Archaeology is a very old discipline, beginning around the 15th to 16th century in Europe. With the progress of science and technology, preservation and analysis techniques have been introduced and revised over and over again. Constantly evolving with each passing year. The most prolific example of how far it has come is the most mysterious city ever discovered, Teotihuacan. It was discovered in an archaeological survey in 1864, and the first excavation began in 1884. Despite constant analysis, we still do not know their language, the original name of the city, or why it was abandoned, and we have not deciphered their written language. A city is complicated, as Teotihuacan is perfect for looking at the evolution of archaeology processes, as many of its mysteries have yet to be uncovered today. Through its evolution as a discipline, more and more about the city has slowly been discovered.

Teotihuacan was a city located near present-day Mexico City. It originated in 200 BC and at its peak had a population of an estimated 100,000 people. The city was a large complex situated in the fertile basin of Mexico. Running directly through the city was the Avenue of the Dead. North of the Avenue was the Pyramid of the Sun, south was the Temple of Quetzalcoatl. In the Center were the Pyramid of the Moon and the Palace of the Butterfly Quetzal God. Surrounding these ritual temples and pyramids were large apartment complexes that housed the priests and citizens of the town. The city was abandoned in 700 BC for unknown reasons, and it was then used by the Aztecs as a pilgrimage site for priests. The Spanish then traveled there and wrote about it, which is how it was discovered by archaeologists.

Archaeology up to 1960 was relatively uncomplicated. It was similar to looting or grave robbing, where they went in and dug up only the most extravagant, eye-catching items. They spent their time looking for the tombs of important people, some even getting tips from grave robbers on where these tombs might be located. After the digs were over, the laborers being paid

to shovel dirt and sand helped themselves to what was still at the site (pg 31 Pasztory). In 1960, a philosophical shift began in the archaeology community. Foreign archaeologists decided to leave the digging to local archaeologists and instead focus their energy on mapping the sites and examining potsherds they found in the ground. They felt it was important to decipher the lives of the entire social hierarchy instead of just the top echelon. It started becoming the new norm in the 1990s. They traded their international glory for intellectual glory (pg 30, 32 Pasztory).

Radiocarbon dating is the oldest scientific tool used by archaeologists to get a more precise estimate for their discoveries. It started being used in 1946 and is a form of absolute dating. It is used to date bones, plant materials, and anything made of carbon, taking the natural carbon in the items and assessing how much has been left by the source to get a rough age. Every element has a half-life, or how long it takes for fifty percent of an unstable atom to decay. The carbon isotope used in radiocarbon dating is Carbon 14, and it takes less than 6,000 years to reach its half-life. This means carbon-14 is only useful in dating up to 60,000 years ago (Koppes and Lerner). This is no problem for archaeologists, as most civilizations that are known fall in the 60,000-year category. Before carbon dating, relative dating processes. Relative dating is a simple process; you compare things to determine if they are older or younger than the item of comparison. In digs, the objects from the surface will be younger than the ones buried under layers of soil. This process is called the law of superposition and is used more in geology to determine the ages of rock layers. Another way to relatively date things is by simple comparison. For example, if you are looking at a human skull, you can tell its rough age based on its size, whether or not it still has baby teeth, and the development of the growth plates.

When the city was first founded, it was hypothesized that the population worshiped a god known as Tlaloc, who controlled water, rain, and farming fertility. This is because the first

vessels and murals depicted Tlaloc. While further going through the city, they found other artifacts, which we now know most likely depict the god of war being depicted with blood and sacrifice. They claimed this war god was Tlaloc. They justified this by calling him red Tlaloc (Price, Spence, Longstaffe). Each grouping of Mesoamerican civilizations had its forms and interpretations for their gods, but they all stayed roughly the same in idea. Most worship was done by the Aztecs, who would travel to the Pyramid of the Sun once a year for rituals. They also incorporated their deity Quetzalcoatl into the city's murals and mythos. They shared a tale that was later recorded by Spanish missionaries as the account of a real man named Quetzalcoat, who was the ruler of Teotihuacan. He was a peaceful man who sacrificed butterflies to the gods. One day, he was forcefully removed by a bloodier faction and swore he would return one day to come back and reclaim his throne. The problem with this myth is whether archaeologists disagree on its truthfulness or not. Some have dedicated their lives to the pursuit of finding any evidence of his life in the city, while others believe it is an Aztec myth taken too seriously by the Spanish for their gain. It is hard to know whether words written down hundreds of years ago are based on real facts and not unknown mysticism.

