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PHOTOGRAPHIC METHODS IN ARCHAEOLOGICAL RESEARCH: RECOMMENDATIONS AND APPROACHES

ARKEOLOJİK ARAŞTIRMALARDA FOTOĞRAFÇILIK YÖNTEMLERİ: ÖNERİLER VE YAKLAŞIMLAR

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Abstract
Photography stands as a pivotal documentation tool in the realm of archaeological studies. Within the context of archaeological research methods such as excavation and survey, it is crucial to capture the overall view of studies and discoveries through images. The technology and techniques of photography utilized in archaeological endeavors have been gradually improving. The rapid progress in technology equips researchers with exceptional tools to document their finds. However, merely possessing the equipment is not sufficient to leverage the benefits of contemporary technology. A solid understanding of photography gear and especially its methodologies greatly streamlines the documentation process. In this light, a range of photographic methods can be employed at any excavation site and at different stages, given that one has access to at least a semi-professional camera. This article delves into the three fundamental techniques in archaeological photography. 'Panoramic photography technique,' the 'HDR photography technique,' and the 'focus stacking technique'. The primary aim of this research is to elucidate how to capture the images necessary for an archaeological project in the most precise and effective manner. To successfully implement these techniques, one must possess basically a competent level of camera and Photoshop software. With a certain amount of practice, they can readily apply the technical insights outlined in this study. This article concludes that photography, as a fundamental method used in archaeological studies, has the potential to open up new collaborative projects for both photographers, academics and archaeologists.

Keywords: Photograph, Archaeological Photography, Photography Techniques.

Öz
Fotoğrafçılık, arkeolojik çalışmalar alanında temel bir belgeleme aracı olarak öne çıkmaktadır. Kazı ve yüzey araştırması gibi arkeolojik araştırma yöntemleri bağlamında, çalışmaların ve keşiflerin genel görünümünü görüntüler aracılığıyla yakalamak çok önemlidir. Arkeolojik çalışmalarda kullanılan fotoğrafçılık teknolojisi ve teknikleri giderek gelişmektedir. Teknolojideki hızlı ilerleme, araştırmacılara buluntularını belgelemek için üstün araçlarla donatmaktadır. Ancak, yalnızca ekipmana sahip olmak, çağdaş teknolojinin faydalarından yararlanmak için yeterli değildir. Fotoğraf ekipmanlarına ve özellikle yöntemlerine dair sağlam bir anlayış, belgelemeye yönelik süreci büyük ölçüde kolaylaştırır. Bu bağlamda, en azından yarı profesyonel bir kameraya erişim sağlandığı takdirde, herhangi bir kazı alanında ve farklı aşamalarda çeşitli fotoğrafik yöntemler kullanılabilir. Bu makale, arkeolojik fotoğrafçılıktaki üç temel tekniği ele almaktadır: 'panoramik fotoğrafçılık tekniği', 'HDR fotoğrafçılık tekniği' ve 'odak yığma tekniği'. Bu araştırmanın temel amacı, arkeolojik bir proje için gerekli olan görüntülerin en hassas ve etkili şekilde nasıl elde edilebileceğini açıklığa kavuşturmaktır. Bu teknikleri başarılı bir şekilde uygulamak için, kişinin yeterli düzeyde fotoğraf makinesi ve Photoshop yazılımı bilgisine sahip olması gerekir. Belli bir süre pratik yaptıktan sonar, bu çalışmada özetlenen teknik bilgileri kolaylıkla uygulayabilirler. Bu makale, arkeolojik çalışmalarda kullanılan temel bir yöntem olan fotoğrafçılığın; fotoğrafçılar, akademisyenler ve arkeologlar için yeni işbirliği projelerinin önünü açacak bir potansiyele sahip olduğu sonucuna varmaktadır.

Anahtar Kelimeler: Fotoğraf, Arkeolojik Fotoğrafçılık, Fotoğrafçılık Teknikleri.

** The article is derived from the Master's thesis titled "Photography Techniques in Cave Excavations in Archaeology: The Keçe Cave Example," written by Savaş Akkaş (Aksaray University, Thesis No: 961977)*

INTRODUCTION

Following its invention, the camera was swiftly embraced and utilized in archaeology. The technique of capturing photographic images in the field was first attributed to R. Lepsius during an archaeological expedition in Egypt from 1842 to 1845. Nonetheless, the most significant contribution to archaeological photography comes from M. Tranchand's collection of images taken during V. Place's excavations in Assyria between 1852 and 1855 (Figure 1). Another notable use of photography was undertaken by Alexander Conze at the archaeological sites in 1872. Instead of relying on lithographs or engravings derived from photographic images, Conze produced the first documentation using actual photographs which is often considered the first modern archaeological record, during his work at Samothrace. The photographs taken by Conze at Samothrace, presented below, shows a meter beside the arch, indicating the height of the object, while the well-chosen angle provides insight into its depth (Figure 2). The images here also capture the stones and other architectural elements of the site in detail (Dorrell, 1994, p. 3-5).

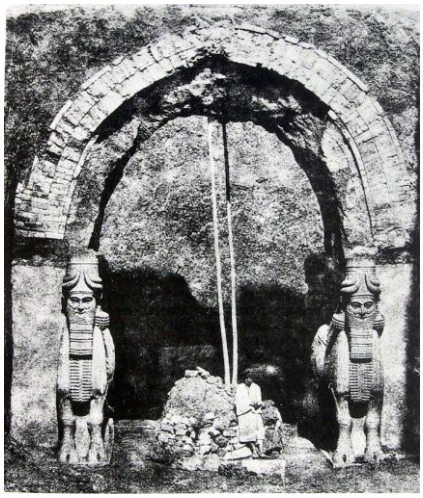

Figure 1. Khorsabad Gate. M. Tranchand1852-1855 (Dorrell, 1994, p. 3).

