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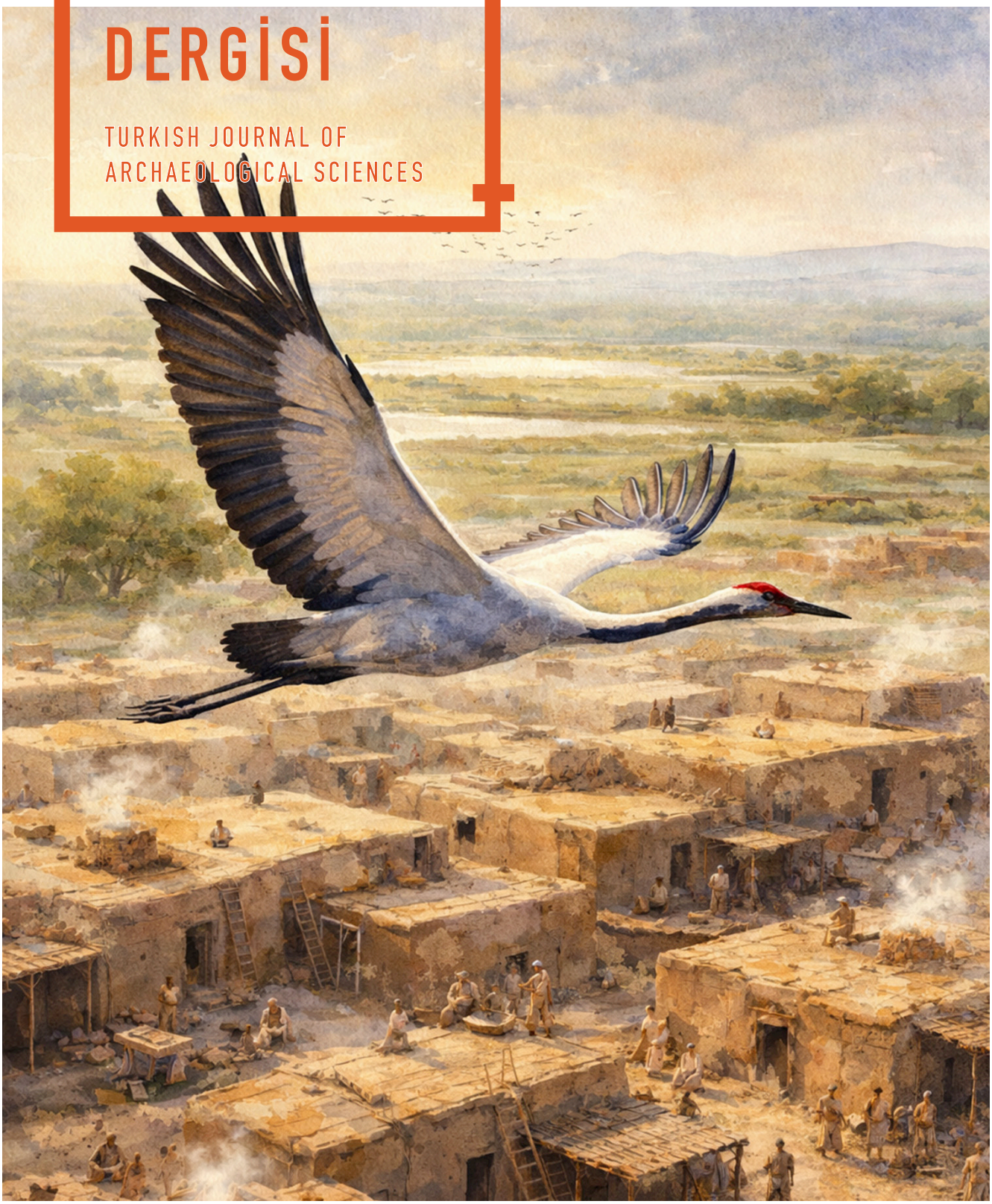

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Editörlerden

Elinizdeki altıncı sayımızla herkese yeniden merhaba. Arkeoloji Bilimleri Dergisi'nin TR Dizin kapsamına kabul edilmiş olması, altı yıldır süren emeklerimizin görünürlük kazanması açısından bizler için sevindirici bir gelişme. Bu süreci, başından beri sürdürmeye çalıştığımız ortak üretim anlayışının doğal bir sonucu olarak görüyoruz.

Bu sayı, dördüncü sayıda aldığımız bazı editoryal kararların devamı niteliğinde, kapsamı görece daha geniş bir içerikle hazırlandı. Teknolojik yenilikler, kuramsal ve metodolojik tartışmalar ile arkeolojinin farklı disiplinlerle kurduğu temaslar; günümüz arkeoloji çalışmalarının çeşitliliğini yansıtan örnekler olarak dergide bir araya geliyor. Dergimiz, belirli bir kuruma, yaklaşıma ya da düşünce hattına bağlı kalmaksızın; farklı ölçeklerde ve farklı bakış açılarıyla üretilmiş çalışmaları bir arada sunmayı amaçlıyor. Bu çeşitliliğin, arkeoloji bilimleri için besleyici ve geliştirici olduğuna inanıyoruz.

Altıncı sayımızın da bu açık ve paylaşımcı çerçeveye katkı sunmasını diliyor; emeği geçen tüm yazarlarımıza, hakemlerimize ve okurlarımıza teşekkür ediyoruz.

Herkese iyi okumalar.

ARKEOLOJİ BİLİMLERİ DERGİSİ
TURKISH JOURNAL OF ARCHAEOLOGICAL SCIENCES

Note from the editors

We are pleased to once again address our readers with the publication of our sixth issue. The inclusion of the Turkish Journal of Archaeological Sciences in the TR Index constitutes a significant and gratifying development, rendering visible the sustained efforts of the past six years. We regard this achievement as a natural outcome of the collective and collaborative scholarly ethos that has guided the journal since its inception.

This issue has been prepared with a comparatively broader scope, in continuity with certain editorial decisions adopted in the fourth issue. Contributions addressing technological innovations, theoretical and methodological debates, and the intersections established between archaeology and other disciplines are brought together here as reflections of the diversity and dynamism characterizing contemporary archaeological research. Without aligning itself with any particular institution, theoretical framework, or intellectual orientation, the journal seeks to provide a platform from diverse perspectives. We maintain that such plurality constitutes a productive and generative ground for the advancement of archaeological sciences.

We hope that this sixth issue will further contribute to this open and dialogical framework. We extend our sincere thanks to all contributing authors, reviewers, and readers for their valuable support and engagement.

Enjoy your reading!

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ARKEOLOJİ BİLİMLERİ DERGİSİ / TURKISH JOURNAL OF ARCHAEOLOGICAL SCIENCES – 2026: 24-41

Digitalizing Materialities: Integrating 3D Documentation at Tall Ya'moun and Tall al-Assara

Marta Lorenzon[a], Paula Gheorghiade[b], Samuel Reinikainen[c] Tia Sager[d], Hussein Al-Sababha[e], Maher Tarboush[f] Antti Lahelma[g]

Abstract

The increasing accessibility of 3D modelling technologies has significantly expanded digital documentation practices in archaeology, ranging from consumer-grade applications to professional photogrammetric workflows. This paper presents a comparative methodological case study based on archaeological material from Tall Ya'moun and Tall al-Assara in northern Jordan. It outlines and evaluates two approaches for producing 3D models of small- to medium-sized cultural heritage objects: (1) mobile LiDAR-based scanning with an iPad Pro using the Polycam application; and (2) traditional DSLR-based photogrammetry using professional software. The comparison focuses on workflow performance, including data acquisition,

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processing requirements, visual quality, and accessibility, rather than providing an independent metric accuracy assessment. The findings show that although photogrammetry has higher geometric resolution and image quality suitable for detailed analysis, the iPad/LiDAR system has great advantages in terms of speed, usability, and portability. Such attributes make mobile scanning ideal for rapid documentation, visualization, and outreach purposes where submillimetric accuracy is not necessary.

Keywords: Digital archaeology, Mobile LİDAR, 3D modelling, Cultural heritage objects, Archaeological methodology

Özet

Üç boyutlu (3B) modelleme teknolojilerine erişimin artması, arkeolojide dijital belgeleme uygulamalarını tüketici düzeyindeki uygulamalardan profesyonel fotogrametri iş akışlarına kadar geniş bir yelpazede yaygınlaştırmıştır. Bu makale, Kuzey Ürdün'de yer alan Tall Ya'moun ve Tall al-Assara'dan elde edilen arkeolojik malzeme üzerinden yürütülen karşılaştırmalı ve yöntemsel bir vaka çalışması sunmaktadır. Çalışmada, küçük ve orta ölçekli küçük buluntuların 3B modellerinin üretilmesine yönelik iki farklı yaklaşım tanımlanmakta ve değerlendirilmektedir: (1) Polycam uygulaması kullanılarak iPad Pro ile gerçekleştirilen mobil LiDAR tabanlı tarama ve (2) profesyonel yazılımlar kullanılarak yapılan geleneksel DSLR tabanlı fotogrametri. Karşılaştırma, bağımsız bir metrik doğruluk değerlendirmesi sunmaktan ziyade, veri toplama süreci, işleme gereksinimleri, görsel kalite ve erişilebilirlik gibi iş akışı performansına odaklanmaktadır. Sonuçlar, fotogrametrinin ayrıntılı analizler için uygun, daha yüksek geometrik çözünürlük ve görüntü kalitesi sunduğunu, buna karşılık iPad/LiDAR sisteminin hız, kullanım kolaylığı ve taşınabilirlik açısından önemli avantajlara sahip olduğunu göstermektedir. Bu özellikler, mobil tarama yöntemini milimetrik doğruluğun gerekli olmadığı durumlarda hızlı belgeleme, görselleştirme ve kamusal erişim (outreach) amaçları için uygun kılmaktadır.

