Thesis

At the junction of Asia and Europe in Istanbul, formerly the Roman outpost called Constantinople, rests the most famous building of the illustrious Byzantine emperor Justinian, the Hagia Sophia. The Hagia Sophia, translated as 'Holy Wisdom' in Greek, was one of the most original monuments in the history of architecture (Harris, 2009). The church, known simply as 'the Great Church' by the townspeople, "fulfilled all the aesthetic, symbolic, and functional needs of the Byzantine Church" (Stokstad, 2004, 48). I contend that the church of Hagia Sophia was a building that represented the most advanced technical knowledge of its time and overall was a building that was substantially advanced, both in its construction, design, and mosaics.

Sources

Primary

Images

There remains a plethora of primary sources available from the Hagia Sophia. Although the first structure was destroyed by fire in 532, it was restored by the ruler Justinian in 557 and still stands today in Istanbul, Turkey. You can explore the many facets of the building online as it has been extensively photographed. The former church and mosque was converted into a museum in 1935, upon which many of the original mosaics have been restored. Many of these mosaics have been photographed and are available for preview online.

Text

Other primary sources include original documents, such as letters, autobiographies and official records, although all of these primary documents exist only in Greek, a language that is foreign to my understanding and thus places considerable constraints on utilizing textual primary sources.

Secondary

The basis of my research paper has been extrapolated from secondary research. I used several books, textbooks, research papers, and peer-reviewed papers to guide my own research paper. I found it helpful to have a source that could easily describe, summarize, analyze, and evaluate research for my own understanding. However, this begs to question the credibility and authority of the sources I have used throughout my research paper.

Perspectives and Research Limitations

Although visual material have become actively encouraged as a central evidence base for historical arguments, throughout my research exploits I have found several difficulties utilizing images as a primary research source. Primarily, I have found it difficult to interpret the images and create meanings within them; to learn the social and aesthetic conventions of the images. I have also felt uncomfortable trying to extrapolate my own interpretation of the mosaics and architecture as I am not well educated at being able to analyze and evaluate such sources. Although I have included several images to be used as primary sources, they were attained through secondary sources.

Some of the constraints of utilizing (or not utilizing) primary text sources include physical and intellectual inaccessibility of the records themselves.

Due to my lack of knowledge surrounding this time period, and ancient history in general, I found that secondary research was the best approach to analyzing and evaluating research. During the research process I often felt that an advanced historical and architectural knowledge (and patience) was required a priori in order to achieve the purpose of instilling a more advanced historical knowledge and writing a purposeful research paper. Even though secondary sources are intended to be more understandable, talk of load-bearing piers, buttresses, colonnades, and pendentives were diction and knowledge that surpassed my understanding of the subject matter. Therefore, it was difficult to extrapolate conclusions from my research.

This research paper certainly lacks credibility and authority. Primarily, my research is too limited in scope to make broad generalizations about this subject matter, and certainly draw any conclusions surrounding my thesis statement. I am unable to perform high-quality research due to a lack of accessibility, understanding, and general knowledge of this time period. Although the flexibility of the internet allows researchers to move seamlessly through multiple databases and scholarly journals, if you are fairly unknowledgeable of the content matter one's search queries will be as well, which will yield a lack of rich information.

Evidence

The thesis statement I provided is a three pronged argument, in that I will provide evidence surrounding the Hagia Sophia's construction, design, and mosaics to argue that the structure represented the most advanced technical knowledge of its time.

Following an earthquake in 557, when the main dome partially collapsed, Justinian restored part of the church. "The restoration has, in its fourteen hundred years, survived further earthquakes, renewed pillage, and two medieval attempts at rebuilding". (Cutler, 1966, 28). Although it appears that this structure is sturdy, it necessitates that further conclusions be drawn about the design and construction of the building itself.

