A Short Story of Geometry in Ancient Art

Cameo Wood – cwood@bennington.edu

Mathematics: A Historical Tour – Professor Van Brummelen

Geometry is found in almost any kind of art of natural scene, from the symmetry of the human body or the flow of drapery. It is not difficult to manifest geometries onto any subject, as many of those in the school of Sacred Geometry have found. Forethought and patience is required in order to uncover preferences in geometries, and to uncover the reasoning behind the choice of different geometries, or perhaps the decision to avoid an obvious geometry entirely. This is a mere attempt to discover some aspects of geometry in human artifice and to understand the geometrical choices throughout ancient primitive, Egyptian, and Greek history.

Figure 1, Peru, 250-550AD

While paintings and sculpture of the ancient Incans and Mayas are without description or explanation, it is possible to compare it to the art being currently made by modern indigenous peoples currently living in a nearly identical technological status. It is known that ancient South Americans definitely had the ability to construct very lifelike representations of the human form (figure 1) though the numerous sculptures that have been found dating back to 250-550 A.D. Even in the presence of these works of more realistic and symmetrical art, it is the cultural norm in ancient Mayan and Incan religious temples to construct statues using other non-human forms and increasingly more complex geometries (Figure 2).

Figure 2, Aztec, 14th Century

One of the other ancient civilisations with a dominant artistic culture were the Egyptians, with their striking pyramids, temples and monuments to their long dead pharaohs. The Egyptians are also particularly important to an understanding of geometry in art throughout history because of the impact of Egyptian style and aesthetic upon Greek culture and art forms.

The earliest portraits from the pyramid age, the fourth 'dynasty' of the 'Old Kingdom," are the most geometrically perfect and rigid works that are known. The portrait of the head featured here in figure 3 was not designed by the artist to flatter the model, or to capture their personality, but only to give a perfect representation of the features of the model in their simplest form. Within this ancient Egyptian aesthetic, perfect to the geometry of form was more important than invention within a new external geometry.

One of the largest influences on the way Egyptian art was formulated was based upon the utilitarian need to have servants after death, which was the main purpose behind the life-size realistic carving upon the tomb walls. This is one of the defining purposes for the Egyptian perspective.

Figure 3, Giza, 2551 BC

Figure 5, Hesire, 2723 BC

Even while observing the very lifelike aspects of the eye, length of limbs and the geometry of form, the carvings were still unrealistic. The perfect almond shape of the eye on the side of the head is not a dimension of the limitation of the artist, but the fear that an eye drawn in perspective would only be half an eye if the carving were to step off the wall. This is also the reason why two left feet are always drawn on a right-facing relief carving and vice versa, as in this portrait of Hesire from *c.*2723 BC. There was a fear of foreshortening, and the loss of usefulness in a servant in the afterlife with only half a foot, or a foot with only a tiny toe instead of a large toe.

Human representations were not the only figures affected by this representation. The image of the Garden of Nebamun shows all elements in their most recognisable and complete perspective. All the birds, fish, and trees are drawn from the side, while the geometry of the grounds is depicted from an aerial point of reference. A tree drawn from the top would not represent the tree that one sees every day, and its

Figure 4, Garden of Nebamum, 1400BC

fruit would not be accessible or visible, and therefore had to have been drawn from the side. A fish from the front would have been quite small indistinct from the front. This explains why these things were drawn from a side perspective, but one might then ask why not draw the entire image from the side. This is related to the representation of a specific garden which could not be walked upon and enjoyed if it had been drawn without distance and perspective. Children also enjoy this method of drawing, as it represents all the essential elements of the things being drawn without being limited to the realistic and more modern perspective of foreshortening and perspective.

The geometry of size and location within any work of Egyptian art is also dependant upon the status of the characters represented. The Gods always are drawn larger and more central within the entire work than the Pharaoh or his family. The pharaoh is then always drawn much larger than his wife or children, and his heir is always more central and larger than his mother or siblings. This type of imagery is well represented in the illustration below of the wall-painting from the tomb of Kunumhotep, *c.* 1900 BC. The figure behind him is his son carrying the fish he had caught, and to his left is the minister of treasures, a very prominent man. The water is painted to have risen above the reeds on