Figure 2. The arched structure in Samothrace (Dorrell, 1994, p. 5).

A key publication detailing the essential technical aspects of photography in archaeology is *Photography for Archaeologists* by M.B. Cookson, with a preface by Mortimer Wheeler (Cookson, 1954). This book has been instrumental in laying out the foundational principles of archaeological photography. Another significant work regarding photographic techniques in archaeology is *Photography in Archaeology and Conservation* by Peter Dorrell (1994). The insights provided in these two books continue to hold relevance today. Reviewing literature on this subject in our country reveals that investigations into archaeological photography are particularly manifest in postgraduate theses. For example, Bekir Köşker's (2002) thesis titled "*Arkeoloji`de Fotoğraf (Photography in Archaeology)*", completed in 2002 under the supervision of Prof. Dr. Sabit Kalfagil, serves as a noteworthy example. Other examples include Nevin Azakoğlu's (2006) master's thesis, completed in 2006 and supervised by Prof. Dr. Barbaros Gürsel, titled *"Tarihi Eserlerin Fotoğraflanması Erken Fotoğrafçılık Dönemi: 1839-1899 (Photography of Historical Artifacts Early Photography Period: 1839-1899)*", Ayhan Özener's (2006) master's thesis titled "*Arkeoloji Biliminde Fotoğraf Teknikleri (Photography Techniques in Archaeology)*" supervised by Assoc. Prof. Dr. Göksel Sazcı, and Burcu Böcekler's (2007) master's thesis, supervised by Prof. Dr. Simber Eskier, titled "*Fotoğraf-Arkeoloji İlişkisi ve Çağdaş Fotoğraf Sanatında Temsili (The Relationship Between Photography and Archaeology and its Representation in Contemporary Photographic Art)*".

Following these contributions, only a small number of further postgraduate research has been undertaken regarding archaeological photography. One such article is *Photography and Archaeology: The Photographic Journey of Urne 40- Fotoğraf ve Arkeoloji: Urne 40'ın Fotoğrafik Yolculuğu* by Dr. Savaş Onur Şen (2023). As this article proves, given the rapid advancements in photographic tools and methodologies, producing updated publications on photography in archaeology would prove advantageous for the discipline.

In archaeological inquiries, the adoption of cameras has mainly replaced laborious techniques like drawing, and it has thereby reduced the time required for documentation tasks and enhanced the reproducibility and permanence of records. Technological progress in camera miniaturization and compactness, coupled with their increased affordability, has rendered photography one of the most crucial tools for documentation in modern archaeology. The rise and swift progression of digital technology have further amplified the utility of photography. While digitalization has made photography easier, it has also introduced certain challenges. The primary challenge lies in accurately representing the existing archaeological finds, while another challenge concerns archiving of the documentation.

This study aims to elucidate both the theoretical and practical facets of photography in archaeology, drawing examples from the Keçe Cave excavation. This research aspires to equip an archaeologist engaged in any excavation or surface survey with the knowledge to capture the most effective photographs. The selection of Keçe Cave as the focal point is justified by the presence of diverse elements both inside and outside the cave, such as excavation sites, rock paintings, rock-cut tomb, along with a rich variety of finds (including stone, ceramic, bone, metal, glass, and decorative artifacts). The fact that materials spanning nearly all archaeological periods exist within a single excavation site enhances the breadth and significance of this study. Furthermore, from a photographic perspective, the presence of both indoor and outdoor areas, allows for the use of both natural and artificial light, and that of fragmented shadows in the outdoor area enables the use of HDR techniques. Furthermore, the use of Focus Stacking techniques for some of the finds, and the cave's location give the opportunity to use Panoramic techniques. All in all, these can be counted among the main reasons for the spatial selection of this study. Active involvement in the Keçe Cave excavations for photography purposes took place in 2023 and 2024 including both field and artifact photography. Prior to engaging in the excavations, a methodical approach for archaeological sites and materials was determined, and photography techniques were executed with this consistent methodology. Practical and cost-effective tools and equipment were acquired for both field and artifact photography. Before capturing images in the field, the most appropriate time frames for each area across different locations were identified, and photography occurred within these time intervals. Two distinct techniques were employed in the field photography to achieve optimal results. The initial method utilized is panoramic photography which was prominently favored to display the wall murals and the surrounding area of the cave. Another method incorporated is HDR photography. This technique was specifically applied to capture images in Area C, positioned right in front of the cave where the 2024 excavations took place. Since the images of the artifacts were taken indoors, artificial lighting was employed which facilitated taking photographs at any hour of the day. A studio-like setting was established by arranging the backdrop, lighting equipment, and camera. The focus stacking method was particularly implemented for artifacts that presented focusing challenges.

Prior to exploring the intricacies of the photographic methods central to this study, it would be beneficial to briefly outline the Keçe Cave excavation site where this research was carried out.

KEÇE CAVE

Keçe Cave is situated in the village of Keçemağara within the Elbistan district of Kahramanmaraş province. Located roughly 40 km north of the Elbistan district center, its elevation reaches 1734 meters above sea level (Yaman, 2020, p. 86). To the east of the cave lies the Beşpınar Mountains (2093 m), which stretch for about 3 km and delineate the border with Malatya province, while the Hezanlı Mountains (2283 m) are positioned approximately 7 km to the north/northeast and mark the boundary of Sivas province. Such geographical attributes render the cave's region adjacent to the borders of three provinces (Kahramanmaraş, Malatya, Sivas) as well as three distinct geographical areas (Mediterranean, Eastern Anatolia, Central Anatolia) (Yaman, 2023, p. 62).