Design

Justinian did not select architects as his master builders to construct this palatial building, rather he entrusted the building process to theoretical scientists "who had never confronted the problems of erecting an actual building" (Stokstad, 2004, 48). The two master builders were Anthemis of Tralles, a Greek Mathematician who specialized in geometry and optics, and Isidorus of Miletus, who was a professor of physics at the universities of Alexandria and Constantinople. Justinian realized, in order to set his church apart from all other buildings at the time, that it had to be designed by men "whose theoretical knowledge could transcend the limits of contemporary architectural practice" (Stokstad, 2004, 50).

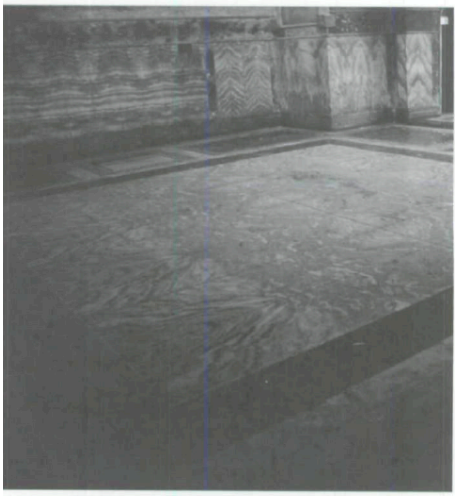
The Hagia Sophia was one of the forerunners of scientific building, which is architecture that is based on mathematical parameters, meant to inform the structural requirements of design (Schibille, 2009). Optical and astronomical considerations also played an important role in the aesthetic content of the design. With this in mind, the architects created an ingenious solution to the problem of "vaulting over a huge area" (MacDonald, 1957, 22) and fused two seemingly exclusive and independent architectural traditions; that of using pendentives to transfer the weight of a dome to piers beneath, rather then to load-bearing walls. They also placed a hemispherical dome on a square base, instead of a circular base, a formerly unseen design. Due to the use of pendentives, the space beneath the dome could be unobstructed and create the impression of a suspended dome. The walls themselves could be adorned with numerous windows to allow in a dramatic passage of light. (Kleiner, 2006; Stokstad, 2004).

It is the central dome that is the feature that distinguishes this structure from equally lavish Roman buildings, such as the Pantheon. The dome, called the "Dome of Heaven", and described by one historical figure who was Justinian's court historian, Procopius, as a golden dome that seems to be "suspended from Heaven" (Stokstad, 2004, 52), acquired this nickname because of the 40 windows at the base of the dome that creates the illusion that the dome is resting on the light (Kieckhefer 2004). Procopius went on to describe the dome as being suspended by "a golden chain from Heaven" (Kleiner, 2006, 235) and that the space "is not illuminated by the sun from the outside, but that the radiance is generated within, so great an abundance of light bathes this shrine all around" (Kleiner, 2006, 235). This depiction of the dome can be viewed in figure 1.

3.4 The Church of Hagia Sophia, (modern Istanbul) 532–537, Constantinople.

Figure 1 (Stokstad, 2004, 49)

From the artistry of the dome, to the beautiful mosaics that adorned the church, everything seemed to have been intricately designed. The glaring exception to this was the floor. “Here, there were no vermiculated mosaics, no rainbow imbrications, and no intricate tessellations. Instead, the floor presented an expanse of Proconnesian marble flagstones, traversed only by four green stripes…” (Barry, 2007, 627). However, visitors to Hagia Sophia remarked that the marble slabs had been sawn parallel to their surface, making the entire floor look like a frozen sea. A picture of the marble floor can be viewed in figure 2. This craftsmanship is believed to be intentional, and was the designers attempt to let mere mortals walk on water to remind its citizenry of “the worlds watery genesis and its apocalyptic destiny in a glacial purity…” (Barry, 2007, 627). Although the floor, at first glance, does not look like it has been treated with the same elaborate detail like the rest of the structure, it is now apparent that the simplistic, unadorned floor was a purposeful design.



