The Study of the Visual Effects of Depth Creations and Perspectives in New Egyptian Archeological Discoveries

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Abstract
Many researchers have worked on the analytical study of the ancient Egyptian art executed in two dimensions as paintings or reliefs depending on the famous squared grid, which was the main guide for the artist to maintain standard proportions in drawing. But in this research I have attempted to base my own analysis and theories that may be put forward to study how the ancient Egyptian artist creates techniques to influence a sense of perspective using the decrease in size to the visual plane. There have been several recognizable elements used by the artist to give depth to their compositions. Although he accepted the drawing surface as flat and created the visuals through a series of symbols arranged over the flat surface, but the detailed analytical study of some objects revealed his attempts to copy the objects as they are seen in nature showing a beginning of a perspective study and depth. The importance of the study lies in it's application on the recent Egyptian archeological discoveries announced by the Egypt's Ministry of Tourism and Antiquities - aiming to understand more about the ancient Egyptian arts and exploration of the Egyptian civilization - based on the work of the Egyptian archaeological missions in various sites in Saqqara. Which comes within the framework of the state's support to conduct archaeological excavations and preserve the ancient Egyptian civilization.

Keywords: Egyptian Art, Monocular Depth Cues, Archeological Discoveries

Introduction

Most of the remains from ancient Egypt came from tombs and temples, as the Egyptians believed in afterlife eternity. In ancient Egypt, this was the primary source of inspiration for the development of art. They erected magnificent statues for their gods, and the decorations on their tombs and temples were the primary source of information about ancient Egypt.

“Natured by the unique civilization of the river Nile, the art of ancient Egypt gave expression to the thoughts and aspirations of an extraordinary people. Chronicling their views of the world, gods, society, life and afterlife for over three thousand years.” (Gay Robins, p2, 1994).

The researches divide the history of ancient Egypt into the following periods: prehistory (up to ca. 3100 B.c) , The Archaic Period (ca. 3100-2650 B.C.) , the old kingdom (ca. 2650-2150 B.C.), the middle kingdom (ca.2040-1640 B.C.) the new kingdom (ca. 1550-1070 B.C.). At these times of prosperity the Egyptians created a huge civilization leaving us thousands of visual arts.

Many people believe that ancient Egyptian art hasn't changed much over thousands of years as a result of Egypt's secure location surrounded by deserts and enriched by the Nile River. The Egyptian way of life, philosophy, language, and religion remained stable over thousands of years, maintaining its identity and character remarkable throughout its history (Edith Whitney Watts, Barry Girsh. p.7). But this is not totally true, as studies have revealed a significant evolution in the visual presentation of figures and elements in tomb walls, temples, and sculptures across the kingdoms.