At the Temple of Quetzalcoatl at the south end of the Avenue of the Dead, several burial pits were found in an underground tunnel beneath the site.. The bodies are mostly men and are dressed in military attire. After the discovery of these bodies in 2003, several ideas have been suggested about who these people are and why they are here. It was originally hypothesized by George Cowgill that because of their military attire, they were an elite corps of soldiers. Another idea was that they were citizens from the town buried in military clothes to indicate their higher status (Price, Spence, Longstaffe). Recently, the archaeologist in charge of the site has been employing new techniques to learn more about these people. They took teeth samples from each

body. From this, they determined some of the “soldiers” were foreign in origin, specifically from Mayan regions and the Valley of Oaxaca, but they had been living in Teotihuacan most of their lives. Some of the “soldiers” are also closely related or lived together long enough to have similar tooth patterns. Based on the way they were buried, with hands tied behind their backs, and ankles tied together, they thought they could be sacrifice victims. They might have been killed after or during the building of the temple as offerings to Quetzalcoatl.

Dental archaeologists and bioarchaeologists use every type of tooth to gather more detailed information about the person they belong to. They take moldings of the teeth to look at under microscopes or scan them to make 3-D models on computers. They look at the enamel to see if there are any indicators of brittle food diets. Types of striations would also indicate if the person ate meat or vegetables, meat leaving only vertical lines, and vegetables having both vertical and horizontal lines. Small amounts of DNA can be extracted from teeth, which is highly useful in determining lineage. The size, shape, and layout of teeth can also give a rough estimate of age (Forshaw). This process is called paleopathology. Mesoamericans were also known to make modifications to their teeth for religious or class reasons. Some cultures would add decorative beads to their teeth, like present-day grills, consisting of hematite, turquoise, and other common to the area (Molina, Iizuka, Suzuki). Although these dental inlays have not currently been found on the bodies at Teotihuacan, they are found in other locations in Central America. It is worth mentioning other dental analyses available to archaeologists.

After the change from foreign digging to only the study of surface artifacts, archaeologists had to get more creative in analyzing items. A wide range of figurines were found throughout the site, all dating to different periods in the city's history. One archaeologist, Warren Barbour, [put the date here], found fingerprints still present on many of the figurines. He

collected them all up and examined each print to determine if the artist was a male or a female. Male and female fingerprints have many differences and are easily differentiated. Barbour found that the figurines from the early history of Teotihuacan were primarily female, then gradually shifted to be all male in the latter half of the city's history. He used these findings to explain the social habits of the citizens and show the city moving forward in the economy from creating for hobby to creating for profit (pg 32 Pastory).

At Teotihucan, there is minor evidence of irrigation, which they used from the San Juan River. Their city was located at a high elevation on fertile land, so they needed a way to get water up to their crops. Archaeologists such as Willian Sanders have taken this information and used it to claim Teotihuacan as a hydraulic state. Others, like René Millon, suggest this is untrue because the San Juan is a creek compared to the Nile River. This is unfair because, no matter the size, water is very powerful. Also, unlike in Egypt, Mexico experiences rainfall. They have a wet season from May to October, where they can get more than 9 inches of rain in one day. Admittedly, this is the weather range for today, but according to S. E. Metcalfe in her article titled *Historical Data and Climatic Change in Mexico,o* she states, “It appears that the climate of the Basin, in the Neovolcanic Axis, was probably relatively wet during the foundation of Teotihuacan during 200 BC… She concluded that the climate was as wet as that during the wettest years (1966-1970) in the period covered by meteorological records” (pg 213). The “she” referred to in the quote is E. Garcia ran a model of the climate during the time of Teotihuacan that Metcalfe is reviewing. This proves that Teotihuacan could have had enough water from the San Juan River to support an irrigation system large enough to justify the label “hydraulic state”. Since we do not have records of rainfall from this time, Garcia most likely used the common climate proxies. Those would be things such as tree rings, plant fossils, pollen, sediment, O16

and O18 levels, and some others. Technically, this is paleoclimatology, but it is worth the examination to prove a Frenchman wrong.

Millon had some actually good ideas. There is a large open complex in the center of the city, at the meeting point of the avenues that run north-to-south and east-to-west. He suggested that this complex was an open-air market, like the ones present in some Aztec cities. That would make sense. The high altitudes where Teotihuacan sat made finding natural resources difficult, so they had to rely heavily on trade (pg 39 Pasztory). We know from more recent findings that Teotihuacan had a large foreign-born population who came over for trading purposes, as explained in paragraph six. So, when Millon came up with this theory in 1973, before the recent findings, he was pretty correct. Teotihuacan was a trader's paradise. It is interesting to think that an observation made in 1973 would take thirty years to prove solidly correct.

Oxygen isotopes have been recently used in archaeology and bioarchaeology to determine the migration patterns of people. Normally, oxygen isotopes are used in paleoclimatology as a climate proxy. They specifically use oxygen-16 and oxygen-18, as those are the most common and easiest to deal with. According to Emma Lightfoot and Tamsin O'Connell, "Oxygen isotopes in mammalian tissues reflect the isotope values of the water ingested (as water or from food) at the time of tissue formation. Usually, ingested water closely approximates the isotopic composition of the local meteoric precipitation, which varies geographically and temporally." For this, they would be using Oxygen 18 because it is heavier, and when in vapor form inside clouds, it is the more likely isotope to condense and come down as rain. The rain became the groundwater that the ancient people drank. Archaeologists get the tissue required to study this from bone and teeth. There are some drawbacks to this method, such as the data being unreliable because theoxygen-188 levels in the tissue are not accurate compared

to the levels in the groundwater. It can become inaccurate from boiling the water first, or the consumption of milk, because milk has a high ratio of oxygen-18 compared to groundwater. There is still time for this process to grow and become more accurate. With the constant evolution of technology, it should not be too much longer till it is as reliable as radiocarbon dating.