Anahtar kelimeler: Dijital arkeoloji, Mobil LİDAR, 3B modelleme, buluntu, arkeolojide yöntem

Introduction

Recent developments in digital technology have enriched the archaeological documentation process, allowing for the recording, preservation, and sharing of data in a more accurate and accessible manner (Lorenzon et al., 2022; Lorenzon, 2025). Such an application was integrated by the TYRAS project, a joint Finnish-Jordanian collaboration between Yarmouk University and the University of Helsinki. This project focused on the archaeological study and digitalization of recovered material from the sites of Tall Ya'moun and Tall al-Assara excavated during the 2022 campaign. Both sites are important, multi-period stratified sites located in northern Jordan, occupied from the Bronze Age into later historical periods (e.g. Ottoman period). Due to their occupational histories, complexity, and well-preserved material assemblages, these sites are suitable for testing and evaluating different digital documentation workflows in both active

field and post-excavation settings. The primary aim of the project was to develop efficient, cost-effective, and high-quality digital documentation of material culture that can be applied both in the field and in post-excavation settings.

In recent years, improvements in hardware miniaturization, computational photography, and automated 3D reconstruction have helped expand three-dimensional documentation beyond the laboratory setting, allowing a wider range of practitioners to engage with 3D recording. This has been referred to as the "democratization" of 3D modelling; however, this is not a straightforward process. While this technology makes it easier for individuals to engage in 3D modelling, it also makes us beholden to specific hardware and software systems, raising questions about method and ethics in digital archaeology (Richards-Rissetto, 2022; Potter et al., 2025).

Three-dimensional modelling has become an integral part of archaeological, architectural, and heritage studies, through a variety of established and emerging technical methods. The basic method behind all attempts at three-dimensional modelling is photogrammetry, a technique for generating measurements and models from photographs. Structure-from-Motion (SfM) algorithms automatically compute 3D structures from overlapping 2D imagery, yielding dense point clouds and textured meshes (Jones & Church, 2020). More recently, the inclusion of active sensors such as LiDAR on consumer mobile devices such as the iPhone and iPad Pro has opened a new, accessible paradigm for 3D data capture (Hurst et al., 2024). In addition, easily accessible applications such as Polycam abstract much of the underlying complexity for the user, enabling them to create models in near real-time. Against this technological backdrop, our pilot project aimed at building artefact and architectural 3D models using two complementary methods: (1) real-time scanning with an iPad and the Polycam application; and (2) traditional photogrammetry with DSLR cameras and professional processing software Agisoft Metashape 2.2.1.

The main aim was to document and analyse the end-to-end process of both methodologies, providing a clear framework for practitioners to select the appropriate tool based on project requirements. Together, we argue that these approaches provide complementary documentation strategies that support different analytical, practical, and communicative goals within a single archaeological project. By pairing digitalisation and community outreach, the TYRAS project sought to foster meaningful engagement with archaeological heritage among local stakeholders and the wider public (Richardson & Almansa-Sanchez, 2015; Bonacchi, 2019).

Methodology: Digital Approaches in Archaeology

In the last decade, digital approaches, especially LiDAR applications and 3D scanning have been incorporated across a range of disciplines from maritime archaeology (McCarthy et al., 2019) to forensic anthropology (Seguchi & Dudzik, 2019), museum curation, preservation and display (Patel et al., 2003), and crowd-sourced collection of data (Bonacchi et al., 2014).

Archaeological 3D scans, and their integration with digital model-making, are also increasingly being used as teaching tools in museums, schools, and universities, although 3D scanning and model-making in archaeology are hardly new endeavours. For example, archaeologists have long used photogrammetry, aerial photography via airplanes, kites and more recently drones, to explore and document large scale areas (Campana, 2017; Bewley, 2025). Recently, close-range photogrammetry has been a common tool used for documenting excavation progress in the field. This recording technique involves the use of a camera, usually attached to a tall pole, and the capture of multiple, overlapping photographs over a desired area. The hundreds of resulting photos are then stitched together, usually by computer software, to create 3D models of areas under study for documentation and presentation purposes (De Reu et al., 2013; Hostettler et al., 2024, 1).

Improvements in technology, especially through the integration of LiDAR (Light Detection and Ranging) into easily portable and commercially available products such as phones and tablets has significantly impacted the ease of use of such technologies for recording data in the field (Pendić & Molloy, 2024, 10–11). LiDAR has become one of the latest "off-the-shelf" tools employed by scholars, curators, and larger institutions adding to the already popularized use of 3D laser scanning and 3D printing for scholarly study and cultural heritage preservation. For example, 3D laser models of China's terracotta warriors were produced with the aim of analysing and comparing anatomical features and craft signatures of individual pieces, in this case ear shapes (Bevan et al., 2014). The availability of these 3D scans significantly accelerated the study of attributes which would have otherwise remained a more labour-intensive task. Beyond their scholarly advantage, digital and 3D technologies have the potential to enhance public engagement with otherwise static collections or exhibitions demonstrating the importance of integrating emergent technologies across disciplines. Our pilot study in Jordan illustrates how these digital tools can be successfully integrated into fieldwork and study season and we expand here on the factors that contributed to their success.

Recent debates in digital archaeology have also underlined that 3D model creation is only part of a larger digital data life cycle. No less important are the ethical, technical, and curatorial aspects entailed in the storing, sharing, and curation of such digital assets. There has been a growing convergence with frameworks such as the FAIR data principles (Findable, Accessible, Interoperable, and Reusable; Wilkinson et al., 2016), and the CARE principles (Collective Benefit, Authority to Control, Responsibility, and Ethics; Carroll et al., 2020), which emphasize that data is not only technically rigorous but also socially and ethically maintained. This translates, in practice, to a careful choice of open and sustainable file formats (e.g., .OBJ, .PLY, .STL) that guarantee long-term accessibility and interoperability, besides metadata standards that identify scanning procedures, provenance, and context. Within archaeological projects,

these considerations are vital to prevent loss of data, while fostering collaboration and ensuring that digital surrogates respect the communities and institutions connected to the original materials. Integrating these principles into scanning and documentation workflows helps bridge the gap between technological innovation and responsible heritage stewardship—an increasingly central concern within digital archaeology. When applied systematically, these digital approaches allow archaeologists to document artefacts and features in ways that support later spatial, contextual, and comparative analyses, while remaining mindful of ethical and curatorial responsibilities throughout the data lifecycle.

iPad/LiDAR Scanning with Polycam

The selection of objects for 3D scanning was made with the aim of representing various functional categories and materials from the Tall al-Assara and Tall Ya'moun assemblage, providing a balanced sample for testing and demonstration purposes. The selected items, therefore, include a range of sizes and materials and conditions of preservation. They consist of a stone pestle, a stone vessel, a set of grinding tools, an incense burner, and a personal ornament (a perforated shell). The objects range in size from approximately 2 cm (the shell ornament) to 25 cm (the stone vessel). They include artifacts made from stone and shell, enabling different surface textures and conditions of preservation to be included in the scanning process. Each item has value within both daily and ritual contexts: the pestle, vessel, and grinding tools pertain to food preparation and domestic activity; the incense burner relates to ritual or symbolic practices; and the shell ornament informs on personal adornment and long-distance exchange networks (Lorenzon et al., forthcoming).

These objects were selected not only for their representativeness, but also for their pedagogical and interpretive potential. Their digital preservation allows easier access for up-close and detailed study by both scholars and students, without a need for direct handling of fragile artefacts. Moreover, the scans also support comparative research with materials from other sites, enabling interdisciplinary dialogue. Additionally, their inclusion in teaching modules, both at Tall al-Assara's field school and in possible future interactive online exhibits, furthers educational engagement and public outreach. The variety of materials and types of objects selected also allowed us to test how different surfaces and forms responded to the scanning workflow, further refining the methodology.

The scanning process started with the selection of a stable, neutral-coloured surface (i.e., a grey tabletop) to provide contrast, while reducing glare and strong reflections. The surface was selected to simulate common field conditions where controlled studio setups are often not available, yet a stable and visually unobtrusive background can still be achieved. Illumination was diffused and ambient, including just natural daylight filtered through a window or reflected

from other bright nearby surfaces, to minimize harsh shadows and highlights. This approach illustrates that effective photogrammetric documentation need not be confined to the laboratory and can also include archaeological fieldwork and site-based recording, without recourse to special lighting or lightboxes. Employing simple portable setups, this technique is practical for rapid high-quality 3D recording under field conditions.

The iPad Pro (4th generation, IOS 18.7.11) was used together with the Polycam application (Polycam, Inc. 2025. *Polycam*,version 5.1.11 [Mobile application]. Available from: https://poly.cam) in LiDAR mode. Each object was moved by hand at a consistent distance of 0.5 to 1 meter, until all surfaces were scanned. The application supported real-time visual feedback, for example by highlighting captured areas as coloured and uncaptured areas in grey, allowing for multiple adjustments. Scanning proceeded vertically, and included a slow, circular pass to fill in any missing details. Using this process, a single object could be scanned in approximately 5 minutes. This resulted in a dense point cloud fusing LiDAR depth data with RGB information from the camera in real time. After scanning, the Polycam application processes the data to create a, textured 3D mesh (Figure 1). At this stage, peripheral data such as floor and background elements could be removed using the built-in cropping tool. Any additional small intrusions or "floaters" within the point cloud could be manually selected and deleted as needed. The final model was exported from the app directly to the common formats OBJ (with MTL and texture PNG) and DAE, for archival and further use within a Sketchfab repository (https://skfb.ly/p8AFX).

Traditional Photogrammetry

The stone pestle, stone vessel, personal ornament, and incense burner were also processed by traditional photogrammetry. We used turntable photogrammetry, whereby a DSLR camera (with a 24-megapixel sensor) is mounted on a tripod, with the artefacts placed on a turntable to simulate rotational movement, making it easy to remove noisy and blurred backgrounds from interfering with the rendering process (Porter et al., 2016). The rotating stand was progressively shifted, thus allowing the camera to take photos with an approximately 70–80% overlap at 20-degree steps, ensuring complete coverage of its surface. After shooting one full ring at the object's mid-height, additional photos were taken at oblique downward and upward angles to also capture the upper and lower aspects of the artefact.