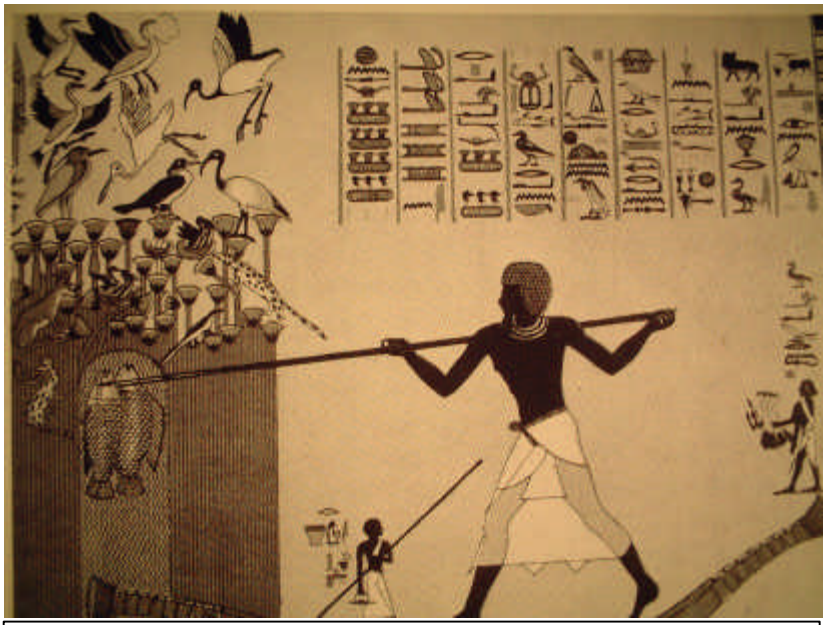


Figure 6, Tomb of Khnumhotep, 199BC

the left hand side, so that the viewer can see that the pharaoh had speared two fish through the reeds, while startling a flock of birds.

Figure 7, Amenophis IV, 1360 BC

These aesthetics of Egyptian art persisted from 2723BC through c. 1345BC without a change. The same rules of representation and perspective remained as the only way to ensure that your servants and gardens would persist into the afterlife, and there was almost no change in the understanding of perspective or geometrical forms during that time. New styles and new pharaohs and stories were depicted, but these laws continued to be followed.

Then an aesthetic revolution occurred. A king of the 18th dynasty during the period of the 'New Kingdom' named Amenophis IV began to challenge religious and cultural norms including that of depiction of Gods and himself in art. He no longer observed any of the strange-headed gods of the past and choose to only worship one, Aten. This god was represented as rays of the sun, ended in hands.

Figure 8, Akhnaten and Nefertiti with their children, 1345 bc

Amenophis changed his name to

Akhnaten, after this God. He also commissioned paintings and reliefs of himself and his family that broke through all the artistic laws that had previously existed. Portraits of Akhnaten had broken away from the rigidity of the 'Old Kingdom' of the fourth dynasty.

The laws of geometry were no longer confined only to the symmetry of the body and the features of the face, but now also to artistic embellishments, and placement of various parts of the body. The rigidity and formalism is now gone, leaving Akhnaten as a rather ugly man, but with personality and a sense of realism. He no longer looks like every Pharaoh that had come before him, but had acquired his own identity. His feet are realistically portrayed for the first time, with both a right and a left foot.

His successor was Tutankhamen, one of the more famous pharaohs whose tomb was discovered nearly undisturbed in 1922. This pharaoh followed in his predecessor's footsteps and commissioned many portraits in the new modern style of the 'New Kingdom.' In the following figure, Tutankhamen is reclining in his throne, almost slouching in a way that must have been scandalous at the time. His wife next to him is the correct realistic proportion to him, and not the correct 'status' proportion. However, even in Tutankhamen's

Figure 9. Tutankhamun and his wife. 1330 BC

time, the old customs were being used again, and Egypt continued with its artistic styles and geometries continued unchanged for a thousand years after this period.

In 2270 BC in Susa, Mesopotamia, wall carvings were also being made. There are not many examples extant today perhaps because the main material was baked brick, and stone was rare, or perhaps because Mesopotamian rituals did not use relief carvings to serve the dead in the afterlife. It does appear as though the carvings that exist do have a significance in the culture, as they mainly depict victories in war. The geometries and perspective are very modern Egyptian, without foreshortened limbs, and very traditional postures. Within these Mesopotamian carvings, only the attackers are shown wounded or dead, never an Assyrian.

Figure 10, Monument of King Naramsin, 2270 BC

The Greeks then took their cues from the Mesopotamian and the Egyptian art that was the prevalent style, and produced very rigid and formal works that perhaps even surpassed very mechanical and geometrical nature that the 'Old Kingdom' of Egypt had typified. The mourning of the dead vase, *c.* 700 BC, is very harsh and primitive, and does not seem to represent any of the movement of live or fluidity that even the portraits of Tutankhamen had in 1330 BC. The vase is decorated with a simple and very exact geometric pattern, and where the

scene itself was part of the rigid pattern, denying the artist any ability to express the forms in a fluid style outside of symmetry.