Egyptian archeological discoveries

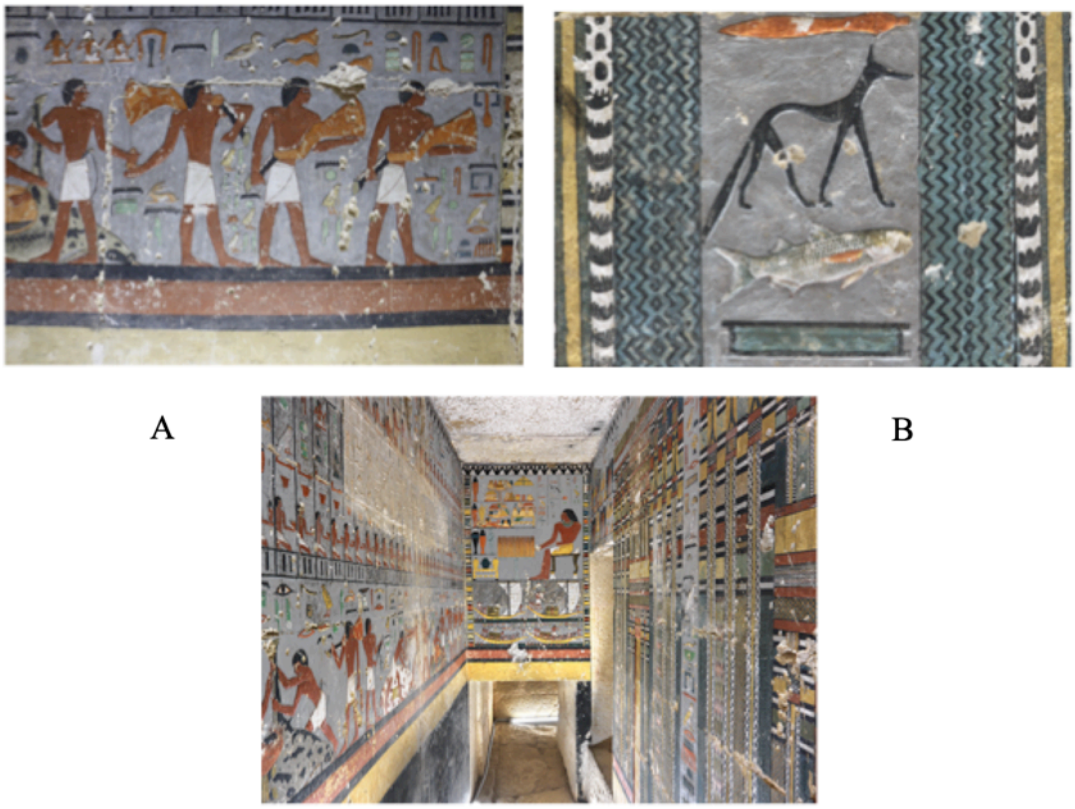
The Egyptian archaeological mission had announced a number of significant discoveries in the Saqqara archaeological area in recent years, including the discovery of hundreds of colorful human coffins containing mummies in good condition for senior statesmen and priests of the 26th Dynasty, which was listed among the top 10 archaeological discoveries in the world for 2020. (M. Marie. 2022) Which comes within the framework of the state's support to conduct archaeological excavations and preserve the ancient Egyptian civilization.

On the 13th of April 2019 the Egyptian archeological mission working in Saqqara has announced the discovery of a burial tomb, it was announced to be for a man named Khuwy, a dignitary from the Fifth Dynasty (figure 1). “The mission uncovered this tomb while documenting the collection of pyramids that belong to King Djedkarea who was the eighth and penultimate ruler of the Fifth Dynasty of Egypt in the late 25th century to mid-24th century BC, during the Old Kingdom” (Essam, 2019).

On March 19, 2022, Egyptian archeological mission working northwest of the pyramid in Saqqara, has announced the discovery of five remarkably well-preserved tombs containing burials and covered with ancient Egyptian artistic drawings, the tombs re also from the old Egyptian kingdom (figure 2). Where it was announced in a press conference with publishing detailed pictures of their unique artistic content. The artistic scenes on the walls of the tombs were covered with remains of most of the colors.

Announced by M.Waziri. - Secretary-General of the Egyptian Supreme Council of Antiquities - The first tomb discovered belonged to a high-ranking statesman, according to

legend. The walls of the burial chambers are carved with scenes from various funerary rituals, such as offering tables, the palace facade, and the seven oil pots. Because of its proximity to the tomb of a man named "Yart," the second tomb is most likely that of his wife. The third tomb is a rectangular well located at a depth of about 6 meters below the surface of the ground for a woman who bore the titles of decorator of the kings and queens, and priestess of the goddess, while the fourth tomb is a rectangular well located at a depth of about 6 meters below the surface of the ground for a woman who bore the titles of decorator of the kings and queens, and priestess of the goddess (M. Marie. 2022).



A B C

Figure (1): Walls of Khuwy's tomb in Saqqara.
Photo adapted from Megahed, M & Vymazalová , H. 2019.

Figure (2): Walls of a discovered tomb in Saqqara.
Photo adapted from M. Marie. 2022.

Grid systems in ancient Egyptian art

It is well known that the Egyptians raised great monuments to their deities and their dead that serve as testaments to their eternal beliefs. The decoration of temples and tombs is a major source for our knowledge of Egyptian art.

"Ancient Egyptian art is characterized by the idea of order. Clear and simple lines combined with simple shapes and flat areas of color helped to create a sense of order and balance in the art of ancient Egypt". (Royal society of chemistry. 2022)

The ancient Egyptian artist's arrangement of the elements on the walls was not random; but he used mathematics to construct his compositions, based on axiality, proportion, and hieratic scaling, In order to maintain the correct proportions in their work (Royal society of chemistry, 2022). The artistic arrangement followed precise squared grid systems and guide lines to align and size the elements within the given format with great proficiency resulting in accurate uniformity of Egyptian art as a result of the standard common proportional system (Teeter, E., 2022). This rule was first applied in the old Egyptian kingdom, with minor variations in proportions in the middle and new kingdoms (Madsen, R.S, 2019).But these variations did not change the style of Egyptian art during the 3000 years that pharaohs ruled Egypt, as objects from any period during this time are instantly recognized as being Egyptian art (Teeter, E., 2022).