Two DSLR cameras were used—a Nikon D810 and a Canon 5D—to capture overlapping images from multiple angles. Although photogrammetry is viable on a wide range of digital camera models, and research trips benefit from lightweight, compact equipment, we nevertheless opted for heavier full-frame professional grade models capable of capturing high resolution source photos, to ensure the quality and analysis potential of the final reconstructions. The

cameras were swapped depending on their synergy with the lenses and lighting equipment used: the images used to model the smaller artefacts were shot using a macro lens beneath a Godox flash placed at an oblique downward angle, with a reflector on the opposite side. The larger artefacts, in turn, were modelled in another room under overhead fluorescent tubes at appropriately lower magnifications. As for the settings, the cameras were kept on manual mode during the shoots, with the aperture set to f/16 for deep depth of field, ISO to 100–160 to minimize the noise, and shutter speed was accordingly adjusted. A total of approximately 240 high-resolution JPG images were captured for each object taking approximately 35–45 minutes per object. We thank Belal S. Al-Hammouri at Yarmouk University for accommodating us in his photography studio.

These photos were then processed using Metashape (2.2.1), a standard software in archaeological photogrammetry (Green et al., 2014). They were first imported into Metashape, after which the "Align Photos" command was selected with the highest accuracy option. This resulted in a sparse point cloud which was used to produce a high-quality, dense point cloud. A 3D polygonal mesh was computed from this dense cloud using an arbitrary surface type, ultra-high quality, and high face count to best capture advanced geometry. A high resolution, size 16384, UV-mapped texture was mapped on the mesh using the default mosaic blending mode. Lastly, a final clean-up was conducted to eliminate loose points and defects of the point cloud. This manual process included the use of the clean tie point tool in Metashape, a more time-consuming process, but nonetheless also more precise than its mobile equivalent (Figure 2).

Results & Integration

Mobile scanning made possible largely using iPads, has given archaeological documentation the advantages of being cost-effective, speedy, and mobile. In contrast to traditional 3D scanning, which often involves large equipment that requires an independent power source and extensive setup and calibration time, mobile solutions can quickly and flexibly capture data with lightweight, self-contained devices. The rendering and scanning can be completed within minutes, allowing for immediate quality assurance and facilitating collaboration among field and laboratory personnel. Specific advantages of mobile scanning include its value in fieldwork situations where conditions change rapidly and where objects or features need to be documented before continued excavation or environmental factors cause deterioration. This has also become a popular method for fieldwork, especially in documenting the fieldwork process and endangered heritage that may be in danger of destruction, due to the ease with which it can be carried out on-site and how quickly the results are obtained. The resulting models are then uploaded onto a collaborative virtual platform like Sketchfab, where researchers in Finland, Jordan, and everywhere can visualize these models to review them almost in real-time. This immediacy has

improved communication between field teams and object specialists and reduced delays between excavation, documentation, and preliminary interpretation.

The accessibility and affordability of iPad scanning also render this technique easily exportable to other archaeological excavations, especially in areas that do not have technical support, but adequate internet coverage (Gautier et al., 2020). However, even with all the speed and convenience of mobile scanning, classic photogrammetry still remains an essential tool for building high-resolution models for science-directed analyses-such as the analysis of imprints or fingerprints on pottery or other faint surface features. The TYRAS project used two professional DSLR cameras to acquire overlapping images and create a 3D model of our objects. With its automatic alignment, dense cloud generation, and mesh reconstruction, this software produced highly detailed, high-resolution 3D models for metric analysis, publication, and virtual presentation. In this case, the models are also stored in Zenodo and are freely available.

The combination of iPad-based LiDAR scanning and DSLR photogrammetry enables a balance between scientific accuracy and efficiency (Figure 3). Rapid field documentation via Polycam ensures that all materials are recorded comprehensively in a very short time. On the other hand, high-resolution photogrammetry can be used for specific artefacts and features requiring higher scientific resolution. This dual approach provides wide coverage and analytical accuracy (Hurst et al., 2024). During the field component of the TYRAS project, digitization activities also included the documentation of architectural remains revealed through excavation and survey (Cutillas-Victoria et al., 2024; Lorenzon, 2025). As stratified talls, archaeological remains at Tall Ya'moun and Tall al-Assara included multi-period buildings, fortifications, lime floors, and stone walls. The exposure of these architectural features after thousands of years raised questions about their future in-situ preservation and conservation, and the impact of weather erosion for architectural stability. In an effort to record as much as possible, the project incorporated GoPro and drone footage, with traditional photography, to produce combined 3D reconstructions also of excavated trenches, enabling artefacts to be correlated with their architectural and stratigraphic contexts.

Although mobile 3D scanning and DSLR photogrammetry were both deployed in the TYRAS project, these two methods ultimately serve different scales of archaeological documentation and analytical needs. Mobile iPad scanning is excellent for object level recording, providing quick and detailed 3D reconstructions of artefacts or small architectural features, for immediate visual inspection. On the other hand, photogrammetry is more fitting for the capture of large scale elements, such as architectural remains, trenches, and broader site-level reconstructions, where spatial relationships must be recorded with positional accuracy.

This comparison does not represent an independent accuracy or ground-truth assessment. Instead, the terms "accuracy" and "resolution" are used qualitatively, referring to model detail,

visual clarity, and suitability for different analytical purposes, rather than measured metric precision. The complementarity of these two data sets is both a source of opportunity and challenges: on the one hand, the technical matching of a set of object scans can be achieved in georeferenced models of the site or within GIS environments, although it still presents a high level of complexity; on the other hand, such a combination is particularly powerful for identifying artefacts within their precise spatial and stratigraphic context.

Future updates in data interoperability and 3D, GIS platforms may further facilitate this convergence, enabling more comprehensive, multi-scale studies that connect artefact-level datasets with site-level datasets in one digital environment. In addition to their research use, some of the 3D models produced by the TYRAS project were also employed in experimental applications for public outreach and community-based activities. In 2025, as part of the community archaeology projects at Tall al-Assara and Tall Ya'moun, these 3D models allowed general audiences to virtually explore the excavated sites and their associated artefacts. This demonstrated how digital documentation can support and enhance heritage education and engagement through remote access to archaeological materials (Richardson & Almansa-Sánchez, 2015; Lorenzon, 2025).

While these outreach-oriented applications present a worthwhile method of producing and exhibiting archaeological data, they also include significant methodological compromises. Mobile scanning workflows allow for the rapid production of models and intuitive interaction, benefitting time-constrained and pedagogical contexts. However, as a result of their use of mobile scanning technology, models produced tend to prioritize visual accessibility over metric accuracy, making them unsuitable for precise analytical or comparative research. Therefore, mobile scanning should be regarded not as a substitute for high-resolution photogrammetric documentation, but as a complementary tool that offers benefits in terms of accessibility and immediacy rather than analytic depth.

Table 1. Comparison of iPad/LiDAR scanning and traditional photogrammetry with respect to field documentation and analysis-oriented applications.

Metric	iPad / LiDAR with Polycam	Traditional Photogrammetry
Data Acquisition Speed	Very fast (3–5 min); real-time feedback	Slower (35–45 min); requires careful setup
Processing Speed	Near real-time; on-device processing in minutes	Slow (30+ min to hours); depends on hardware and software workflow
Ease of Use	High; intuitive and minimal technical expertise needed	Low–moderate; requires understanding of photographic principles and software
Hardware Cost	Comparable overall; an iPad Pro with LiDAR (~€1,500) is similar in cost to a DSLR setup with a capable laptop. While many institutions already have computers for processing, iPads may require dedicated purchase.	Comparable; a DSLR camera and accessories are moderately priced, and computers are typically part of institutional infrastructure.
Geometric Accuracy	Moderate–high; in static mode point cloud density <1 mm, while in dynamic scanning (as used here) accuracy averages around 1 cm (Teo & Yang, 2023).	Excellent; sub-millimetre accuracy achievable with high-quality images and calibration.
Textural Fidelity	Moderate; lighting-dependent with potential noise and blur; reflective surfaces can cause issues.	High; produces crisp, photorealistic textures, though reflective surfaces remain problematic for both methods.
Primary Documentation Context	Unmatched speed, portability, and on-site feedback; enables immediate visualization without external power or lengthy post-processing, particularly advantageous in field conditions lacking electricity or stable infrastructure.	Superior accuracy, resolution, and control over output; ideal for detailed scientific analysis and high-quality visualizations. It may need a generator to work in field condition as it required long-time computer processing

Discussion: Digital Archaeology and Community Outreach

The Museum of Jordanian Heritage, located at Yarmouk University, was originally designed to act as a bridge between archaeological research, education, and community outreach. As mentioned by Kafafi (1996) and Ajaj (2007), the museum has continued to develop this initial goal, most recently through its active involvement in the TYRAS project. The integration of the 3D models produced by the TYRAS project into the museum's collections supports university teaching, community engagement and outreach, and sustainable heritage management. The museum's participation in the project demonstrates how digital documentation initiatives

can strengthen links between archaeological research and museum practice in Jordan, while expanding the social and educational impact of archaeological work.

In addition to their role in digital recording and analysis, such projects also play an important role in education. The process of scanning and modelling provides students with hands-on experience in digital recording, data processing, and interpretation, skills that are increasingly central to archaeological fieldwork and heritage management. 3D models can also be integrated into teaching and training as additional tools and resources for university and vocational education. They support virtual access to artifacts and collection that are not easily accessible, while fostering the development of digital literacy among the next generation of archaeologists.