4 Chora Church (Kariye Camii), *naos*, ca. 1316–21 (photograph by the author)

Figure 2 (Barry, 2007, 629)

Construction

It is fabled that Justinian spent more than forty thousand pounds of silver on the sanctuary screen alone (which, unfortunately, not a single fragment of silver survives), and the lavishness continued throughout the construction and decoration of the Hagia Sophia. “Columns and colored marbles were brought from all over the Aegean and from as far away as the Atlantic coast of France. Marble workshops on Prokonnesos…were kept busy furnishing capitals, cornices, and huge pavement slabs…thousands of laborers from all over the Mediterranean world worked on the building…” (Safran, 2002, 152-154). All of this complex construction was completed in the remarkable time span of five years.

In such haste to have the church completed, it has been hypothesized that the builders employed more mortar than brick. These large quantities of mortar would have taken far

longer to dry then normal, and although would appear dry and stable from the outside, could still be described as ‘flowing mortar’ from the inside. Along with the pressure exerted on the walls and the gooey-internal mortar, the walls and vaults shifted, which led to the permanent deformation of the building. It was because of this unaccounted gooey mortar that part of the dome is said to have collapsed. Despite this formidable set-back, in that the building techniques could not match Justinian’s and the architects’ bold imagination, the construction of the church, in terms of its mortar, was unparalleled and extremely advanced. A picture of the mortar can be viewed in figure 3.

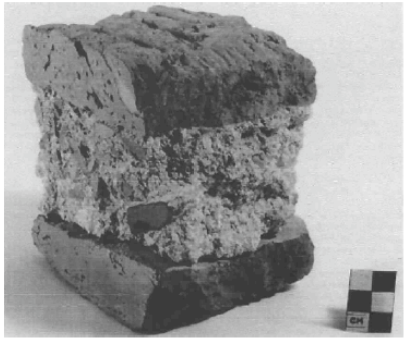


Fig. 1. Hagia Sophia mortar sample M-26 from the base of rib 7 at the west face of the main dome—dated by Van Nice to AD 558–563 (photo Dumbarton Oaks).

Figure 3 (Moropoulou, Cakmak, Biscontin, Bakolas, & Zendri, 2002, 544)

Legends say that the mortar used in Hagia Sophia was mixed in with cooked barley and willow trees (Van nice, 1948, 7). Although no one has found traces of such vegetable substances, specimens show that the mortar consists of: “burnt lime, sand, occasional pieces of gravel, and considerable immixture of crushed brick” (van Nice, 1948, 7). The substances within the mortar are thought to have been deliberately added so that the limestone, crushed brick, and water would react to produce “a silica matrix that can

absorb seismic energy that would otherwise fracture the building" (Dixon, 2002). This enabled the walls to 'give' a little, rather then being as rigid as possible, which is now known as one of the keys to earthquake-proofing buildings. The sheer mechanical strength of the mortars also may be considered an early example of reinforced concrete (Moropoulou, Cakmak, Biscontin, Bakolas, & Zendri, 2002). As a result of this advanced engineering, the Hagia Sophia has withstood earthquakes up to a magnitude 7.5 on the Richter scale.

Interior - *Mosaics*

Justinian did not just construct a brilliant structure; he adorned the interior with displays of "precious materials, vivid colors, and patterns of light" (Stokstad, 2004, 54). The ethereal dome glistened due to its adorned gold mosaic, while the columns and walls were covered with a lustrous veneer of purple, white, yellow, and green marble. "The columns and architrave of the sanctuary screen were sheathed in silver and hung with red silk" (Stokstad, 2004, 54). Procopius exclaimed that the gold, gems, and silver cannot possibly be described and that mere men would be unable to comprehend the workmanship that had been accounted for within this church (Kieckhefer, 2004).

Although there was lavish decorations of precious stones, metals, chalices, and patterns, one remarkably advanced characteristic of one of the mosaics depicted within the church was that of Christ as a bearded man, as we recognize him today. Prior to this, Christ was always represented as a beardless man. This depiction certified Hagia Sophia as "not only

the religious center of eastern Christianity, but the fountainhead of artistic expression" (Morey, 1944, 201). This mosaic can be found in figure 4.