Figure proportions were based on the width of the palm of the hand, so there were rules about head-to-body proportions. The faces should not show any emotions (Royal society of chemistry, 2022) .The standing human figure was proportional from the hairline to the soles of the feet by an eighteen-square grid, and the length of the foot was allotted three squares, while the torso from the neck to the waist was allotted four squares. This system was used until the twenty- fifth dynasty (700 b.c.), when the grid was changed to twenty-one squares, resulting in the elongation of the figures prominent in the Ptolemaic and Roman eras (332 b.c. –A.D. 395) (Teeter, E., 2022). Ancient Egyptian artists used vertical and horizontal reference lines. Many tombs still have these grids on the walls, which were used to ensure that the lower and apprentice artists working for the master artist followed the conventions. (Royal society of chemistry, 2022)

Figure (3): Outline study of Khuwy's main figure.

Monocular depth cues in the Egyptian art

Many viewers find much of Egyptian art familiar and easily understandable, so that they can appreciate it without knowledge. In the two-dimensional Egyptian art, the artist has accepted

the drawing surface as flat (Gay Robins, p2, 1994). Although the artist has presented the elements to be invariably voluminous and located at various distances, their presentation on the tomb walls is necessarily two dimensional. “The Egyptians conceptualized a system of pictorial conventions that was tailored to their particular cultural needs. Based on frontal images, where “frontal” means unaffected by foreshortening, and the images are mental or memory images, a concept created to explain Egyptian representations by mental storage mechanisms “. (M. k. Hartwig., 2015. P.146).

To create the illusion of perspective on a flat surface, drawing any object in three dimensions requires a specific viewpoint. Drawing an object in two dimensions necessitates depicting only one surface of that object. And it turns out that emphasizing just one surface has advantages. The outline conveys the most information in pictorial representation. When something is defined by an outline, it is easier to understand. Even though many Egyptian drawings and paintings include details from multiple sides of the object, the outline becomes the most important feature when drawing on a flat surface. There is also a strong emphasis on clarity and readability. The majority of Egyptian art was displayed in an architectural context. Relief modeling, also known as bas-relief, which involves mounting or carving a mostly flat sculpture into a wall, this technique was used in some tomb compositions. You can't say that a relief's outline is flat because the relief also models the body's surface and has texturing and surface detail in addition to its outline. (Martin M., 2022.)

Despite the two dimensional identity in the Egyptian art, the analysis of the research case studies shows various basic attempts from the Egyptian artist to imply depth, whether it was intended or as a result of copying the nature infront of him in his drawings -in a very basic form using techniques that exploit the well-known monocular cues of depth-. (Brooks K. R. (2017).

“Human operators perceive depth by interpreting a variety of cues collected by the visual system” (R. Bogdanova, P. Boulanger, and B. Zheng, 2016. p2). Both physiological and psychological cues are used by the human visual system to interpret depth in sensed images drawn on a flat surface. When viewing drawings with only one open eye, the viewer can access some physiological cues that require both eyes to be open (binocular) (monocular), the human visual system senses the object distances based on all available depth cues. (Okoshi, T., 1976). Monocular cues -in their basic form- used by the Egyptian artist, influencing a sense of perspective to the viewer to be judged (Brooks K. R. (2017) were eventually harmonized in the geometrical system of the Egyptian art. The most interesting - from a theoretical point of view- are overlapping and occlusion, relative size, gradient and simple shading (J. Hayman, 2006.p13).