From a technical point of view, these educational and outreach outcomes are supported by the complementary use of iPad-based LiDAR scanning and DSLR photogrammetry. For example, using Metashape, artefacts can be recorded from multiple angles in discrete image sets, which later can be merged to produce complete 3D models with minimal surface occlusion. Although this process requires significant computational power and some human input, the resulting photogrammetric models demonstrate the high level of control and accuracy that can be achieved through resource-intensive workflows. In addition, the LiDAR scanning offers particular advantages for depth measurement, a task that is often complex when using photogrammetry alone. In the case of LiDAR, the distance between the device and the subject is calculated laser pulses (Lefsky et al., 2001, 79). When interpreted in relation to research objectives, the value of the documentation process depends less on technological sophistication than on contextual applicability. Mobile LiDAR scanning is especially effective in contexts prioritizing immediacy, accessibility, and user engagement, particularly in educational and outreach settings where rapid model generation and intuitive interaction are essential. Photogrammetric workflows, on the other hand, while more resource-intensive, remain essential for research-driven documentation that requires higher levels of geometric control, visual fidelity, and reproducibility. These findings, therefore, suggest that methodological integration should be understood as a strategic alignment of tools with analytical, pedagogical, and social goals, rather than as a convergence toward a single standardized workflow.

This longstanding commitment to education and accessibility has recently been extended through broader digitalisation initiatives at the Museum of Jordanian Heritage, that are aimed at safeguarding collections and expanding public outreach. In the words of Abdulla A. Al-Shorman, in this project, "the aim is to promote and present Jordan's heritage and create more potential visitors either to the museum or to rural Jordan" (Al-Shorman, 2016). This initiative includes a virtual tour of exhibition galleries incorporating 3D replicas of a range of artefacts supporting expanded local and global access to Jordanian heritage.

The digitisation of TYRAS artifacts aligns with this broader framework through the integration of digital heritage methods and community-based archaeology. Its participatory approach, centred on training students and community members in mobile scanning and photogrammetry methods, supports inclusive heritage management and shared stewardship (Moser et al., 2002; Fernández-Hernández et al., 2015; Lorenzon & Zermani, 2016). Building on this foundation, the TYRAS team is developing a GIS-linked 3D environment and an open-access repository to ensure long-term sustainability, that will facilitate spatial and stratigraphic analysis, and support dissemination efforts. In this way, digital documentation functions not only as a technical tool but as a means of connecting research, education, and community engagement within a coherent framework of responsible cultural heritage practice (Figure 4).

While previous studies have emphasized the democratising potential of mobile 3D documentation technologies, this case study shows that such claims depend heavily on context and intended use. Rather than pointing to a simple shift towards universally accessible documentation, the results instead suggest that specific tools are better suited to particular analytical, educational, and social purposes. Taken together, these findings suggest that combining digital methods is less about adopting a single, unified technology, and more about selecting and applying the right tools to support a specific goal, research, or educational question.

Conclusion

The contrast between mobile scanning and photogrammetry is not about which is better but about which methodology is more appropriate. The iPad/LiDAR combination is an incredibly accessible methodology for delivering fast documentation, visualization, and assessment, which is highly valuable in the field when time and resources are scarce. Photogrammetry, meanwhile, remains an essential methodology for those projects that require greater geometric resolution, controlled data acquisition, and detailed analytical outputs. Mobile scanning does not supersede these traditional methodologies, but rather adds to them, creating an expanded repertoire of documentation methodologies that the modern archaeologist can utilize.

In the near future, the development of mobile scanning hardware with AI processing will certainly bring these two methodologies even closer together. For the time being, however, these two methodologies will continue to co-exist in the ever-growing 3D digital capture toolbox. The modern archaeologist is, therefore, best served by familiarity with both approaches and by selecting methods that most closely align with a project's requirements for accuracy, efficiency, and resource availability.

Looking ahead, the continued integration of 3D scanning, photogrammetry, and GIS within archaeological excavation toolkits promises to transform field documentation and analysis by enabling real-time spatial recording, multi-scalar interpretation, and more connected, collaborative, and accessible approaches to studying and preserving the past.

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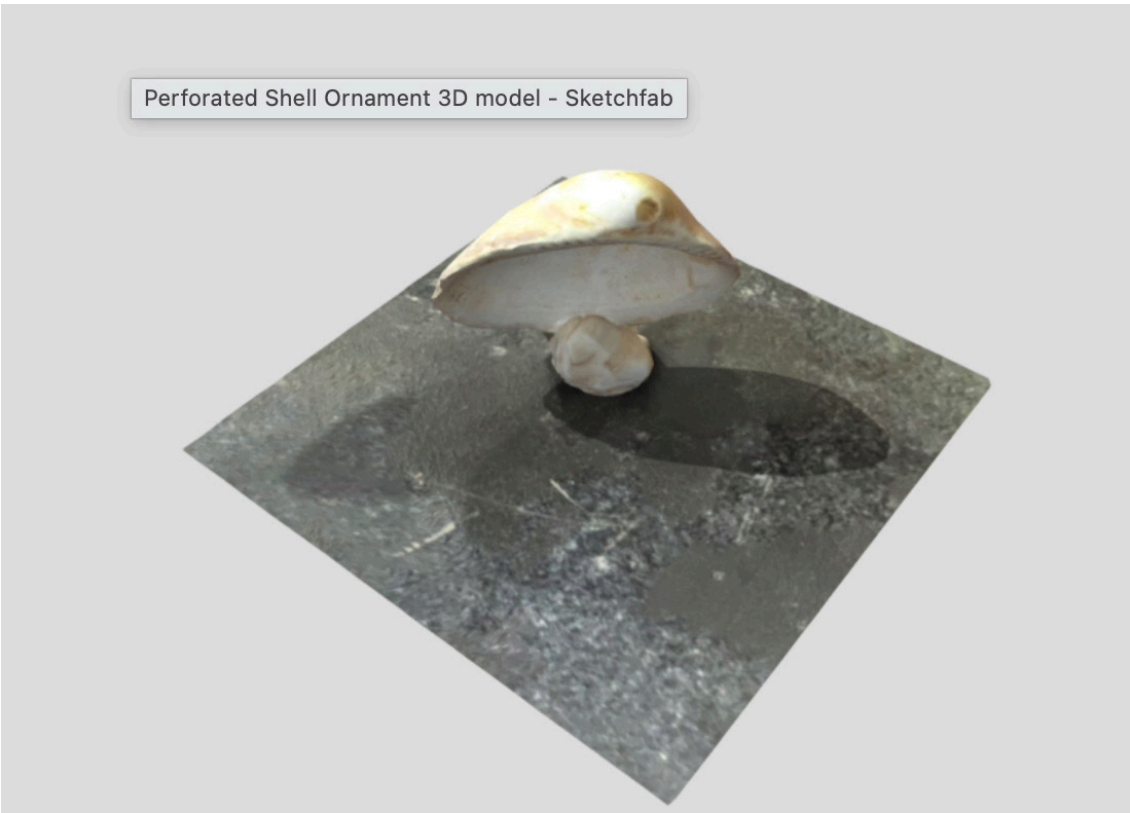

Figure 1: iPad model of a perforated shell from Tall al-Assara.

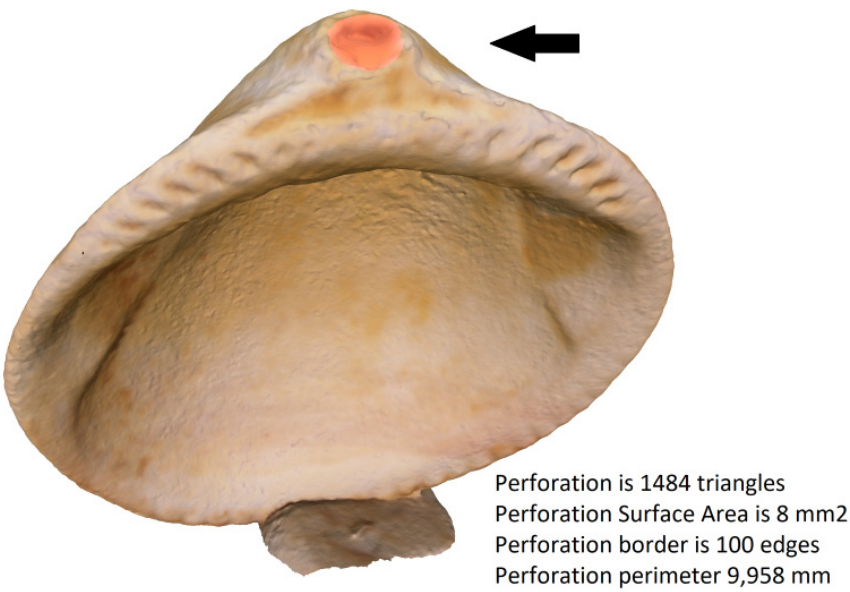

Figure 2: Photogrammetry model of a perforated shell from Tall al-Assara.