The first archaeologist to note the presence of Keçe Cave was Prof. Dr. İsmail Kılıç Kökten (1904-1974). He discovered the cave during his archaeological studies in Kahramanmaraş in 1959 however, he did not undertake any excavations at the site (1960, p. 46). Later in 2012, surveys along the Afşin-Elbistan route identified recorded archaeological artifacts in and around Keçe Cave. These findings include lithic tools attributed to the Paleolithic Age, as well as artifacts assumed to originate from the

Early Bronze Age and the Roman Period. Another significant aspect of the site is the presence of prehistoric paintings located within one of the smaller caves in the eastern area (Yaman, 2019). Excavations in the site started in 2015 to reveal the significance of Keçe Cave and to uncover its archaeological potential for the region. Excavations at Keçe Cave are still ongoing both within the cave and on the terrace section outside it. The assemblages of artifacts that are found just beneath the surface layer include chipped stone implements, animal bones and bone tools, ceramics, metal objects, glass items, and coins (2023, p. 67-71). The excavation work is currently carried out by a team of archaeologists and students, led by Assoc. Prof. Dr. İrfan Deniz Yaman.

PHOTOGRAPHY TECHNIQUES

The explanations to be presented regarding photography techniques used in the field of archaeology will be given in a specific order. In this context, it is necessary to mention the light sources used in archaeological photography, as in every field of photography.

The Use of Light in Archaeological Photography

The aesthetic effect of light in a photograph is certainly among the issues that artists value. Although light is fundamentally divided into the basic categories of natural and artificial, it has also many different types in terms of its effect in a technical context (Yıldırım & Nuhoğlu, 2024). Being able to take photographs by using the intensity and direction of different artificial lights in a studio environment is related to the technical competence of the photographers. In natural light conditions, the photographer's ability to read the light and adjust their shooting plan accordingly will be only possible for an artist with many years of experience. In this context, in shots taken with natural light, the correct evaluation and control of the direction and aesthetic effect of the light is of critical importance to achieve successful results (Kanburoğlu, 2012, p. 180).

In this study, "natural light" was used for photography of the excavation site and its surroundings, while "artificial light" (Godox Led 6R RGB Led Video Light) was used to photograph the artifacts. This particular model was chosen for its use in artificial lighting because it is both easily portable and has an adjustable Kelvin temperature range between 3200 and 6500. The first group of artifacts photographed at the Keçe Cave excavation site consisted of chipped stone tools. Numerous factors influenced the photographic process for these artifacts, including the type of stone used, stone colors, technological characteristics, and fragment thicknesses. In this context, it is important to emphasize that the techniques used to photograph the selected chipped stone artifacts may vary for each piece. The chipped stone artifact was photographed with partial frontal lighting, and a silver reflector was used to illuminate areas that remained in darkness. Since the large size of the artifact would affect photographic clarity, the "photo stacking technique" was applied. The steps involved in applying the photo stacking technique (which will be described in a separate section) are as follows: two photographs were taken from each side of the artifact. In Photoshop's Camera Raw settings, the amount of light was increased by realistically adjusting the exposure and shadow settings, while the highlights and white balance were decreased to avoid glare. Vibration and saturation were negatively adjusted to bring the color balance closer to the original. Texture and sharpness settings were also increased to highlight the details on the artifact (Shutter speed 1/250, Aperture f/5, ISO 500) (Figure 3).

Figure 3. Chipped stone tool.

For the image of the jawbone, side illumination was favored. The LED light was adjusted to a yellow hue to enhance the visibility of the bone artifact, with its brightness finetuned according to the piece. I n Photoshop's Camera Raw filter, the exposure and shadow levels were raised to amplify the light, acc urately mirroring the original scene. Vibrance and saturation were reduced to achieve true color fidelit y. Texture and sharpness were heightened to emphasize the intricate spongy details of the artifact (Shu tter speed 1/125, Aperture f/8, ISO 500) (Figure 4). Regarding the shot of the animal's tooth, side illum ination was also employed. In Photoshop's Camera Raw filter, the exposure and shadow adjustments w ere increased to boost the light, while highlights and white balance were toned down to prevent glare. This resulted in accurate color representation (Shutter speed 1/100, Aperture f/5, ISO 250) (Figure 5)

Figure 4. Animal jawbone.

Figure 5. Animal tooth.

To capture the ceramic artifact, side illumination was utilized. In Photoshop's Camera Raw settings, the exposure and shadow parameters were heightened to faithfully represent the artifact, while highlights and white balance were reduced to eliminate glare. Vibrance and saturation were lowered to adjust the color balance to its original state. The texture and sharpness levels were enhanced to accentuate the artifact's intricate details (Shutter speed 1/80, Aperture f/5.6, ISO 400) (Figure 6).

Figure 6. Pottery piece.

The metal artifact was captured byusing side illumination. Within the Camera Raw filter of Photoshop, the exposure level was elevated to accurately depict the state of the artifact, and the saturation was positively enhanced to better reveal the hues of the corroded material. Adjustments to texture and sharpness were also made to emphasize the intricate details of the artifact (Figure 7: Shutter speed 1/100, Aperture f/5.6, ISO 400), (Figure 8: Shutter speed 1/100, Aperture f/5.6, ISO 320) (Figures 7-8).

Figure 7. Metal artifact.

Figure 8. Metal artifact.

