constantine in the honor of his Chirstian mother.

The important events about the cathedral of Constantinople were all centered around the struggle for power between the patriarch or the bishop of Constantinople and the Emperor. Ideally the cathedral was the place where the Emperor and the Patriarch met in peace. It was a place where both became equal under the protection of God; however,
politically this was not always so and usually, the building of Hagia Sophia suffered by the strife between the Emperor and the Patriarch because the cathedral was also a place for public gatherings, and for the people voicing their complaints. Usually the bishops were against the power and the riches of the Emperor. In 398 John Chrystostom became bishop and started to oppose the emperor. When he was exiled by the emperor there was a big riot and the populace burnt down the cathedral. Hagia Sophïsa was rebuit in 415 and then burnt down again. Finally in 532 Emperor Justinian decided to build a more impressive cathedral.

The architects Anthemius and Isidore are referred to, by the contemporary historian Procopius as mechanicoi and not as architects. Anthemius must have been a teacher of geometry. They were more like master builders or engineers. Yet, it is thought that without their new theoretical approach it would not have been possible to build such a new and unique design.

The dedication of Hagia Sophia occurred on the 27th of December in 537. While the Patriarch Menas rode in the imperial chariot, the Emperor Justinian walked with the people in the procession.

Hagia Sophia was where the Byzantine emperors were crowned. This was also because they wanted to have a good relation with the church. When the Emperor entered the church, he would leave his crown and sword at the narthex before entering the main hall.

When the Ottoman Sultan Mehmet II took Constantinople in 1453, the first thing that he did was to pray in the Hagia Sophia. He had the church cleaned and decorated and paid his respects to it. Hagia Sophia became the imperial mosque of Mehmet II for 10 years till he had his own mosque built. We believe this was designed by the Venetian architect Filarete. Mehmet II did not touch any of the figurative mosaics. Some time later, they were covered in plaster, as a protection against any harm that might come from fundamentalist religious people. All through the Ottoman rule Hagia Sophia was greatly venerated and after the foundation of the Republic of Turkey in 1923 it was turned into a museum.

We should not forget that during the Middle Ages, Constantinople was raided many times by the crusaders of the Catholic West. The 4 bronze horses that are now in front of the Church of in Venice came from Constantinople as well as many relics that are now in the church. Constantinople was also raided by the Arabs in the 7th century, and Hagia Sophia having made a great impression on them, it was written in the coran that this great house of god must have been meant for the Muslim people who had come to correct the corruption of Christianity. Therefore, it is certain that the Muslim world had always a great veneration for Hagia Sophia.

Byantine architecture was also not highly appreciated by the West which had, since the Renaissance very different aesthetic principles. It was only in the early 20th century that the western art critics looked at Hagia Sophia favorably. Its architecture was constructed on very different aesthetic and structural principles than Western churches.
Let us now turn to the building itself. Although having withstood many dangers of collapse, today we take Hagia Sophia for granted. However, seen in the context of the technology of building of its time, it is a miraculous building in terms of its structure and visual impact. Although its dome has partially collapsed several times, and therefore it is no longer a perfect geometry, it is a remarkable structural feat given that it is a very low dome. Also, as we know that the first scientific calculations of statics were only possible after 1730’s, it is a great success that Anthemius and Isidore could so well calculate the structural stresses of the building in 532. The structural and static analyses made today, show that the architects had a qualitative understanding of the stresses and tensions of the building. However, it could be said that the deficiencies of the structure came from the fact that their understanding was not exact in a quantitative calculus.

What impresses one about Hagia Sophia is the breathtaking height and width of its enclosure and how immediately when we enter the nave, we are pulled into the movement of the space under the dome, attracting us towards the apses but also making us fully aware of the expanse and weightlessness of the dome.