Figure 11, The Mourning of the Dead, 700 BC

Up until this point, art had not been created based upon life, but more upon the rules of geometry and art, and held perfect symmetry to a high ideal. Beginning with artists like Polymedes of Argos in 590 BC, artists began to create art from real-life scenes, and not just the rules of form. For the first time, the artist actually explored what a knee looked like, and how the muscles bound themselves against bone.

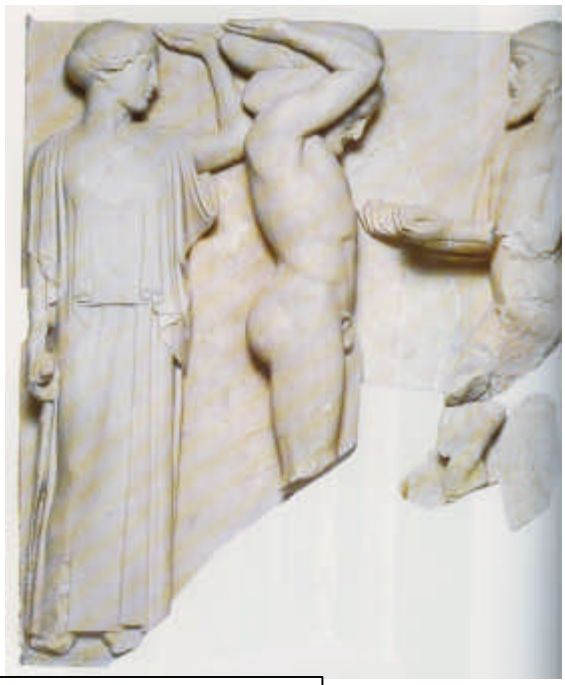
The vas in figure 12 made in 540 BC still features the profile style like the Old Kingdom Egyptians, featuring classical poses from the side profile with unrealistic depictions of the body, with eyes too large and round for a true realistic depiction. The vase in figure 13, however, is completely different. Not only is there a partial loss of a face due to the central figure being assisted in putting his armour on, but his left foot faces toward the viewer, changing his sideways pointing foot into a more realistic forward facing foot. This was the first time in all of history that a little before 500BC, artists dared paint a foot from the front. In addition, the shield next to the man being armoured is set off at an angle, which was very untraditional,

as it was considered unclear if a shield that was not facing toward the viewer in its round form was unclear or perhaps even bad luck.

Figure 13, Achilles and Ajax playing draughts, 540 BC

Figure12, Achilles and Ajax playing draughts, 540 BC

In figure 14 of Hercules carrying the Heavens, Athene is squarely facing us, and the other characters are in profile that follow all the rules of perspective, proportion and geometry that had been made by the ancient Egyptians. It is important to note that the calm and grace indicative of Greek sculpture is also largely as a result of following these ancient rules. This formalism and classicism has defined itself even today. While the classic Greek artists did not always present their works in the austere white marble and stone that



gure 14, Hercules carrying the Heavens, 0-460

we recognise today, there was still a calm and reserve that is immediately identifiable as Greek. The geometry of the placement of the characters still seem to be on a two-dimensional plane, as if all action takes place in a small corridor. This is left over from the Egyptian and Assyrian forms that have survived, where distance, perspective, and complicated geometries of face, form, and action had only begun to be explored.

In figure 15, Hegeso is depicted on the stone that marks her grave as she was in life. Her servant presents her jewellery box to her so that she may choose a piece. It has a very similar geometry to the Egyptian representation of Tutankhamen on his throne, with his wife adjusting his collar in figure 9. The Egyptian image very stiff and unnatural, and again, quite two-dimensional. In the Greek image in figure 15, the symmetry and geometry is consistent, but it is now more relaxed and quite free. The two women's arms frame the upper half of the carving, and those lines are answered in the lines of the stool. Her hand becomes the centre of attention, grounded by the

Figure 15, Tombstone of Hegeso, 400BC

flow of her down and her carved head, and the focus of the two faces.

As the Goddess of victory stop suddenly to fasten a loose sandal, the viewer realises that the artist is no longer concerned with the rules of formalism, nor is afraid of foreshortening. The artist is now able to convey movement and the body as realistically as possible. The geometry of her body could be traced on a straight line, from shoulder to foot, with her face and her left hand at equal distances from one another. The concentric circles in the draping of her dress radiate from her face, further framing the action as well as her now-missing face.

Geometry within Egyptian and Greek art was mainly limited to equal weight, and a near-excessive sense of symmetry and perfection. The lines were simplistic, but with a sense of the most critical elements that required portrayal. Most of these rules are still followed today when creating modern artwork in the classical style of the Egyptians and Greeks.

Figure 16, Goddess of Victory, 408 BC

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