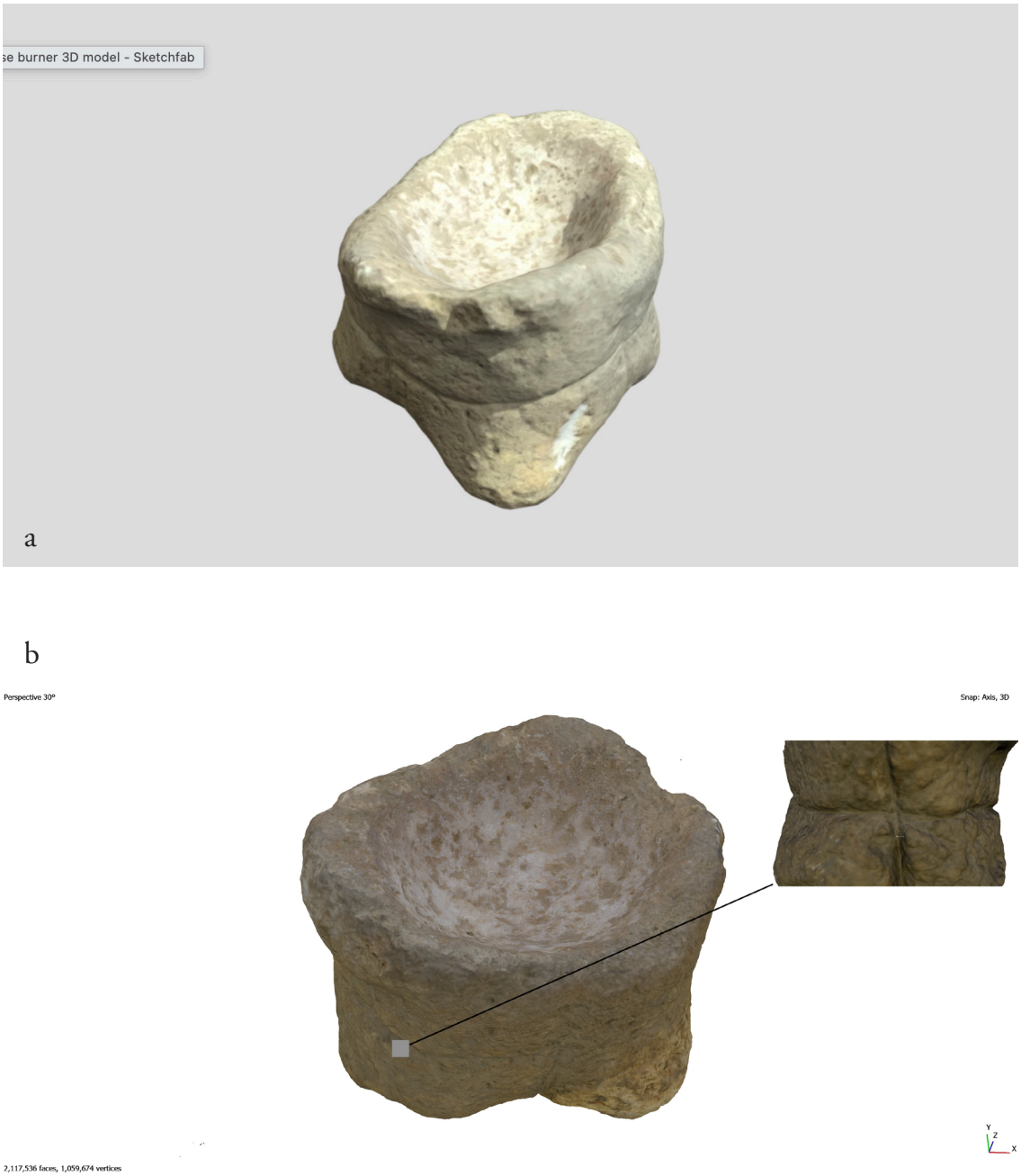

Figure 3: Qualitative comparison of the same artefact an incense burner from Tall Ya'moun documented using (3a) iPad-based LiDAR scanning with Polycam and (3b) DSLR-based photogrammetry. The figure illustrates general differences in surface representation and texture rather than providing a metric comparison.

Figure 4: 3D georeferenced photogrammetry of the TYRAS 89 site identified in the survey.

ARKEOLOJİ BİLİMLERİ DERGİSİ

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Amaç & Kapsam

Arkeoloji bir süredir geçmişin yorumlanmasında teknoloji ve doğa bilimleri, mühendislik ve bilgisayar teknolojileri ile yoğun iş birliği içinde yeni bir anlayışa evrilmektedir. Üniversiteler, ilgili kurum ya da enstitülerde yeni açılmakta olan "Arkeoloji Bilimleri" bölümleri ve programları, geleneksel anlayışı terk ederek değişen yeni bilim iklimine adapte olmaya çalışmaktadır. Bilimsel analizlerden elde edilen sonuçların arkeolojik bağlam ile birlikte ele alınması, arkeolojik materyallerin, yerleşmelerin ve çevrenin yorumlanmasında yeni bakış açıları doğurmaktadır.

Türkiye'de de doğa bilimleriyle iş birliği içindeki çalışmaların olduğu kazı ve araştırma projelerinin sayısı her geçen gün artmakta, yeni uzmanlar yetişmektedir. Bu nedenle Arkeoloji Bilimleri Dergisi (ABD), Türkiye'de arkeolojinin bu yeni ivmenin bir parçası olmasına ve arkeoloji içindeki arkeobotanik, arkeozooloji, alet teknolojileri, tarihlendirme, mikromorfoloji, biyoarkeoloji, jeokimyasal ve spektroskopik analizler, Coğrafi Bilgi Sistemleri, iklim ve çevre modellemeleri gibi uzmanlık alanlarının çeşitlenerek yaygınlaşmasına katkı sağlamayı amaçlamaktadır. Derginin ana çizgisi arkeolojik yorumlamaya katkı sağlayan yeni anlayışlara, disiplinlerarası yaklaşımlara, yeni metot ve kuram önerilerine, analiz sonuçlarına öncelik vermek olarak planlanmıştır. Kazı raporlarına, tasnif ve tanıma dayalı çalışmalara, buluntu katalogları ve özgün olmayan derleme yazılarına öncelik verilmeyecektir.

Arkeoloji Bilimleri Dergisi açık erişimli, uluslararası hakemli bir dergidir. Araştırma ve yayın etiğine uygun bulunan makaleler çift taraflı kör hakem değerlendirme sürecinden geçtikten sonra yayınlanır. Dergi, Ege Yayınları tarafından çevrimiçi olarak yayınlanmaktadır.

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Aims & Scope

Archaeology is being transformed by integrating innovative methodologies and scientific analyses into archaeological research. With new departments, institutes, and programs focusing on "Archaeological Sciences", archaeology has moved beyond the traditional approaches of the discipline. When placed within their archaeological context, scientific analyses can provide novel insights and new interpretive perspectives to study archaeological materials, settlements and landscapes.

In Türkiye, the number of interdisciplinary excavation and research projects incorporating scientific techniques is on the rise. A growing number of researchers are being trained in a broad range of scientific fields, including but not limited to archaeobotany, archaeozoology, tool technologies, dating methods, micromorphology, bioarchaeology, geochemical and spectroscopic analysis, Geographical Information Systems, and climate and environmental modeling. The Turkish Journal of Archaeological Sciences (TJAS) aims to situate Turkish archaeology within this new paradigm and to diversify and disseminate scientific research in archaeology. New methods, analytical techniques and interdisciplinary initiatives that contribute to archaeological interpretations and theoretical perspectives fall within the scope of the journal. Excavation reports and manuscripts focusing on the description, classification, and cataloging of finds do not fall within the scope of the journal.

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Makale Değerlendirme Politikası (Çift Taraflı Kör Hakemlik) ve Yayın Süreci

Arkeoloji Bilimleri Dergisi, Türkçe veya İngilizce özgün araştırma makaleleri yayımlamaktadır.

1. Daha önce yayımlanmamış veya başka bir dergide değerlendirme sürecinde bulunmayan ve tüm yazarlar tarafından onaylanan makaleler değerlendirilmek üzere kabul edilir.
2. Gönderilen makaleler, ön inceleme, intihal taraması, hakem değerlendirmesi ve dil düzenlemesi aşamalarından geçirilir.
3. Ön inceleme aşamasını geçemeyen makaleler, yazar(lar)a iade edilir ve aynı yayın döneminde tekrar değerlendirmeye alınmaz. Ön incelemeyi geçen makaleler, en az iki hakemin değerlendirdiği çift taraflı kör hakem sürecine tabi tutulur.
4. İntihal kontrolünden geçen makaleler, Editör tarafından bilimsel içerik, yöntem, ele alınan konunun önemi ve derginin kapsamına uygunluk açısından değerlendirilir. Editör, makalelerin ön değerlendirmesini yapmak üzere editör yardımcılarına yönlendirir.
5. Editör yardımcıları, her bir makaleyi son gönderim tarihinden önce inceleyerek Arkeoloji Bilimleri Dergisi yayın ilkelerine uygunluğunu değerlendirir. Bu aşamada intihal taraması yapılır ve dergi yazım kurallarına uygunluk kontrol edilir.
6. Editörler ve editör yardımcıları, makalenin etik standartlara, konuya uygunluğa, metin düzenine, dipnotlar ve kaynakçaya, görsel kalitesine ve gerekli telif hakkı izinlerine uyup uymadığını değerlendirir. Bu kriterleri karşılayan makaleler, çift taraflı kör hakemlik süreci korunarak en az iki ulusal/uluslararası hakeme gönderilir.
7. Derginin hakem değerlendirme süreci ve editoryal etik kuralları, değerlendirmelerin milliyet, cinsiyet veya diğer herhangi bir faktöre dayalı önyargılardan arındırılmış olmasını sağlar. Makaleler, doktora derecesine sahip ve güçlü bir araştırma geçmişi bulunan en az iki uzman tarafından değerlendirilir.