Side illumination was employed for the micro-find photography. Given that the artifact was measured less than 1 cm, a *macro extension tube* was utilized during the photography session to better capture the intricate details. Thanks to the macro extension tube, our standard lens enabled us to close in on the finds with nearly macro lens quality, thus allowing us to document all the features of the artifact despite its diminutive size. In Photoshop's Camera Raw filter, the exposure and shadow adjustments were raised to boost the luminosity, while the highlights and white balance were decreased to minimize glare. Vibrance and saturation levels were positively adjusted to restore the color balance to its true state. Texture and sharpness settings were also heightened to accentuate the details on the find (Shutter speed 1/30, Aperture f/5.6, ISO 500) (Figure 9)

Figure 9. Stone beads.

For the glass artifacts, lateral illumination was used, with black cardboard positioned on each side. This black cardboard, reflecting its own light, generated a dark line along the edges of the glass artifacts, enhancing their definition. A polarizing filter was also implemented to mitigate light reflections. Within Photoshop's Camera Raw settings, exposure and shadow adjustments were increased to optimize light intensity, while light tone and white balance were reduced to avert glare. Vibrance and saturation settings were adjusted negatively to restore color balance to its original state. Texture and sharpness settings were enhanced to render the artifact's details more prominent (Shutter speed 1/160, Aperture f/5.6, ISO 500) (Figure 10).

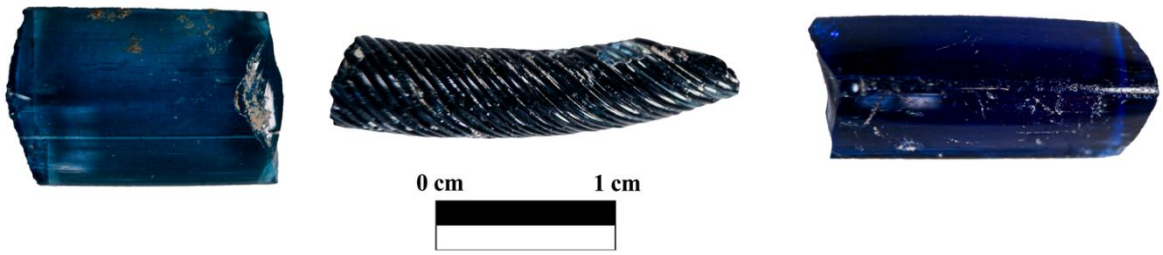

Figure 10. Glass artifact pieces.

The photographs of the artifacts were taken by using a setup made of two LED lights and a reflector, without relying on daylight. The values set during the photo shoot were determined specifically according to the size and shape of the artifact. As a basic setting, the aperture was adjusted first, and the ISO and shutter speed were then adjusted accordingly. For large artifacts where stacking techniques were applied, a low aperture setting such as F5.6 was used as several photographs were needed. For larger artifacts (flatter, with fewer indentations) where this technique was not necessary and only one photograph was taken, the aperture setting could be increased to F8-F11. For smaller artifacts, an aperture setting of F5-F5.6 was ideal. This prevented blurring that might have been caused by a low aperture setting, and it also disabled the light loss that might result from a high aperture setting.

Following the photography examples of the Keçe Cave artifacts, the panoramic photography technique, HDR photography method, and Focus Stacking technique—central themes of this study—will be elaborated upon with examples.

Panoramic Photography Method

Large-format images and digitally enhanced panoramic photographs are garnering interest both as a commercial product and as a powerful visual medium in the realm of photographic art. The foundation of the large-format visuals that captivate us today is rooted in the art of panorama execution, which originated in 1789. The Diorama displays pioneered by Daguerre in 1821 not only hold significance as a performing art but also, they present the inaugural examples to utilize large-format photographic prints in exhibitions. The demand for – and appreciation of -large-format visuals has evolved alongside the growth and dissemination of photography. Cameras designed to capture this expansive image as a formal and accurate representation in a single shot are referred as panoramic cameras. It is also feasible to create panoramic images without employing a panoramic camera. Özdal explainsthis method in the following statements:

1-As initially demonstrated by the daguerreotypists, the technique of merging photographs captured from specific points along a direct line parallel to the landscape is essential. For the photographs to merge accurately, there must be overlapping images between each subsequent photograph taken. By layering the same visuals, the image can be extended without distortion or displacement.

2- Similar to most automatic or digital cameras in use today, the captured image using a wide angle of 14-28 degrees is cropped at the top and the bottom to create an impression of a panoramic image.

3- It is possible to generate panoramic photographs with digital cameras and computer-aided applications. Software available for download from the internet or photo-stitched programs included with digital cameras greatly simplifies our tasks (Özdal, 2008).

Capturing images of the work area is crucial in archaeological research. Photographs of the work area can be taken to showcase the entire site, as well as detailed areas such as close-ups of the excavation site. Panoramic images are utilized in archaeology to depict where the work is being conducted and the extent of the area it encompasses. With the advancement of technology from past to present, such images are now primarily captured using unmanned aerial vehicles (drones). In fact, not only photographs but also 3D scanning models have now become part of this framework. Despite technological advancements, an example will be provided within this study for archaeologists who operate under constrained conditions or who wish to create panoramic photographs using alternative techniques.

This method was used to obtain general photographs of the rock paintings and the cave as well as its surroundings. Panoramic photography of the rock paintings is essential as all the shapes and symbols can be perceived as a complete whole. Taking an overall view of the cave utilizing the panoramic photography technique is essential to showcase the entire area encompassing the Keçe Cave. Employing a tripod is necessary when capturing panoramic photographs. To photograph the Keçe Cave, a setup was formed at a hill across from the cave, which is approximately at the same elevation as the cave. The following steps were followed during the photography process:

Step 1: The camera display was adjusted to the 9-segment grid setting (Figure 11).

