ARTS 1B Midterm

Due Feb 13, 2023 Monday

Cover Sheet

The cover sheet should be placed at the front of your midterm. I will not read your midterm unless it contains the cover sheet. By writing your name at the bottom of the cover sheet, you are signing a contract that is binding and is part of the honor code expectations for this class. The cover sheet must use the following words:

Name: Frank Yungfong TANG

I understand that I am expected to use my own words in this midterm. If I use any words from a source, I must put those words in quotes and then I must give credit to the source by using parenthetical notes (in-text citations), footnotes, or endnotes. This applies to any use of ChatGPT or any other AI source, and if I use any AI bot source, I must put the words from that AI source in quotes and give credit to the AI source using one of the above citation methods.

My name:_Frank Yungfong TANG_ Date:__Feb 12, 2023____

ARTS 1B

Midterm Exam, Winter 2023, De Anza College

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Large structures were built by the Romans in different periods for different reasons. Some were built to strengthen the national power while others were used to provide public service to please their citizens and avoid rebellion. The use of concrete and rounded arches allowed Romans to build large structures in massive numbers quickly.

The key reason that the Romans are able to build their structure with such big size is mainly due to their knowledge of making "*opus caementicium*", also known as Roman concrete, as their key building material. Greeks usually used natural material, marbles or limestone, to build their structure. Roman, on the other hand, preferred to utilize the concrete, sometimes with pieces of marble surfaced attached for decoration. Roman's usage of concrete allowed them to create voussoir, the wedge-shaped or tapered stone used to construct an arch, easily in fine precision. This is because the concrete was made by the mixture of gravel, sand, broken rocks, cement, and water spread and poured into molds. Therefore, Roman can model it to their desired shape much easier than carving a stone. The use of concrete also allowed Roman to transport the building material much easier because the ingredients could be moved in smaller batches and then mixed together closer to the construction site without the need to move large marble or limestone in long distance travel. During the construction, falsework, also called Centring, was temporarily built to support the weight until the keystone on the top was installed. Due to these techniques, rounded arches flourished in Roman architecture, contrasting to the prior post-and-lintel based Greek design.

An early example of a large Roman structure is *Pont du Gard*, built around the year 25 BCE in Nimes, France. It is a bridge with three tiers of rounded arches stacked on top of another. This bridge grants the more than 30 miles long aqueduct of Nimes a way to cross the Gard river to provide fresh water to needed cities. Concrete provides both the necessary precision and the massive quantity to build these arches. The largest arch is an astonishing 82 feet wide. Rounded Arch holds heavy weight by allowing all the gravity force to create compression, and push the neighboring voussoir together to redirect the gravity force into the ground. The compressive stresses, secured by the keystone on top, eliminated the tensile stresses in the arches. Part of the gravity forces also push horizontally toward the mountain base the edge arches leaning against. Therefore, these hills provide additional support and allow large amounts of water flowing on the top tier of *Pont du Gard*. The use of arches is a genius invention, not created by the Romans, but heavily utilized by them and much more widely used in Roman structures than those in any other civilizations. Here, we also see the Romans dedicated their architectural wisdom in public service to improve the quality of life and health service for the daily lives of their citizens.

Another example of a large Roman structure is *The Colosseum in Rome,* also known as *Flavian Amphitheater,* which was built between the year 72 and 80 CE. It was built to reinvigorate Rome as part of an imperial attempt after the year 69 CE, the troublesome "The Year of the Four Emperors". The emperor Vespasian built *The Colosseum* to provide free entertainment to the citizens in Rome, with animal hunts, gladiator combats, and even mock naval battles by flooding *The Colosseum* with water, since it was built on the location which was previously a pond. The structure consists of three levels of arcades of engaged columns, in Doric, Ionic and Corinthian order to pay tribute to Greek architecture. However, the weight is mainly supported by many rounded arches. And the structure was built by using concrete instead of

marble or limestone. In its maximum capacity, *The Colosseum* could host more than 50,000 spectators and therefore has eighty entrances. It is a massive 620 feet by 513 feet building to show the Roman architecture achievement, their usage of concrete and rounded arches, their preference of Greek aesthetic, and their human center architecture motivation.

One final example is *Baths of Caracalla* built more than one hundred years later around the year 212-216 CE in Rome. *Baths of Caracalla* was a public bath, free for citizens to use, and was designed to ameliorate their quality of life. Emperor Septimius Severus probably started the building project, but the project was finished after Caracalla became the emperor. It provided an area for socialization, recreation, and relaxation to Roman citizens as a hub of wellness. The structure could hold 1,600 bathers on the 6.5 acres site. This massive building was 702 ft long and 360 ft wide and 145 ft tall. It has three main baths: *tepidarium*: hosted the warm water, *calidarium*: hosted the hot water, and *frigidarium*: hosted the cold water. These three baths are in slightly different designs and some of their walls are very thick to provide enough support. The *tepidarium* was smaller than the others. Only eight masonry pillars were used to carry the weight of the giant 118 feet in diameter dome in the circular *caldarium*. Three groin vaults, constructed by the intersection of two barrel vaults, support the ceiling in the central *frigidarium* bath. Their ruins in Rome today allow us to see the thickness of their walls and the luxurious life of Roman civilization and the remote ancient culture in their society. The bath cleans the citizens for free and therefore improves the health condition in this ancient crowded capital of the Roman Empire. Yet again, we see how the Romans use concrete and rounded arches to construct massive structures for public service.