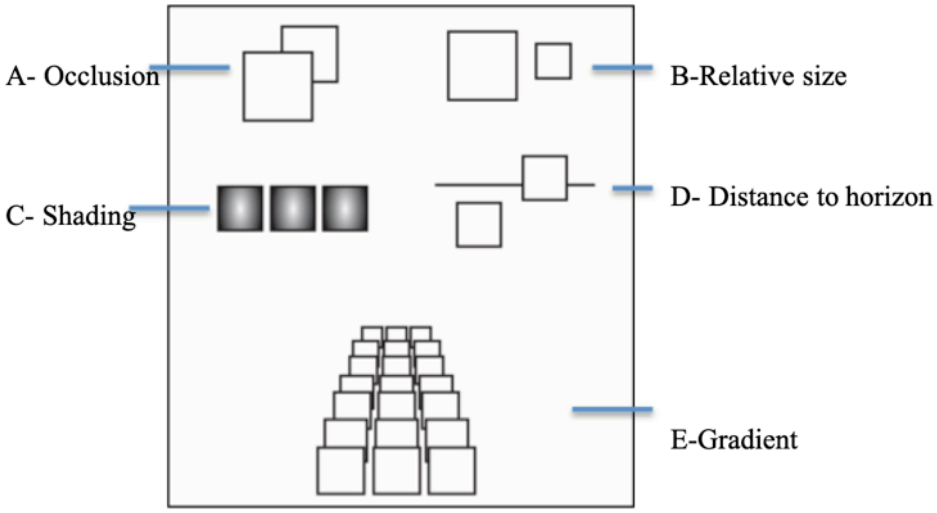


Figure (4): Monocular depth cues.
Photo adapted from R. Bogdanova, P. Boulanger, and B. Zheng, 2016.

Relative size

Through out different historical periods artists adopted different techniques to show the decrease in size of objects at a distance to apply a perspective presentation; the foreshortening of objects lying at an angle to the picture plan, and the convergence of parallel lines as they move away from the viewer (Gay Robins, p2, 1994). But relative size in the Egyptian art is a very critical matter. The relative proportions are not haphazard or unintelligible, but convey a consistent ideological message (B. A. Power, P.38, 1999). The sizes of the figures in ancient Egypt were determined by their importance, power and strength. In order to clearly define the social hierarchy of a situation, figures were not drawn to sizes based on their distance from the painter's point of view to show depth or perspective, but on relative importance (Gay Robins, 1994). "Ancient Egyptian art aimed at producing a readable meaningful picture, which represents the meaning not the perception of the world". (K., Aldenhoven, 2019). Therefore the proper understanding of the "meaning" of the illustrations in the Egyptian art helps in understanding the use of relative scale (B. A. Power, P.37, 1999).

This is very clear in the case studies of this research. In (Figure 1-C), the tomb owner drawn as the largest figure in the scene (Royal society of chemistry, 2022) and dominates the rest of the composition, "where conventions for drawing the human figure are reaching their standardized form" (B. A. Power., P.38, 1999). The left wall in figure 1-A contains a secondary scene divided into three main horizontal registers, the first two divided into vertical columns containing figures carrying offerings. The figure's sizes are relatively much smaller than the tomb owner on the front wall in figure 1-C (H. ElKamshoushy., 2019). "The larger the scale of the figure, the more important they were" (A. Calvert, 2022).

Gradient patterns

Although the relative size is related to the figure importance, gradient patterns - not related to image importance -have been used by the Egyptian artist. A very clear example of the gradient decrease in size is the circular details on the fish, Figure (6). The analytical study of

the fish pattern shows geometrical accurate decrease in size in each row of the pattern, creating a unique gradient effect making the fish look more voluminous, and creating an impression of spatial depth. The gradient pattern represented in accordance with the artist's viewing and not with his imagination, as a result of copying the nature infront of him (M. k. Hartwig., 2015. P 146).

Another clear example of the use of gradient sizing, the offerings in figure (5), The image shows a sample of the offerings presented to the tomb's owner drawn on the horizontal registers on the front wall facing the main figure. The objects of known distance subtend a smaller and smaller angle, it is interpreted as being further away (M. Kalloniatis, C. Luu., 2007) . Although the decrease in size is very close, and the depth impression is not very clear to the viewer, but it is considered a very basic form of monocular depth cues.

Figure (5): Detailed study of the offerings gradient patterns in Khuwy's tomb.

Figure (6): Detailed study of the fish circular gradient pattern in Khuwy's tomb.

Interposition

Interposition cues occur when there is overlapping of objects. The overlapped object is considered further away (M. Kalloniatis, C. Luu., 2007) When objects block each other out of our sight, we know that the object that blocks the other one is closer to us. The object whose outline pattern looks more continuous is felt to lie closer. Figure (7) shows depth perception based on overlapping techniques. An image with continuous outline is felt closer to the viewer .In image A the larger square is infront of the smaller one, in image B and C no clear depth information can be understood. In image D the smaller square is closer to the viewer than the bigger square (Okoshi, T., 1976.)