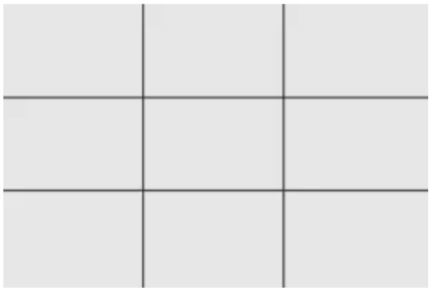

Figure 11. Grid adjustment appearance on the camera screen.

Step 2: Reference points to create intersections were established (Figures 12-13).

Figure 12. Photo 1 The reference point.

Figure **13.** Photo 2 The reference point.

Step 3: Six photographs were taken based on the reference points (Six photographs were captured for the study, but this number can be increased depending on the area and subject being studied) (Figures 14-16).

Figure 14. Photographs 1 and 2 were taken as panoramic photography.

Figure 15. Photographs 3 and 4 were taken as panoramic photography.

Figure 16. Photographs 5 and 6 were taken as panoramic photography.

The steps to be executed in Photoshop are:
Step 1: File > Automate > Photomerge (Figure 17).
Step 2: Auto > Blend Images > Browse (Figure 18).

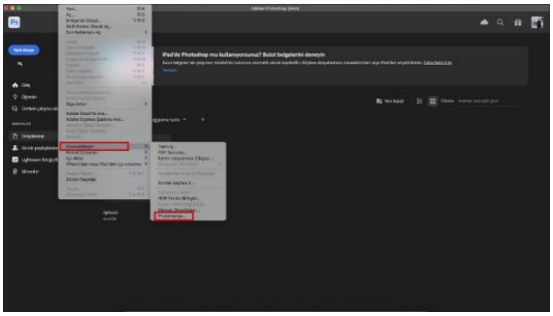

Figure 17. Step 1.

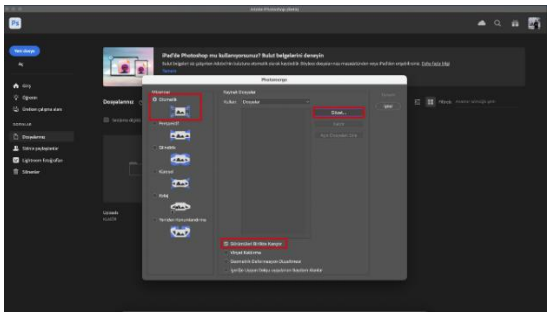

Figure 18. Step 2.

Step 3: Select photos using Ctrl (Command) > Open (Figure 19).

Step 4: OK (Figure 20).

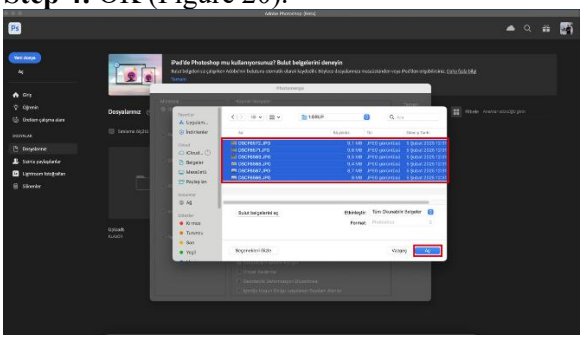

Figure 19. Step 3.

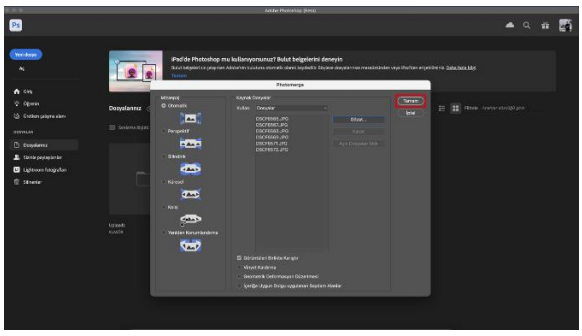

Figure 20. Step 4.

Step 5: Select photos using Ctrl (Command) > Merge (Figure 21).
Step 6: Trim edges, adjust color settings (Figure 22).

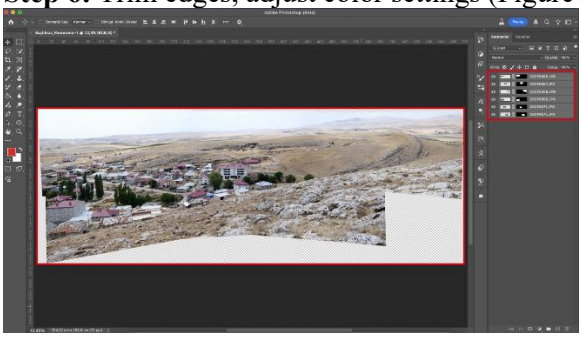

Figure 21. Step 5.

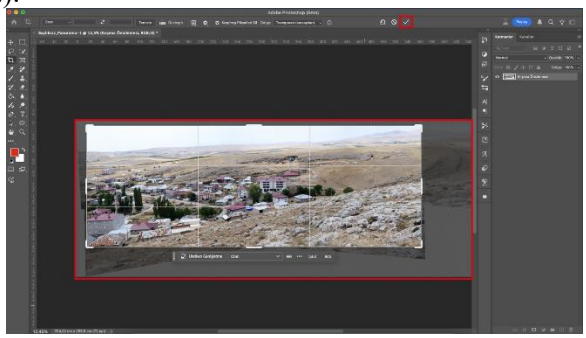

Figure 22. Step 6.