According to the great expert of Structure, Rowland Mainstone, who also wrote a book on Hagia Sophia, till the modern times, there were actually two kinds of building types for spanning wide openings. One was the space thurss that ends in longitudinal spaces and their covers such as in Gothic cathedrals, and the other the tholos tomb type which is a circular structure covered by a central dome. Hagia Sophia belongs to the second type. Yet, often this second type, in its general use shows the application of many openings – like the octagonal baldachen – to which many additional spaces were added, in the form of an ambulatory. These additional structures that surrounded it, were in fact means to support the outward thrust of the dome; they acted as buttressing. In the case of Hagia Sophia, such a structure would not have been appropriate for a cathedral which needed a very expansive space to house a large community. Such a form would also not have contributed to its monumental grandeur. At this early stage cathedrals were often not very much concerned with their exterior appearance but concentrated more on the interior appearance. However, Hagia Sophia was also very impressive from the exterior, with its silhouette of the great low dome and the tympanum full of windows on the north and south elevations.

To achieve the monumental interior, the space was mainly structured by 4 great arches carrying the dome. However, as in all cases when domes and vaults are used, the dead weight of the cover elements, of the dome, would push the carrying piers and columns outward and distort the structure. One way to stabilize the system was to counter the outward thrust of the dome, by using other domes that would buttress it. In the case of Hagia Sophia two half domes were used and the arches which supported these had to be built very deep, almost as barrel vaults. So, the thrust of one spanning element was balanced by another spanning element.

In western architecture, the preference for churches was the use of the basilican form with space thursses, as in the case of Gothic structures. The dome with the centralized
form was preferred for mausolea and martyria. In the East, meaning in Byzantium, and later in Ottoman mosque architecture, the centralized dome system was preferred. Nevertheless, except for Hagia Sophia, all Byzantine churches were small in size. It was rather the Ottomans, and especially Sinan, the 16th century architect of Suleiman the Magnificent who developed the potential of Hagia Sophia’s structure to its full advantage. Using exclusively domes and half domes to cover the spaces and also to counter the outward thrust, and to enlarge the interiors.

However, Hagia Sophia is not a simple centralized structure. It is a complex system with a synthetic structure. It is a combination of both the domed hall and of the groin vaulted rectangular hall. Usually, when the basilican form of axial space was chosen in the west for churches, it was because the round, domed hall did not offer many possibilities for meeting spatially other church functions such as chapels etc. The basilican form was more suited to create a complex plan that would accommodate other secondary spaces. The fact that the Ottomans preferred the domed hall was because the functions of a mosque were very singular, only communal prayer.

Hagia Sophia used the two half domes to expand space in an axis from West to east and also to counter support the outward thrust of the dome. Yet, these half domes also had to be supported against their outward thrust. Therefore, they also opened on both sides by the use of two exedrea. The other problem of using 4 piers and 4 arches was the passage from the dome (the sphere) to the base (the square base created by 4 piers). The pendentive was used as the passage element from sphere to square. Yet it was necessary to make the bridging arches deep enough so that they would act both horizontally and vertically to counter the forces.

As we see, not all the structural problems were perfectly met, since the dome collapsed shortly after the first building. The second time it had to be heightened by 20 Byzantine feet to make it more solid. Also over history, many times, the piers were strengthened by being made wider, and the second storey columns that were free, had to be connected with a filling wall to strengthen the piers. Also, the buttressing of the piers on both southward and northward directions had to be connected; in other words there had to be a triangulation of buttressing against the outward thrust. Since this was not strong enough, there has been a strong distortion of the structure at the base.

‘‘Only on the north and south were the outward thrusts of the dome resisted by deep arches spanning between the main piers. To stabilize these piers against the thrusts, they were extended outward beyond the arches, to form, above the level of the gallery roofs, the boldly projecting masses that are still one of the most conspicuous features of the exterior... arched openings were left in these outward extensions to provide passageway along the aisled and galleries and over the f-gallery roofs.

The result architecturally was a breathtakingly vast expanse of completely uninterrupted space thirty meters wide, more than twice as long and open for most of its length to broad galleires and aisles that were once filled with light much more than they are today.’’
‘‘Dematerializing the structural mass by casing of the piers with colored marble, and the
dome and curved arches with mosaic... creating a marked sense of ambiguity about the
nature of the true system of support. Procopius said ‘‘ as if the dome did not rest on solid
masonry but covered the space with its golden orb, ‘suspended from heaven’. The most
proper place for the meeting of the Emperor and Patriarch to exchange the kiss of
peace.’’