8. Hakemler, makalenin yayınlanmaya uygunluğunu değerlendiren bir form doldurur ve gerekli revizyonlara yönelik önerilerde bulunur. Hakemler makaleyi değişiklik yapmadan kabul edebilir, küçük değişikliklerle kabul edebilir, büyük değişiklikler ve yeniden gönderim talep edebilir veya makaleyi reddedebilir. Her iki hakem de küçük değişiklikleri kabul ederse ve revize edilen versiyon onaylanırsa makale kabul edilir. Büyük değişiklikler gerektiğinde, makale Editörler tarafından yeniden değerlendirilir ve gerekli düzeltmeler yapıldıktan sonra hakemlere geri gönderilebilir. Revizyonlar yeterli bulunduğunda makale yayımlanmak üzere kabul edilir. Eğer bir hakem makaleyi reddeder veya biri olumlu, diğeri olumsuz görüş bildirirse, makale üçüncü bir hakeme gönderilir. Ancak iki hakemin olumlu görüş bildirmesi durumunda, son yayın kararı Editör Kurulu tarafından verilir. Editoryal kararlar nihaidir ve yalnızca istisnai durumlarda ilgili *COPE* yönergelerine göre itiraz edilebilir.
9. Hakemlerden, değerlendirmelerinde nazik, saygılı ve bilimsel bir dil kullanmaları beklenir. Saldırgan, saygısız veya kişisel yorumlardan kaçınmaları gerekmektedir. Bilimsel olmayan yorumlar tespit edildiğinde, dergi yönetimi hakemden raporunu gözden geçirmesini ve düzeltmesini talep eder. Hakemlerin değerlendirmelerini belirtilen süre içinde tamamlaması ve burada açıklanan etik sorumluluklara uyması gerekmektedir.
10. Dil düzenlemesi tamamlandıktan sonra, kabul edilen makaleler ilgili dergi sayısında tematik veya kronolojik sıraya göre düzenlenir.
11. Makalelerin mizanpajı, dergi tasarımına uygun olarak yapılır ve ardından Editörler tarafından gözden geçirilir.
12. Makalelerin son PDF versiyonu, nihai kontrol ve onay için yazarlara gönderilir. Yazarlar, makalenin derginin etik standartlarına uygun olduğunu ve çalışmalarının tüm sorumluluğunu kabul ettiklerini teyit etmelidir.
13. Hakemlerin talepleri doğrultusunda yazarlar tarafından yapılan düzenlemeler incelendikten sonra, nihai yayın kararı Yayın Kurulu tarafından verilir.
14. Yukarıda belirtilen süreçler tamamlandıktan sonra ilgili dergi sayısı son haline getirilir ve makalelere DOI numaraları atanır.
15. DOI numaraları atandıktan sonra baskı süreci başlar ve yayın süreci tamamlanır.

Editör Sorumlulukları

1. Editör, makaleleri yalnızca bilimsel içerik temelinde değerlendirir; yazarların etnik kökeni, cinsiyeti, cinsel yönelimi, milliyeti, dini inançları veya siyasi görüşleri dikkate alınmaz.
2. Editör, gönderilen makalelerin tarafsız bir şekilde çift taraflı kör hakem değerlendirmesine tabi tutulmasını sağlar ve yayınlanmadan önce gizliliği korur.

3. Editör, hakemlere makalelerin gizli bilgi içerdiğini ve değerlendirmenin ayrıcalıklı bir etkileşim olduğunu bildirir. Hakemler ve yayın kurulu üyeleri, makaleleri üçüncü şahıslarla tartışamaz. Belirli durumlarda, Editör belirli bir noktayı netleştirmek amacıyla bir hakemin değerlendirmesini diğer hakemlerle paylaşabilir.
4. Editör, derginin içeriği ve genel kalitesinden sorumludur; gerektiğinde düzeltme notu yayımlamak veya geri çekme işlemi yapmak editörün sorumlulukları arasındadır.
5. Editör, yazarlar, editörler ve hakemler arasında çıkar çatışmasına izin vermez. Hakem atama konusunda tam yetkilidir ve makalelerin yayımlanmasına ilişkin nihai karardan sorumludur.

Hakem Sorumlulukları

1. Hakemler, araştırma, yazarlar ve/veya finansman sağlayıcıları ile herhangi bir çıkar çatışması içinde olmamalıdır. Değerlendirmeleri objektif olmalıdır.
2. Hakemler, gönderilen makalelerle ilgili tüm bilgilerin gizli kalmasını sağlamalı ve telif hakkı ihlali veya intihal tespit etmeleri durumunda Editöre bildirmelidir.
3. Kendini makaleyi değerlendirmede yetersiz hisseden veya incelemeyi belirtilen süre içinde tamamlayamayacağı kanısına varan hakem, Editöre haber vermeli ve değerlendirme sürecinden çekilmelidir.

Yazar Sorumlulukları

1. Yazar olarak belirtilen kişiler, makalenin kavramsallaştırılması, tasarımı, veri toplama ve yorumlama, veri analizi veya araştırma ve yazım süreçlerine önemli katkıda bulunmuş olmalıdır. Tüm ortak yazarlar, makalenin son sürümünü onaylamalı ve içeriğinden eşit derecede sorumlu olmalıdır.
2. Yazarlar, görsellerin (fotoğraf veya şekiller) telif hakkı düzenlemelerine uygun olmasını sağlamalı veya gerekli izinleri almalıdır. Eğer etik veya telif hakkı ihlali tespit edilirse, dergi ilgili makaleyi geri çekme veya erişimini engelleme hakkını saklı tutar.
3. Yazarlar, dergi editörleri ile iletişim kurmaktan, düzeltmeleri yapmaktan, makaleyi belirtilen sürede yeniden göndermekten ve etik ile telif hakkı kurallarına uygunluğu onaylamaktan sorumludur. İlk gönderimden sonra yazar isim değişiklikleri dikkate alınmaz.

Düzeltme Süreci

Hakemler tarafından revizyon talep edilmesi durumunda, ilgili raporlar yazara iletilir ve yazarın en kısa sürede gerekli düzeltmeleri yapması beklenir. Yazar, yaptığı düzeltmeleri işaretleyerek güncellenmiş makaleyi Editörlere sunmalıdır.

Türkçe Dil Düzenlemesi: Hakem sürecinden geçen Türkçe makaleler, Türkçe Dil Editörü tarafından incelenir ve gerekli görüldüğünde yazardan tashih istenebilir.

Yabancı Dil Düzenlemesi: Hakem sürecinden geçen İngilizce makaleler, Yabancı Dil Editörü tarafından gözden geçirilir ve gerekli görüldüğünde yazardan ek düzeltmeler yapması istenebilir.

Dizgi, Mizanpaj ve Son Okuma Süreci

Yayın Kurulu tarafından yayımlanması onaylanan makaleler, nihai yayına hazırlanmak üzere dizgi ve mizanpaj işlemlerine tabi tutulur. Mizanpaj işlemi tamamlandıktan sonra, yayınlanmadan önce makaleler için son okuma süreci gerçekleştirilir.

DOI Atama

Dijital Nesne Tanımlayıcısı (DOI), elektronik ortamda yayımlanan bir makalenin resmi ve orijinal versiyonuna kalıcı bir bağlantı sağlayan benzersiz bir kimlik numarasıdır. Arkeoloji Bilimleri Dergisi, yayın sürecinin tamamlanmasının ardından kabul edilen tüm bilimsel makalelere DOI numarası atayarak, makalenin dijital ortamda resmi kaydını güvence altına alır.

ARKEOLOJİ BİLİMLERİ DERGİSİ

TURKISH JOURNAL OF ARCHAEOLOGICAL SCIENCES

Article Evaluation Policy (Double-Blind Peer Review) and Publication Process

The Turkish Journal of Archaeological Sciences publishes original research articles in Turkish or English.

1. Manuscripts must be original, unpublished, and not under review elsewhere. All authors must approve the submission.
2. Submitted manuscripts undergo preliminary review, plagiarism screening, peer review, and language editing.
3. Manuscripts that do not pass the preliminary review are returned to the author(s) and are not reconsidered within the same publication period. Those that pass proceed to the double-blind peer review, evaluated by at least two reviewers.
4. The Editors evaluate manuscripts based on scientific content, methodology, significance, and the journal scope. Manuscripts passing this stage are assigned to associate editors for preliminary assessment.
5. Associate editors ensure manuscripts comply with journal principles, including plagiarism screening and adherence to formatting guidelines.
6. Editors and associate editors verify compliance with ethical standards, subject relevance, formatting, references, image quality, and copyright permissions. Approved manuscripts are sent for double-blind peer review.
7. The journal's peer review process maintains fairness and objectivity, free from biases based on nationality, gender, or other factors. Reviewers must have a doctoral degree and a strong research background.
8. The reviewers complete evaluation forms and provide recommendations: accept without changes, accept with minor revisions, request major revisions and resubmission, or reject. If both reviewers recommend minor revisions, and the revised version is approved, the

manuscript is accepted. If major revisions are required, the manuscript may be reassessed before final decision. If there is one positive and one negative review, a third reviewer is consulted. The final decision rests with the Editors. Editorial decisions are final and can only be appealed under *COPE* guidelines.

9. Reviewers must use respectful, professional, and scientific language. Disrespectful or unscientific comments will prompt a revision request. Reviews must be completed within the assigned timeframe.
10. After final editing, accepted manuscripts undergo thematic or chronological organization before inclusion in the journal.
11. Typesetting is conducted according to journal layout guidelines.
12. The final PDF version is sent to the authors for review and approval. Authors must confirm that the manuscript adheres to the journal's ethical standards and accept full responsibility for their work.
13. The Editorial Board makes the final publication decision after reviewing revisions.
14. Once this process is finalized, DOI numbers are assigned to the articles.
15. Following DOI assignment, the printing stage begins, completing the publication process.

Editor Responsibilities

1. The Editor evaluates manuscripts based solely on scientific merit, without bias toward authors' ethnicity, gender, nationality, or beliefs.
2. The Editor ensures a fair, confidential double-blind peer review process.
3. Manuscripts remain confidential before publication. Reviewers and editorial board members must not discuss them with third parties. If necessary, reviewer evaluations may be shared between reviewers by the Editor for clarification.
4. The Editor ensures journal quality, including corrections and retractions when necessary.
5. The Editor prevents conflicts of interest and has full authority in reviewer assignments and publication decisions.

Reviewer Responsibilities

1. Reviewers must disclose any conflicts of interest regarding the research, authors, or funding sources. Reviews must be objective.
2. Reviewers must maintain confidentiality and report any copyright infringement or plagiarism to the Editor.
3. Reviewers who feel unqualified to evaluate a manuscript or unable to complete their evaluation on time should notify the Editor and withdraw.

Author Responsibilities

1. All authors must have made significant contributions to the manuscript in terms of conceptualization, design, data collection and interpretation, data analysis, or research and writing. All co-authors must approve the final version and share responsibility for its content.
2. Authors must ensure that all images comply with copyright regulations or obtain necessary permissions. The journal reserves the right to retract or restrict access to articles with unresolved copyright or ethical issues. Any such actions will follow COPE guidelines.
3. The corresponding author is responsible for journal communication, revisions, post-publication inquiries, and compliance with the journal's ethical and copyright policies. Changes to authorship after submission will not be considered.