Overlapping -which is the oldest technique for depicting non-planer spatial relationships- was already used by the Egyptian artist in the old kingdom, to depict one object partly occluding

another. In Egyptian art, meticulous overlapping is often used to depict a row of objects (Figure 1-2) (J. Hayman, 2006. p 13).

The Egyptian artist tried to employ some depth cues to show overlapping, that was clear in the relationship of figures and objects they are carrying, figure of Khuwy's arm passing in front of his body carrying an item shows that it lies between the figure and the viewer (figure 3), and also the standing figures carrying offerings passing in front of their bodies giving an illusion of depth (figure 1-A) (Robins, 1994).

Symbolism plays an important role in establishing a sense of order in Egyptian art. Important figures were not usually depicted overlapping, but figures of servants were. Each object or element in a scene was designed and drawn from its most recognizable angle. The objects in a scene were then grouped together to create the whole. This is why images of people show their face, waist, and limbs in profile, but the eye and shoulders are shown facing frontally. These scenes are composite images designed to provide complete information about the relationship of the objects to each other, rather than from a single viewpoint. Rules were also applied to the poses and gestures of the figures to reflect the meaning of what the person was doing. An ancient Egyptian artist would depict a figure in an act of worship with both arms extended forward with hands upraised. The Egyptian artist did not attempt to replicate the real world but did achieve a realistic dialogue between the three dimensions world and their paintings by the use of position and grouping to represent depth so the background is shown above the figure, the foreground below or to one side.
(Royal society of chemistry, 2022)

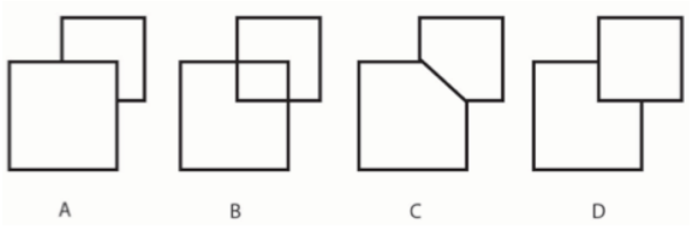


Figure (7): Depth perception based on overlapping techniques. (Okoshi, T., 1976.)

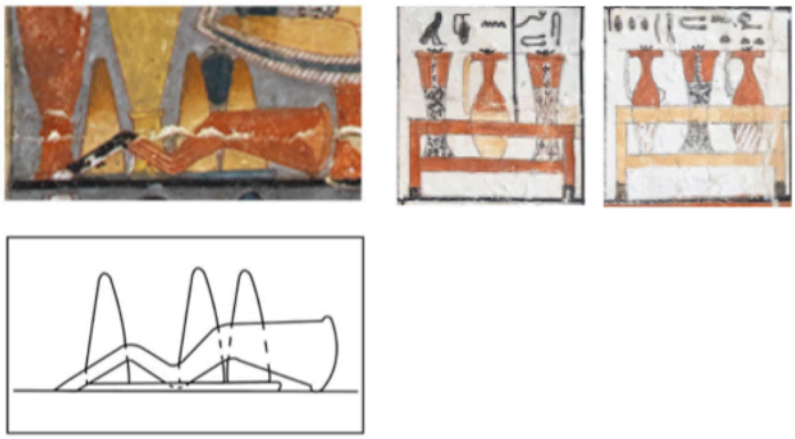


Figure (8): Overlapping and occlusion in the Egyptian art.

Gradient colors and shades

“The Egyptian colors were not chosen randomly but each had a very specific symbolism for the Egyptians and was used to convey that significance. In the Egyptian art color was regarded as an integral element of all art representations” (Joshua. J., 2017).

Gradient colors or shades can provide information about an object's dimensions and depth (figure 9). Although the Egyptian artist depended on flat coloring with no shading in most of his illustrations, slight shading is recognized in some offering drawings on the tomb walls. It is not clear whether it was intended by the artist to show a sense of depth using gradient colors and shading or it was a result of the precise copying of the objects infront of him in his drawings.

Figure (9): Evidence of shading used by the Egyptian artist.