Christ with the emperor Constantine IX and the empress Zoe. On the east wall of the south gallery of Hagia Sophia

Figure 4 (Morey, 1944, 204)

After the church was turned into a mosque many of the beautiful mosaics that adorned the walls of Hagia Sophia were painted over and the majorities have not yet been restored. During its height, however, it was so adorned with mosaics, gold, silver, and precious stones that one spectator complained that because so much beauty is found in one spot it does not allow the spectator to fully enjoy the sight because your eye constantly glints from one spectacle to another (Safran, 2002).

Significance for Contemporary Society

Justinian's Hagia Sophia was a perplexing spectacle in many ways. The architects designed and created an ingenious and harmonious modeling of space within the domed walls of the church (Kleiner, 2006); Justinian placed his faith in scholars rather then seasoned master builders; and the architects created an advanced mortar which enabled Hagia Sophia to withstand extremely strong seismic forces. These intelligent master builders seemed to push the limits of what had been previously available common knowledge. They were inventive in their design and construction, and as a result this structure is now renowned as "the architectural marvel of Byzantium's Golden Age" (Stokstad, 2004, 55). Although this architecture was not readily copied in style, it inspired many other master builders to be inventive in their own style and design.

After 1400 years of constant use, the structure is still intact and thus becomes a "vast and living laboratory for studying the best techniques employed by known architects…" (Van nice, 1948, 6), which helps modern day builders create stronger and more stable buildings. The rapidity of the church's successful construction makes it one of the greatest engineering feats of all time, which is certainly raises interest to modern engineers and architects alike.

The elaborate and over-the-top demands of Justinian, in terms of the churches interior, also provide some resemblance to our current day's society conspicuous consumption, and potentially reveals the patterns that may soon follow. The church was ransacked during the crusades several times and most of its ornamental finishing's were taken and

scalped in distant lands. Perhaps we, as a nation, should be more cognizant of the things we value, and learn to place less importance on material objects, because just like Hagia Sophia these can be taken away as quickly as they are provided.

Conclusions

During the 10th century when Prince Vladimir of Russia sought a national religion, ambassadors of Russia visited Constantinople and became so enthralled and impressed with Hagia Sophia that they declared, "Surely this is the House of God" (Safran, 2002, 88). It was the architectural pursuits of Justinian that inspired Russia's Orthodox religion. Although this does not exclaim that Hagia Sophia was the most advanced building of its time, the building itself was certainly one of the most original monuments in the history of architecture (Stokstad, 2004). "Hagia Sophia is regarded as the finest example of Byzantine architecture in the world" (Dixon, 2002). The church can be described with many superlatives and its indelible mark on architectural history is world renowned.

Although Hagia Sophia was advanced in its own right, it is difficult to extrapolate a definitive conclusion to my thesis statement. The scope of my research was too limited, in that I focused solely on this church alone, and did not research any of the other formidable structures and buildings of the same time period. I'm also not proficient enough in architecture and engineering to truly comprehend and create sound conclusions surrounding how 'advanced' a building is. The Hagia Sophia certainly had some set backs, such as the dome collapsing, therefore does this mitigate its 'advanced' quality?

The purpose of my paper was not meant to describe the many architectural problems inherent in, or ascribed to, Hagia Sophia; it is to explain what elements I believe would be of importance in describing it as one of the most advanced buildings of its time. Until more primary sources and evidence surrounding this structure is interpreted and analyzed, I cannot infer data interpreted from secondary sources, regardless if it is the most technical knowledge of the moment. At this point I am unaware of rigor, accuracy and credibility of the secondary sources I have utilized, even though the bulk of these sources have been peer-reviewed. Although I have productive inquiry into this subject matter, broad generalizations will not be beneficial to the researcher or the reader.

I can attest that the Hagia Sophia was a unique building, and it "remained a white elephant through most if its later history" (Ousterhout, 1996, 23), in that its design was too sophisticated to become a workable model for other buildings. Although it was the largest dome structure in the world at it's time (Olsen, 2004), at the moment it is unclear whether or not it truly was the most advanced building of its time.

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