Revision Process

If revisions are requested, the review reports are sent to the authors. The authors must make necessary revisions promptly, highlighting them for clarity, and submit the updated manuscript to the Editors.

Turkish Language Editing: Turkish manuscripts passing peer review are reviewed by the Turkish Language Editor, who may request corrections.

Foreign Language Editing: English manuscripts passing peer review are reviewed by the English Language Editor, who may request corrections.

Typesetting, Layout, and Proofreading Process

Approved manuscripts undergo typesetting and layout formatting, followed by a final proofreading before final publication.

DOI Assignment

Digital Object Identifier (DOI) is a unique identifier that provides a permanent link to the official and original version of an electronically published article. The Turkish Journal of Archaeological Sciences assigns DOI numbers to all accepted scientific articles at the end of the publication process, ensuring the article's official recording in the digital environment.

ARKEOLOJİ BİLİMLERİ DERGİSİ

TURKISH JOURNAL OF ARCHAEOLOGICAL SCIENCES

Arkeoloji Bilimleri Dergisi Yayın Etiği ve Yayın Politikası

Yayın Etiği

Arkeoloji Bilimleri Dergisi, yürütülen tüm süreçlerde; Yazar, Hakem, Editör, Yayıncı ve Okuyucu sorumlulukları bağlamında yayın etiğine ilişkin uluslararası bir standart olarak kabul gören *Committee on Publication Ethics* (COPE) politikalarını benimsemekte ve yönergelerini takip etmektedir.

Editörler için: Editörler kurulunda yer alan araştırmacıların göndermiş olduğu makalelerle ilgili olarak makale hakem sürecindeyken makale sahibi editörlerin editör rolleri askıya alınır ve hakem sürecini görmemeleri sağlanır, böylece çift taraflı kör hakemlik korunur.

Hakemler için: Arkeoloji Bilimleri Dergisi, önyargısız ve en iyi etik standartlara göre çift taraflı kör hakem değerlendirmesi sistemi işletir ve COPE'nin Akran Hakemleri için Etik İlkelerinde belirtilen akran hakemlerine yönelik kılavuzunu dikkate alır. Hakemlerin, incelemelerini kendilerine ayrılan süre içinde tamamlamaları beklenir. Hakemlerimizin gizliliğine saygı duyuyor, yazarların ve hakemlerin de aynı gizliliğe uymasını bekliyoruz. Hakemlerin önyargısız ve saygılı bir dil kullanarak rapor vermeleri beklenir. Agresif dil veya yazarlar hakkında kişisel görüşler içeren yorumlar dikkate alınmaz. Bir hakem, gönderiyi incelemeye başlamadan önce varsa konuya istinaden veya olası herhangi bir çıkar çatışması hakkında editörleri bilgilendirmelidir.

Yazarlar için: Arkeoloji Bilimleri Dergisi, bilim dünyasına özgün çalışmalar sunmayı amaçlamaktadır. Makaleler özgün bilimsel araştırma olmalıdır. Dergiye çalışmalarını gönderen yazar(-lar) söz konusu yazının daha önce başka bir yerde yayımlanmadığını ya da yayımlanmak üzere bir başka yere gönderilmemiş olduğunu kabul etmiş sayılırlar. Yazarlar, araştırma ve yayın etiğine uyduklarını kabul ederler. Yazar/lar etik izin gerektiren çalışmalar için Etik Kurul İzni sunmalıdır. Yazar/lar araştırma sürecinde araştırmaları için mali destek almışlarsa bu desteği makale metninde belirtmelidir. Yayın sonrası hata tespit edilmesi durumunda yazar/lar, hatalı makaleyi geri çekmek ve düzeltmekle yükümlüdür. Dergi ilkelerine uymayan makaleler dergiye kabul edilmezler. Ön değerlendirme ve intihal denetimini başarıyla geçen makaleler hakem değerlendirme süreci için en az iki hakeme gönderilir.

Telif Hakkı

Arkeoloji Bilimleri Dergisi'nde yayımlanan tüm özgün makaleler, Creative Commons Atıf-GayriTicari 4.0 International (*CC BY-NC 4.0*) lisansına tabidir. Bu lisans ile taraflar, Arkeoloji Bilimleri Dergisi'nde yayımlanan tüm makaleleri ve görselleri; atıfta bulunarak dağıtabilir, kopyalayabilir, üzerine çalışma yapabilir, yine sahibine atıfta bulunarak türevi çalışmalar yapabilir. Arkeoloji Bilimleri Dergisi tarafından yayınlanan makalelerin telif hakları *CC BY-NC 4.0* lisansı kapsamında yazarlara aittir. Yayınlanan tüm telif hakları yazarın/yazarların sorumluluğundadır. Dergide yayınlamayı kabul ederek, yazarlar bu telif hakkı şartlarına uymayı da kabul ederler. Dergide yayımlanan eserlerin sorumluluğu yazarlarına aittir. Yazarların yayımlanmış olan makalelerine ait PDF dosyaları, kendi kurumsal arşivleri ile başka makale platformlarında ve sosyal medya hesaplarında açık erişim politikası gereği paylaşılabilir. Arkeoloji Bilimleri Dergisi hiçbir çıkar gözetmez.

İntihal

Arkeoloji Bilimleri Dergisi, intihal tespit yazılımı (*iThenticate* veya benzeri) kullanarak metinleri kontrol etme hakkını saklı tutar. İntihal, başkalarına ait çalışmaların (fikirlerin, verilerin, kelimelerin, görüntülerin vb. her türlü medyatik formun) kaynak göstermeden veya gerekli olduğunda izin veya onay alınmadan kullanılmasıdır. Bu tanım çerçevesinde yazar(lar)ın gerekli referanslar veya izinler olmadan kendi çalışmalarını yeniden üretmeleri, kendinden kendine intihali içerir. İntihal materyali içeren gönderiler otomatik olarak reddedilecektir. Yayınlanmış ise yayınlandıktan sonra dahi, ilgili eyleme karar verilerek COPE'nin Akran Hakemleri için Etik İlkelerine göre sürdürülür.

Makale Geri Çekme Politikası

Bünyesinde özgün makalelere yer veren Arkeoloji Bilimleri Dergisi yayın yönetimi, yayın politikası gereği henüz değerlendirme aşamasında veya dergide yayımlanmış bir makaleye dair etik olmayan bir durum şüphesinin oluşması veya telif hakkı ihlali halinde, söz konusu çalışma hakkında incelemelerde bulunabilir. Yapılan incelemeler sonucunda bu amaçla değerlendirilen makale için COPE'nin makale geri çekme süreçleri uygulanır.

Eğer dergi editörleriyle iletişime geçen çalışma sahibinin kendisinden henüz yayımlanmış, hakem sürecinden geçerek kabul edilmiş ya da değerlendirme aşamasındaki çalışmalarıyla ilgili bir geri çekme talebi gelirse Arkeoloji Bilimleri Dergisi Yayın Kurulu bunu ivedilikle işleme alır. Bu işlemin yapılabilmesi için yazar(lar)ın geri çekme isteklerini kaleme aldıkları bir belge hazırlayıp her bir yazarın ıslak imzasıyla imzalayarak Arkeoloji Bilimleri Dergisi e-posta adresine (editor@arkeolojibilimleridergisi.org) iletmesi gereklidir. Bu süreç COPE'nin Akran Hakemleri için Etik İlkelerine göre sürdürülür. Arkeoloji Bilimleri Dergisi Yayın Kurulu, başvuruyu inceleyip karar vermeden önce yazarların çalışmasını başka bir dergiye yayınlanmak üzere göndermesini katiyetle etik bir davranış olarak kabul görmez.

Finansman

Yayında sunulan çalışmanın tamamlanması için alınan fon ve benzeri araştırma desteği, uygun olduğunda hibe numaraları ve/veya bilimsel proje numaraları da dahil olmak üzere beyan edilmelidir. Arkeoloji Bilimleri Dergisi'nde uygulanan yayın süreçleri, bilginin tarafsız ve saygın bir şekilde gelişimine ve dağıtımına temel oluşturmaktadır. Hakemli çalışmalar bilimsel yöntemi somutlaştıran ve destekleyen çalışmalardır. Bu noktada sürecin bütün paydaşlarının—yazarlar, okuyucular ve araştırmacılar, yayıncı, hakemler ve editörler—etik ilkelere yönelik standartlara uyması önem taşımaktadır. Makalelerde cinsiyetçi, ırkçı veya kültürel ayrım yapmayan, kapsayıcı bir dil kullanmalıdır ("insanoğlu" yerine "insan"; "bilim adamı" yerine "bilim insanı" gibi). Arkeoloji Bilimleri Dergisi yayın etiği kapsamında tüm paydaşların bu etik sorumlulukları taşımasını beklenmektedir. Burada belirtilen etik görev ve sorumluluklar, *Committee on Publication Ethics* (COPE) tarafından açık erişimli olarak yayınlanan rehberler ve politikalar dikkate alınarak hazırlanmıştır. Bkz.: COPE İş Akış Diyagramları.

Kişisel Verilerin Korunması

Arkeoloji Bilimleri Dergisi'nde değerlendirilen çalışmalarda gerçek kişilere ait kişisel veriler Kişisel Verilerin Korunması Hakkında Kanun kapsamında koruma altındadır. Yazara ait hiçbir bilgi üçüncü kişi ve kurumlarla paylaşılmaz.

ARKEOLOJİ BİLİMLERİ DERGİSİ

TURKISH JOURNAL OF ARCHAEOLOGICAL SCIENCES

Turkish Journal of Archaeological Sciences Publication Ethics and Policies

Publication Ethics

The Turkish Journal of Archaeological Sciences adheres to the ethical standards set by the Committee on Publication Ethics (COPE), ensuring integrity in all aspects of the publication process for authors, reviewers, editors, publishers, and readers. The journal follows COPE guidelines to uphold ethical publishing practices.