In one of the apartment complexes on site, a set of four murals was found on a small patio. The central figure in these images is a godly figure with butterfly wings, a bird headdress, and reptile eyes. The mural was first interpreted by Laurette Séjourné in 1959 as representing the Aztec god Xochiplli. Since then, it has been re-interpreted six more times by Alfonso Caso in 1966, Janet Berlo in 1983, Hasso Von Winning in 1987, Kathleen Berrin and Pasztory in 1993, Karl Taube in 2005, and Zoltan Paulinyi in 2006. The interpretation from 2006 believes it may be a representation of a sun god and a plant fertility god (Paulinyi). Before the founding of the murals, this god was only depicted on pots and vessels located in places that Teotihuacan greatly influenced. In the background of one of the murals is a mountain, some waves, and growing squash. It is widely known that the mountain is most likely the Triple Hill or the fertile mountain, as more detailed and explained pieces of art have been found in different locations with the Butterfly Bird God and the mountain. Also, in known religious iconography, the Fertile Mountain with the waves is most likely a representation of the underworld. In other vessels, the Butterfly Bird God is also seen in front of the gates of the underworld, so this relation makes sense. As for how it is known they are waves, other murals located at Teotihuacan have been found with the same symbols and fish and underwater creatures in them, so it is a safe bet they can be interpreted as water.

Around the year 1400, the Aztecs stumbled upon the abandoned city of Teotihuacan. They turned the city into a spiritual site, making trips to the temple for religious purposes. With the takeover of the city by the Aztecs, all the artifacts they left there made archaeologists think the city originally belonged to the Aztecs. It took until after the widespread use of radiocarbon dating on previously living materials to determine that the city originated before the time of the Aztecs. One accident that happened because of the Aztecs was before the use of LiDAR scanners, when the researchers on the dig site thought there might be a smaller pyramid underneath one of the pyramids on site. The Aztecs had been known to build a larger structure on top of existing pyramids, so they thought it might be the case for Teotihuacan, too. Shortly after removing the stone and rubble, they realized there was nothing underneath. In fear of ruining the ancient pyramid further, they tried to cement the hole back up, leaving the rubble and stone on top of other dig sites, muddying the findings of future digs. Now, thanks to LiDAR technology,y the pyramids do not have to touch to see the secrets they hold inside. LiDAR stands for light detection and ranging. It releases light waves into the ground and waits for them to bounce back up into the machine. It calculates the time taken to travel back into the machine to determine whether objects are on the ground. It is an extremely beneficial tool for diggers to use; they do not have to dig randomly in the hopes that there will be something there. Instead, they can know there are things in the ground and how far down they are located.

In 2015, an extensive LiDAR mapping program was done at Teotihuacan. They were able to bring the original Teotihuacan Mapping Program done by Millon from a 2-D surface into 3-D models. They were focused on the large forested areas surrounding the ritual center to see the extent of the city's limits. This scan proved the city was much larger than the current protected zone given to Teotihuacan by the Mexican government. With the constant growth of the country,

a construction site was set up near the city of Teotihuacan. While trying to build a new national airport, the miners destroyed over 200 sites within the Teotihuacan city limits (Sugiyama). These sites are now only available in LiDAR form. The moral debate over the protection of ancient sites versus the urbanization and development of a country is long-standing and not worth debating in this essay.

Another example begins with an exhibit from Linda Schele and Mary Miller called *The Blood of Kings*. It showed art from Mayan cities depicting bloody rituals and sacrifices, which were previously thought not to be done by the Mayans. This revelation spurred the comparison of the Mayans to the city of Teotihuacan. Up to this point, Teotihuacan had only been studied in comparison to what is known about the Aztecs. They compared the arts, pottery, and even their hieroglyphics in the hopes of uncovering more mysteries. Some discoveries were probably made, but Teotihuacan was a city made in contrast to its peers. It can be difficult not to compare when so little is known, and civilizations located within similar locations can have the same language and Gods. It should only be compared in small amounts to the other (pg 28 Pastory).

Science is complicated, history is also complicated, and this is because people are complicated. Every day, new things are being invented and learned, some of which can be applied to other things to make them better. Archaeology has been around for many years, and with each passing year, new advancements are constantly being made. It may take another one hundred years for the secrets of Teotihuacan to be unlocked. By that point, archaeology will have come up with more scientific tools to discover even more information from a simple bone from a long-dead human.

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