Around noon on August 24, the year 79 CE, Mount *Vesuvius* neighboring *Pompeii* started to erupt. Massive volcanic debris and volcano ashes quickly covered *Pompeii* and nearby town

Herculaneum. Hot gas and ashes showered down and killed many alive. Buildings were destroyed and inhabitants were suffocated to death. Both towns were covered under a thick layer of ash, and therefore preserve the vivid image of that moment for more than 1,600 years. Because the thick layers of ashes covered the whole town, the disruption by war or plundering were avoided on the sites. Therefore, the modern day excavation in these two towns empower us to peek into the daily lifestyle of the community in the Roman Empire with more precise archaeological evidence in high quantity. For example, we can see the use of *compluvium* and *impluvium* in their residents to open their window inward, rather than outward. We also learned more details about the public bath. Even the bath in this town is much smaller, but they are better preserved. We were also able to observe some of the paintings on the wall depicting their clothes and relationship within the community. The hot lava sealed the city and protected the color on the fresco for thousands of years and gave us a unique gift to understand the past in finer detail.

Greek architecture greatly influenced Roman as we see Roman love to use Greek order columns, entablature, and pediment in their buildings. But we also see them show two primary differences: The first is that the Romans mainly use concrete as their material, due to their high demand to build more structure quickly. The second is, based on the advantage of using concrete, Romans are able to build rounded arches, barrel vaults, and groin vaults much easier, faster and in better precision. Therefore we see most Roman structures with arches and sometimes with larger domes while Greek ones are based on the post-and-lintel only design. Politically, famous Greek structures were primarily built as Temples to serve for religious function and designed for the priesthood. In contrast, Roman structures were built to serve a public function for civil usage. In other words, Greek built for the priests, Roman built for citizens.

Through the above discussion of *Pont du Gard*, *The Colosseum*, and *Baths of Caracalla*, we examined the impacts of concrete and rounded arch usage in Roman structures. We also discussed how the tragic event in *Pompeii* preserved the image of their society for us to understand today. Finally, we discussed how the Romans built their architectural achievement on top of the great success of Greek civilization, but expanded with their citizen central motivation. Concrete usage fulfilled the high demand of building material and also enabled Roman to construct by using more advanced edifice elements, such as arches and groin vaults to erect larger, stronger, and better buildings.

Extra Credit:

Many Christian missionaries, including Peter and Paul, got killed by the Roman Emperors before Constantine the Great changed the state religion of the Roman Empire to Christianity. Their witness by faith, hope and love moved many people around them. They start to preach their belief as a faith for all the people and not designated only to a specific people group and tribe. They also preach their faith to any classes of people in the Roman Empire, regardless if they were official, military officers, businessmen or slaves. The well-established Roman highway allows many Christian missionaries to easily travel between towns. Through these, Christianity brought hope to many and widespread their faith to every corner and any levels of the Roman Empire. Eventually, the faith reached Constantine the Great. In the year 313 CE Constantine the Great issued the "Edict of Milan" to fairly treat Christian without prosecution within the Roman Empire. In the year 325 CE, he officially changed the official religion of the Roman Empire to Christianity.

After Constantine the Great adopted Christainty as the state religion of the Roman Empire, two types of Christian churches were built. First some early Christian architects quickly

transformed the Roman basilica into Early Christian Basilica church because the Christian faith required bigger meeting places for all the followers to gather and worship, in contrast to the Greek or Roman religion which only permitted priesthood and important officials to participate with their indoor religious ceremony. Because the pre-existing Roman basilica served a similar capacity, it was easily transformed to religious usage. Another form of the Christian church is a centrally-planned architecture for martyria, to mark the place of suffering of early Christian missionaries. This type of church was often the site of tombs or baptisteries. The reason early Christian architects selected the Roman basilica to emulate is because the basilica is a large long rectangular shape building with its entrance on the wide side and each long end has a giant statue of the Roman Emperor. It is easy to transform a pre-existing Roman basilica structure quickly into a Christian church by moving the entrance to one of the long ends and removing the statue of the Roman Emperor then putting up a cross and altar in one of the far ends. The architect is the most widely used architecture which can accommodate a large group of people together. It is also shaped like a cross with slight modification. One of such examples is *Old St. Peter's Basilica* (319-329) in Rome, which no longer exists. However, we can still understand its shape by studying its drawing plan.