The outcome after systematically following all the steps is illustrated in Figure 23.

Figure 23. Panoramic technique final version.

HDR Photography Method

HDR (High Dynamic Range) is a technique that harmonizes various lighting values to ensure that every area within the image (whether in shadow or light) is perceived in an optimal way, free from overexposure or excessive darkness, by expanding the dynamic range with the assistance of software (Kanburoğlu, 2009).

This method is utilized to capture a harmonious and high-quality photograph, particularly in regions where shadows and highlights coexist. After making the necessary adjustments to the camera settings, the shutter button is pressed once to capture a series of images across the determined dark and bright exposure ranges. These images are subsequently merged in Photoshop by following the required procedures to create a well-balanced photograph.

This method is regarded as highly advantageous in fieldwork, especially at archaeological sites, as it

enables toovercome the challenges posed by natural lighting.

Camera Instructions:
Step 1: Menu > Shooting Settings > AE Bracketing Adjustment (Figure 24).
Step 2: Frame/Step Configuration (This setting should be modified based on the number of frames and the intervals at which pictures are intended to be taken (Figure 25).

Figure 24. HDR technique, step 1.

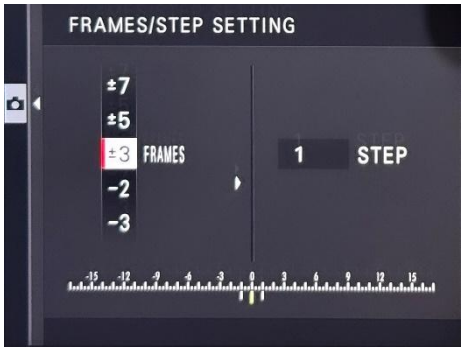

Figure 25. HDR technique, step 2.

Step 3: 1 Frame/Continuous > Continuous (Figure 26).
Step 4: Sequence > - 0 + (negative, zero, positive) (Figure 27).

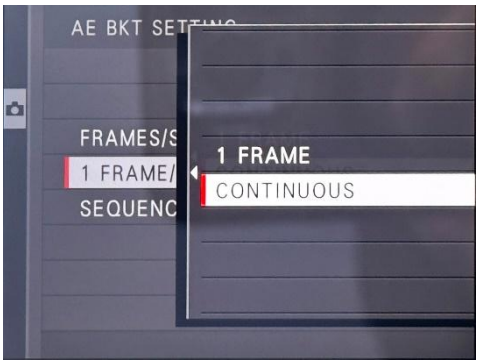

Figure 26. HDR technique, step 3.

Figure 27. HDR technique, step 4.

Photoshop Instructions:
Step 1: File > Automate > Merge with HDR Pro (Figure 28).
Step 2: Browse (Figure 29).

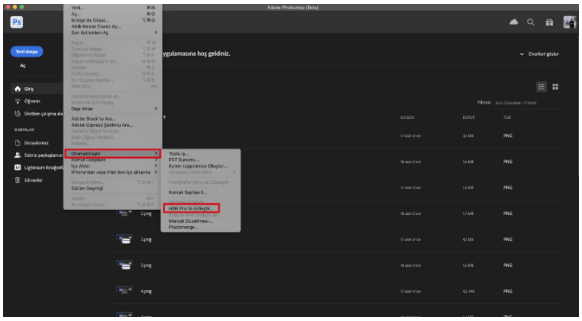

Figure 28. Photoshop, step 1.

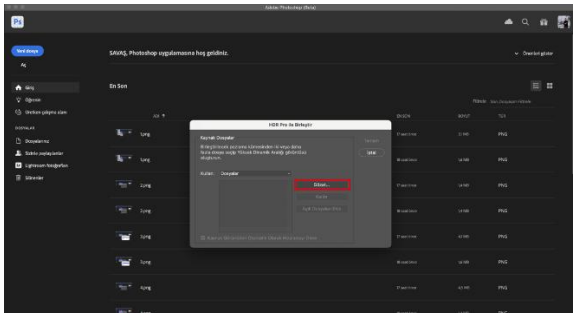

Figure 29. Photoshop, step 2.

Step 3: Select images with Ctrl (Command) > Open (Figure 30).

Step 4: Attempt to Automatically Align Source Images > OK (Figure 31).

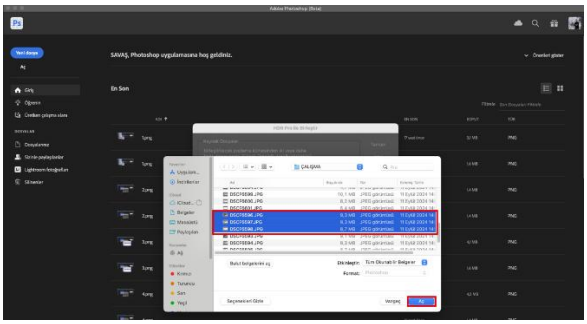

Figure 30. Photoshop, step 3.

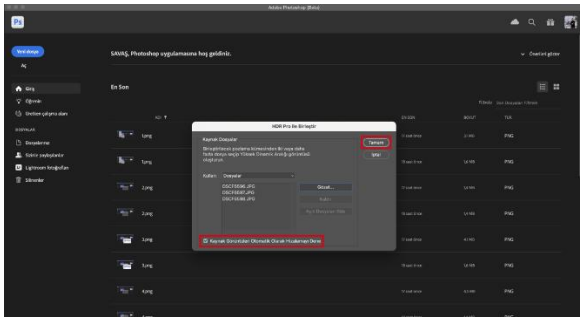

Figure 31. Photoshop, step 4.