‘‘Up to the springings of the arches and semidomes the piers were constructed by stone
closely fitted together. Above, brickwork was used.. but of very high quality where it
would be subject to stress. Considerable use of both timber and iron ties. Iron as cramps
between adjacent blocks of stone’’

‘‘ In the Moslem East, the achievement acted, till the conquest of Constantinople’ as the
spur to the building of a considerable number of large domed prayer halls and
mausoleums of a simpler design than as something to be directly emulated. Two
differences: pointed arch rather than semicircular and squinches rather than
pendentives. After conquest created a challenge to build a series of imperial mosques
that might be interpreted as constructive criticisms of the design of St. Sophia. In
Ottoman times the greatest comprehensibility and clarity, rather than the intricacies of
the plan of St. Sophia are searched for. In the Sultan Ahmet.. well fitted stone instead of
deformable brick and more iron tie rods especially at the level of the exedrae.’’

Span of dome 32 meters, length of nave more than 72 –82 meters.
The Atrium is gone. It was where the public met also for all kinds of protests and social
events in addition to religious festivities. The Partiarch’s room must have been on the
second floor, because one of the documents states that when the Emperor asked him to
come and meet him he was in the middle of a service and had to come down the steps.
His house must have also been close.

At first all decoration was without figures, Gold tassarea which gave a light to the dome,
also because the dome was lower it reflected this light much more. There were always
gas lamps and the light of the interior is said to have worked also as a sign to the sailors,
because it could be seen from afar. The 40 windows in the drum, each corresponding to
one rib of the dome, also supplied the inside with a lot of light, the first rays of the sun
came in through the dome. It is claimed that when it was built the Hagia Sophia’s
interior was much more luminous because many of the windows on the side aisles were
not blocked. Later, the additional buttressing and the minarets prevented a lot of light
from entering.

Procopius echoes Homer when he says ‘‘(the Dome) does not seem to rest upon solid
masonry but to cover the space as if suspended from the heaven by a golden chain.’’
The interesting fact about Hagia Sophia is that it combines the basilical plan with the central plan. This must be due to the liturgical practice of those times when many different entrances were needed for processional entrance of different groups, a huge area for the congregation and also areas to keep some groups separate like the women and the catachumens.

Most of the figurative mosaics date from the 9th to the 12th centuries. Some of it was destroyed because the church underwent many earthquakes. Today in the lower aisles some of the mosaics that cover the vaults are original ones. Very few original ones remain in the upper galleries. After the first earthquake which was only 5 years after it was built, the second great earthquake was in the 9th century and the other great one was in the 13th century, in all of which the dome was always partially destroyed and rebuilt again. In the first time it was heightened about 20 Byzantine feet and was repaired by Isidore the younger who was a nephew of the original Isidore.

Selim the Second, (1566-1574) was one of the Sultans who paid most respect to Hagia Sophia, he ordered the cleaning of all the buildings around it and Sinan strengthened the dome and also added some buttresses on the atrium side. The great marble urns in the nave are gifts that are brought from Bergama, old Greek urns, by Selim the second.

As Rowland Mainstone convincingly argues, it is Ottoman architecture and especially Sinan who during the reign of Suleiman the Magnificent developed the potential offered by Hagia Sophia into its most rational and perfect structural form. At first, In the Sehzade mosque, Sinan carried the centrality of Hagia Sophia further by using 4 semidomes which created a most balanced structure where the thrust of the dome was supported from all sides, as in an ambulatory, but this time with semidomes which had the same diameter as the dome and therefore expanded the space in four directions without getting smaller. Yet, the 4 pillars in the center of the space was a problem for Ottoman intentions of space for communal prayer. In the Suleymaniye commissioned by the Sultan in 1548, after he had signed a treaty with Charles the 5th and claimed to be the greatest sovereign of Europe, the Hagia Sophia model is repeated in principle. However, this time the great difference is that we do not experience any divisions or interruptions in space. Unlike Hagia Sophia where side aisles were necessary for the Byzantine religious practices, In the Suleymaniye the space is uninterrupted on all sides and the great piers that carry the dome are articulated with mouldings, have been given an irregular form so that they seem to retreat from the central space.