Conclusion

The importance of this research lies in it's application on the recent Egyptian archeological discoveries announced by the Egypt’s Ministry of Tourism and Antiquities - based on the work of the Egyptian archaeological missions in various sites in Saqqara. Aiming to understand more about the ancient Egyptian arts and exploring the Egyptian civilization. Revealing more information about the artist’s dialogue between the three dimension world and their paintings.

The ancient Egyptian artist’s arrangement of the elements followed a precise squared grid system and guide lines to align and size the elements within the given format with great proficiency. Despite the two dimensional identity in the Egyptian art, the research analysis of the case studies shows various basic attempts from the Egyptian artist to imply depth. It is not clear if they are basic attempts from the artist to show depth and volume to his elements or it’s a result of the precise copying of the nature infront of him in his drawings.

In a very basic form, some of the illustrations show the use of techniques that exploit the well-known monocular cues of depth-. The most interesting - from a theoretical point of view- are; overlapping, occlusion, relative size, gradient and simple shading. The dominant feature used in the artist’s drawings was overlapping and occlusion while shading and gradient patterns were used in very limited drawings. Relative size was used to convey a consistent ideological message, that the larger the scale of the figure, the more important they were, and it wasn’t meant to convey depth or perspective in his drawings.

Gradient sizing of patterns were recognized in only two visual elements; The offerings placed on each other and the fish pattern, which both shows geometrical accurate decrease in size in each row of the pattern, creating a unique gradient effect making the element look more voluminous, and creating an impression of spatial depth.

References

A. Calvert. (2022). Ancient Egyptian art, Khan academy. Retrieved from, https://www.khanacademy.org/humanities/ap-art-history/ancient-mediterranean-ap/ancient-egypt-ap/a/egyptian-art. Accessed 1st May 2022.

B. A. Power. (1999). Iconographic windows to Ezekiel's world, University of Toronto.

Brooks K. R. (2017). Depth Perception and the History of Three-Dimensional Art: Who Produced the First Stereoscopic Images?. *i-Perception*, *8*(1), 2041669516680114. Retrieved from https://doi.org/10.1177/2041669516680114)

El Aref, N. (2019/4/ 13). Egyptian antiquities minister takes ambassadors to visit newly discovered tomb in Saqqara. Ahram online. Retrieved from http://english.ahram.org.eg/News/329952.aspx

Essam, A. (2019/4/13). All what you need to know about the one of a kind Khuwy tomb. Egypttoday. Retrieved from, https://www.egypttoday.com/Article/4/68261/In-pic-All-what-you-need-to-know-about-the

Joshua. J. Color in ancient Egypt. 2017.Retrieved from, https://www.worldhistory.org/article/999/color-in-ancient-egypt/.

J. Hayman. (2006). The objective eye, color, form and reality in the theory of art, United states of America .

K., Aldenhoven. (2019). Retrieved from, https://www.topoi.org/project/topoi-1-2/

Martin. M., (2022). Why does ancient Egypt's distinctive art style make everything look flat . Retrieved from, https://www.livescience.com/why-ancient-egyptian-art-2d

M. Kalloniatis, C. Luu., (2007). The perception of depth, National library of medicine. https://www.ncbi.nlm.nih.gov/books/NBK11512/

M. k. Hartwig.(2015). A companion to ancient Egyptian art, USA.

Okoshi, T. (1976). Three-Dimensional Imaging Techniques, Academic Press, New York. Retrieved from, http://www.hitl.washington.edu/projects/knowledge_base/virtual-worlds/EVE/III.A.1.c.DepthCues.html . Accessed 10 June. 2022.

Principles of Egyptian art, royal society of chemistry. (2022). Retrieved from edu.rsc.org.

R. Bogdanova, P. Boulanger, and B. Zheng. (2016). Depth Perception of Surgeons in Minimally Invasive Surgery, Surgical innovation.

Robins, G. (2008). *The ancient art of egypt* . Massachusetts : Harvard university press.

Robins, G. (1994). *Proportions and style in Ancient Egyptian art* .Texas : University of Texas press.

Teeter, Emily. (1994). "Egyptian Art." *Art Institute of Chicago Museum Studies*, vol. 20, no. 1, pp. 15–31. Retrieved from *JSTOR*, https://doi.org/10.2307/4112949. Accessed 12 June. 2022