Step 5: You can make modifications according to your individual preferences at this stage. (Figure 32).
Step 6: Save (Figure 33).

Figure 32. Photoshop, step 5.

Figure 33. Photoshop, step 6.

The outcome is displayed in Figure 34.

Figure 34. HDR technique final version.

Focus Stacking Technique

Small objects are frequently found among archaeological finds. The recording of various structures and archaeological finds within the scope of cultural heritage by using advanced digital imaging systems is increasing day by day. However, some technical difficulties are encountered in the process of digitizing small objects. The most common problem in macro photogrammetry is related to depth of field. At high magnification levels, a small depth of field can disrupt image alignment or create problematic areas. It can also significantly reduce texture quality by creating blurry areas during the photographing phase. The proposed solution here is the Focus-Stacking technique (Marziali & Marziali, 2019).

Focus stacking is a photographic technique that consists of capturing a stack of images at different focal

planes for each camera exposure. This is the only solution to overcome the problem of short depth of field. The movement of the focal plane between various shots can be achieved in two different ways. One is: fixing the camera to a tripod and manually or automatically changing the focal plane with software while the other method is to hold the focus lens fixed and move the entire camera/lens system on a micrometer-sized slide, which moves the focal plane as well (Clini, Frapiccini, Mengoni, Nespeca, & Ruggeri, 2016).

In this technique, multiple photographs are taken by focusing on different points of the find and then one can combine them in Photoshop to ensure that the entire find is in focus. Depending on the characteristics of the photographed piece, sometimes it is possible to apply this technique with two photographs, while in some pieces this number can reach twenty. In this study, the photo stacking technique was used, especially in profile photography of large-sized stone finds. The photograph shooting stage and Photoshop processing sequence are as follows:

Step 1: Taking photographs by focusing on different points in a way that complements each other
Note: Here, the areas inside the circle are not in focus. The areas outside the circle are in focus (Figure 35).

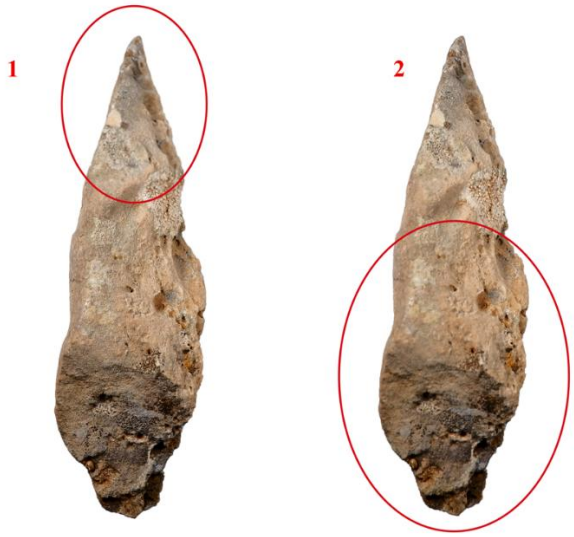

Figure 35. The appearance of photos.

After taking a photo, the processes in Photoshop are as follows:
Step 1: File > Scripts > Load Files into Stack (Figure 36).
Step 2: Files > Browse (Figure 37)

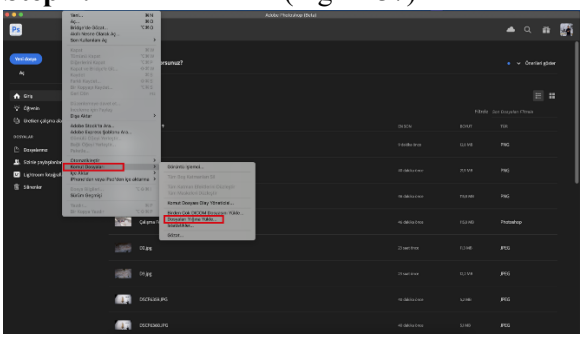

Figure 36. Photoshop, step 1.

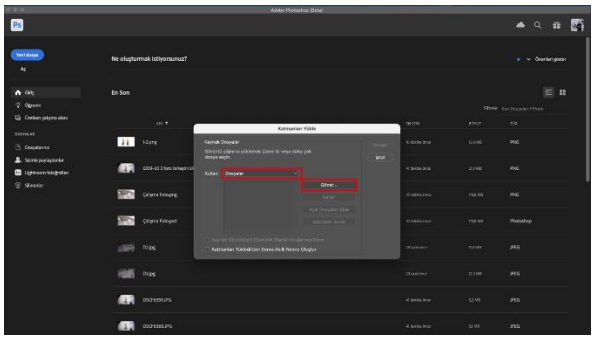

Figure 37. Photoshop, step 2.

Step 3: Select photos with Ctrl (Command) > Open (Figure 38).
Step 4: Try to Automatically Align Source Images > OK (Figure 39).

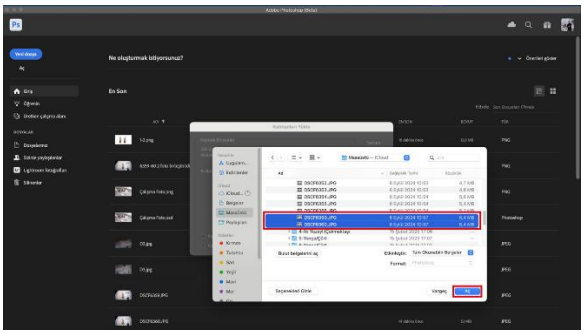

Figure 38. Photoshop, step 3.