These two examples by Sinan carried the Hagia Sophia example to its most developed possibility. After Sinan Ottoman architects did not venture any further but were content to go back to Sinan’s early solutions. When the great Renaissance architects Rome decided on a huge dome, larger than that of Hagia Sophia on a centralized plan, they could not create the effect of either Hagia Sophia or Suleymaniye’s grand expansice space and dominating dome. In St. Peters, which has even a larger dome than the Hagia Sophia, the experience of it is almost non existent due to the fact that one does not become aware of the dome till one comes almost under it. This is because of the barrel
vaults that cover the rest of the building and avoid the view of the dome except from immediately under it.

Therefore, one could say that Hagia Sophia which is now understood to be a great building by the West, had been ignored because the aesthetics of Byzantine art was very alien to the Renaissance and to the later NeoClassical spirit. It could said that for as long as they experienced it the Ottomans venerated Hagia Sophia, learned from it and always treated it with great respect. Many of the restorations to which we owe its longevity are made by the Ottomans. In the 19th century Fossati brothers were invited from Italy again for a big restauration. Today Hagia Sophia serves as a museum. Its preservation is not as good as one would wish it to be. For one thing, being such a huge and high edifice it is very hard to do any comprehensive restauration. It is very difficult to avoid the leaking of the dome, a restauration which is carried on today. However it also takes a lot of humidity from the ground, because it is very close to one of the greatest cisterns of Byzantium and to keep the water level of this cistern low has proved to be very difficult. Nonetheless, Hagia Sophia is still being experienced at least by thousand everyday, very close to its original state.

In Haghia Sophia, if we ignore the added Turkish minarets , no dimension is axagerrated: a certain measure reigns throughout and the towering mass resolves itself tranquilly in the melodious curve of the dome. …more esoteric and spiritual in expressions suggesting the sublime through the depth of its afflatus, it therefore remains serene. There is no excess there either of mass or power. Form is preserved.

Whereas the Greek temple, seeking to attract attention and impress the crowd outside, turned its attention mainly to external appearance, the Chirstian church was concerned with retaining the faithful within its halls, and concentrated on the artistic arrangement of theinterior. Hagha Sophia is an excellent example of this characteristic…. It has sometimes been said that Haghia Sophia was left externaly unadorned because the surrounding structures would have concealed all such ornament. This is inadequate as explanation. The church with its atrium formed a unified whole; the atrium allowed only a full-face view of the main building which thus could not be considered as a work in itself but was subordinated to the whole. The structures surrounding the Haghia Sophia,… merely helped to provide the spectator with a”scale” of comparison,… thus gave an impression of sublime. When we enter the Bosphorous we have the same impression with Haghia Sophia towering over the surrounding buildings.

In Haghia Sophia interior we have the example of three scales existing together. The doors, windows parapet slabs and columns gives human size; even if the building were smaller their size would be the same. These members are set to large scale doors, windows and columns (as we may see in the side barrier of the nave) making the enlargement of the latter comprehensible by comparison with the former. The five opening of the colonnade in the ground floor are set below the seven in the gallery. Similarly the windows in the tympana between the northern and southern major arches are multiplied in superimposed rows, so that the smaller opening measure the larger ones along ever-increasing, ever-widening space which finally becomes infinite as it merges
with the central space under the forty windows at the base of the dome, spread above it like a cloudless brilliant sky.

Sublimity because of the vastness of space and the height. It defies classification; a basilican form combined with centrally planned form. In the atrium open space the dimensions are 3:2. As we pass the narthex we are drawn into the depth towards the apse; the nave is more strongly illuminated than the narthex so the nave pulls us in towards the apse. At the same time as one enters from the narthex one has the impression that on one’s both sides the space is unconfined because of the two exaedra, we also get a deep view into the aisles but cannot see walls, so space seems to be endless. Screen walls on both sides. The dome emanates light. Everything contributes to immeasurable sense of space. The pendentives barely touch each other at their finger tips.

At night Hagia Sophia was lit by gas lamps inside, this light would be seen from the exterior from long distances and would help the barged on the sea; during the day, the first light of the sun would come into the great church, and the golden tesserea would radiate this light brilliantly defying all boundaries of space.

Sources:
Rowland Mainstone - Hagia Sophia – Thames and Hudwon 1988
Panayotis A. Michelis – An Aesthetic Approach to Byzantine Art - B.T. Batsford Ltd. 1955 London -