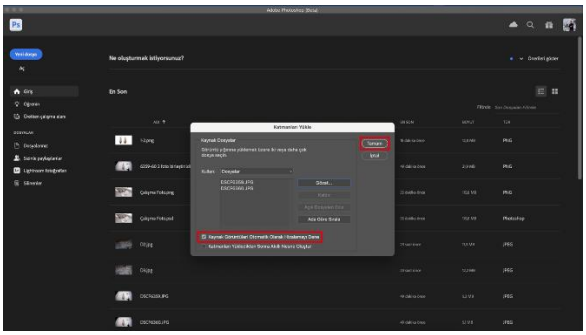

Figure 39. Photoshop, step 4.

Step 5: Select photos with Ctrl (Command) > Edit > Automatically Blend Layers (Figure 40).
Step 6: Stack Images > Seamless Tones and Colors > OK (Figure 41).

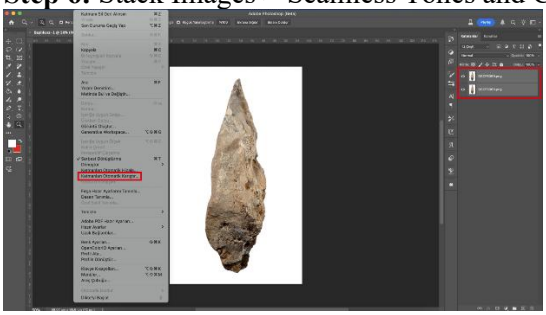

Figure 40. Photoshop, step 5.

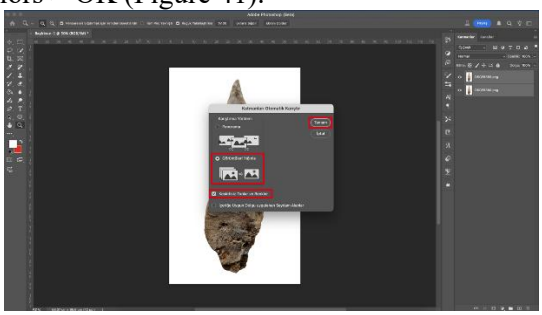

Figure 41. Photoshop, step 6.

Step 7: Select and Merge Photos (Figure 42).

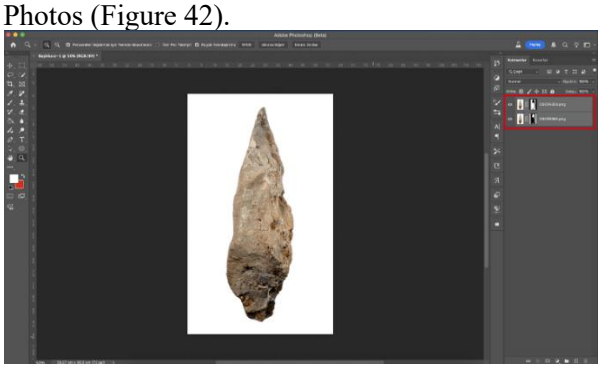

Figure 42. Photoshop, step 7.

The result after following all the steps is shown in Figure 43.

Figure 43. Photo stacking technique final result.

CONCLUSION

Photography has always been a cornerstone of *documentation* during archaeological surveys and excavations carried out in the field. It is essential to capture the progression of an archaeological endeavor from its onset, including the images of the sites, the research team at work, and the artifacts discovered. Prior to the digital camera era, photographs taken during research could only be viewed post-printing, which meant only certain team members had access to cameras. This scenario has evolved to a considerable degree with the rise of digital photography and its wider accessibility. Although each archaeological project operates with its unique dynamics, in general, archaeologists have become more adept at photographing their own endeavors. While photography is a professional requisite, its perception varies significantly among those who pursue it as a career or an academic interest. Field archaeologists and professionals from similar disciplines primarily photograph with intent, aiming for images that align with their objectives, such as illustrating the research area, capturing team members in action, and documenting specific discoveries. Each image included in these categories must exhibit particular attributes. For instance, a wide-angle shot is essential for portraying the worksite alongside its context. Additionally, there are critical considerations, such as selecting the right lens for the intended purpose. In the current era, one can explore various documentation techniques, ranging from 3D scanning to aerial photography via drones. Nevertheless, even with the utilization of cameras in archaeological endeavors, traditional drawing methods remain popular, and despite modern documentation advancements, photography still continues to be a fundamentaltool.

This article offers practical advice especially for those who are engaged in any archaeological endeavor and who possess basic photography skills. It provides in-depth information on the most formative aspects of the discipline together with its major challenges. Currently, panoramic images are often captured using drones. For those lacking this capability, or in circumstances where drone operation is hindered by weather conditions, methods for creating similar images with a camera are delineated. The HDR technique discussed previously is acknowledged for its capacity to enhance the quality of photographs, particularly since most archaeological work typically unfolds in outdoor environments. Lastly, the photographic stacking method, which is introduced as a remedy for the clarity issues related to depth in artifact photography, is elaborated upon. Practitioners employing this technique can effectively document artifacts with optimal clarity.

Archaeological projects, particularly excavations, involve a timeline stretching over several months. It is impractical for every excavation to have a professional photographer present throughout this entire time period. Therefore, essential techniques in archaeological photography, often conducted by knowledgeable and seasoned team members, have been highlighted. The core objective of this study is to provide recommendations to enhance the quality of photography within archaeological projects. We vision that in the forthcoming years, more comprehensive solutions can be formulated through collaborative efforts between photographers, academics, and archaeologists. This study is also expected to act as a catalyst to bring out new research that orients itself around such interdisciplinary approaches.

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