For Editors: If a member of the editorial board submits an article to the journal, their editorial role is suspended during the peer review process to prevent any access to or influence over the review. This measure safeguards the integrity of the double-blind peer review system.

For Reviewers: The Turkish Journal of Archaeological Sciences employs an unbiased and ethical double-blind peer review system in accordance with COPE's Ethical Guidelines for Peer Reviewers. Reviewers are expected to complete their assessments within the assigned timeframe. The journal maintains the confidentiality of reviewers and expects both authors and reviewers to do the same. Reviewers must provide objective cand respectful evaluations. Comments containing aggressive language or personal opinions about the authors will not be considered. Before commencing a review, reviewers must disclose any potential conflicts of interest to the editors.

For Authors: The Turkish Journal of Archaeological Sciences aims to contribute original research to the scientific community. Submitted manuscripts must be original and based on scientific research. By submitting a manuscript to the journal, authors confirm that the work has not been published elsewhere and is not under consideration for publication in another journal. Authors must comply with research and publication ethics. If the research requires ethical approval, authors must provide an Ethics Committee Approval. If financial support was received for the research, authors must declare this in the manuscript. Authors are responsible for correcting any errors discovered post-publication. Manuscripts that do not adhere to the journal's ethical principles will be rejected. Following a preliminary evaluation and plagiarism check, manuscripts undergo peer review by at least two independent reviewers.

Copyright Policy

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Plagiarism Policy

The Turkish Journal of Archaeological Sciences reserves the right to check submitted manuscripts using plagiarism detection software (*iThenticate* or similar). Plagiarism includes the use of another's work—whether ideas, data, text, images, or other media—without proper citation or required permission. This also applies to self-plagiarism, where authors reuse their own previously published material without appropriate citation. Manuscripts found to contain plagiarism will be rejected. If plagiarism is identified post-publication, corrective measures will be taken under COPE's Ethical Guidelines for Peer Reviewers

Article Retraction Policy

The Turkish Journal of Archaeological Sciences is committed to academic integrity and will investigate ethical concerns regarding submitted or published articles. If ethical violations or copyright infringements are suspected, the journal will initiate a review process and follow COPE's retraction procedures as necessary.

If an author wishes to withdraw their manuscript after submission, acceptance, or publication, the Editorial Board will process the request promptly. Authors must submit a signed withdrawal request, endorsed by all co-authors, to the journal's official email address (editor@arkeolojibilimleridergisi.org). Manuscripts must not be submitted to another journal before receiving formal withdrawal confirmation, as this is considered unethical.

Funding Disclosure

If the research was supported by a grant or other financial resources, authors must disclose this in the manuscript, including relevant grant numbers and project identifiers where applicable.

Ethical Standards and Responsibilities

The Turkish Journal of Archaeological Sciences aims to support the objective and reputable dissemination of knowledge. Peer-reviewed publications represent the application of scientific

methodology, and all stakeholders—authors, readers, researchers, publishers, reviewers, and editors—must adhere to ethical standards. Manuscripts should use inclusive language that is free from bias based on sex, race or ethnicity, etc. (e.g., "he or she" or "his/her/their" instead of "he" or "his") and avoid terms that imply stereotypes (e.g., "humankind" instead of "mankind"). The ethical duties and responsibilities outlined herein align with open-access policies and the Committee on Publication Ethics (COPE) guidelines.

Protection of Personal Data

Personal data of individuals involved in research published in the Turkish Journal of Archaeological Sciences is protected under the *Law on the Protection of Personal Data*. No personal information of authors will be shared with third parties or external institutions.

ARKEOLOJİ BİLİMLERİ DERGİSİ

TURKISH JOURNAL OF ARCHAEOLOGICAL SCIENCES

Makale Gönderimi ve Yazım Kılavuzu

* *Please see below for English*

Makale Kabul Kriterleri

Makalelerin konu aldığı çalışmalar, Arkeoloji Bilimleri Dergisi'nin amaçları ve kapsamı ile uyumlu olmalıdır (bkz.: Amaç ve Kapsam). Buna göre yayım önceliği, makalelerin arkeolojik yorumlamaya katkı sağlayan yeni anlayışlar, disiplinler arası yaklaşımlar, yeni metot ve kuram önerileri ile analiz sonuçlarındadır.

Makaleler Türkçe veya İngilizce olarak yazılmalıdır. Makalelerin yayın diline çevirisi yazar(lar)ın sorumluluğundadır. Eğer yazar(lar) makale dilinde akıcı değilse, metin gönderilmeden önce anadili Türkçe ya da İngilizce olan kişilerce kontrol edilmelidir.

Yazarın Türkçesi veya İngilizcesi akıcı değilse, özet ve anahtar kelimelerin Türkçe veya İngilizce çevirisi editör kurulu tarafından üstlenilebilir.

Her makale, 4000-10.000 sözcük arasında olmalıdır. Metne, 200 kelimeyi aşmayacak uzunlukta Türkçe ve İngilizce yazılmış özet ve beş anahtar kelime eklenmelidir. Özete referans eklenmemelidir.

Metin, figürler ve diğer dosyalar e-posta veya wetransfer yoluyla **archaeologicalsciences@gmail.com** adresine gönderilmelidir.

Makale Kontrol Listesi

Lütfen makalenizin aşağıdaki bilgileri içerdiğinden emin olun:

- Yazarlar (yazarların adı-soyadı ve iletişim bilgileri buradaki sırayla makale başlığının hemen altında paylaşılmalıdır)
- Çalışılan kurum (varsa)
- E-mail adresi
- ORCID ID

Makalenin içermesi gerekenler:

- Başlık
- Özet (Türkçe ve İngilizce)
- Anahtar kelimeler (Türkçe ve İngilizce)
- Metin
- Kaynakça
- • Şekiller, tablolar, vb.
- • Ekler (varsa)

Yazım Kuralları

Metin ve Başlıkların Yazımı

- Times New Roman karakterinde yazılan metin 12 punto büyüklüğünde, iki yana yaslı ve tek satır aralıklı yazılmalıdır. Makale Word formatında gönderilmelidir.
- Yabancı ve eski dillerdeki kelimeler italik olmalıdır.
- Ana başlık 14 punto ve bold; sırasıyla alt başlık 12 punto ve bold; bir alt başlık ise 12 punto ve italik yazılmalıdır.
- Başlıklar numaralandırılmamalı, altları çizilmemelidir.
- Başlık ve alt başlıklarda her kelimenin ilk harfi büyük olmalıdır.

Referans Yazımı

Ayrıca bkz.: Metin içi Atıflar ve Kaynakça Yazımı

- Referanslar metin içinde (Yazar, yıl, sayfa numarası) şeklinde verilmelidir.
- Metin içinde aynı parantezdeki çoklu referanslar alfabetik sıraya göre dizilmelidir.
- Referanslar için dipnot ve son not kullanımından kaçınılmalıdır. Bir konuda not düşme amacıyla gerektiği taktirde dipnot tercih edilmelidir.
- Dipnotlar Times New Roman karakterinde, 10 punto büyüklüğünde, iki yana yaslı, tek satır aralıklı yazılmalı ve her sayfa sonuna süreklilik izleyecek şekilde eklenmelidir.

Şekiller ve Tablolar

- Makalenin altına şekiller ve tablolar için bir başlık listesi eklenmelidir. Görsellerde gerektiği takdirde kaynak belirtilmelidir. Her şekil ve tabloya metin içerisinde gönderme yapılmalıdır (Şekil 1 veya Tablo 1).
- Görseller Word dokümanının içerisine yerleştirilmemeli, jpg veya tiff formatında, ayrı olarak gönderilmelidir.
- Görüntü çözünürlüğü basılması istenen boyutta ve 300 dpi'nin üzerinde olmalıdır.
- Görseller Photoshop ve benzeri programlar ile müdahale edilmeden olabildiğince ham haliyle gönderilmelidir.
- Excel'de hazırlanmış tablolar ve grafikler var ise mutlaka bunların PDF ve Excel dokümanları da gönderilmelidir.

Sayıların Yazımı

- MÖ ve MS kısaltmalarını harflerin arasına nokta koymadan kullanınız (örn.: M.Ö. yerine MÖ).
- "Bin yıl" ya da "bin yıl" yerine "... binyıl" kullanınız (örn.: MÖ 9. binyıl).
- "Yüzyıl", "yüz yıl" ya da "yy" yerine "yüzyıl" kullanınız (örn.: MÖ 7. yüzyıl).
- Beş veya daha fazla basamaklı tarihler için sondan sayarak üçlü gruplara ayırmak suretiyle sayı gruplarının arasına nokta koyunuz (örn.: MÖ 10.500).
- Dört veya daha az basamaklı tarihlerde nokta kullanmayınız (örn.: MÖ 8700).
- 0-10 arasındaki sayıları rakamla değil yazıyla yazınız (örn.: "8 kez yenilenmiş taban" yerine "sekiz kez yenilenmiş taban").

Noktalama ve İşaret Kullanımı

- Ara cümleleri lütfen iki çizgi ile ayırınız (—). Çizgi öncesi ve sonrasında boşluk bırakmayınız.
- Sayfa numaraları, tarih ve yer aralıklarını lütfen tek çizgi (-) ile ayırınız: 1989-2006; İstanbul-Kütahya.

Kısaltmaların Yazımı

- Sık kullanılan bazı kısaltmalar için bkz.:

Yaklaşık:	yak.	Circa:	ca.
Bakınız:	bkz.	Kalibre:	kal.
Örneğin:	örn.	ve diğerleri:	vd.

Özel Fontlar

- Makalede özel bir font kullanıldıysa (Yunanca, Arapça, hiyeroglif vb.) bu font ve orijinal metnin PDF versiyonu da gönderilen dosyalar içerisine eklenmelidir.

Metin içi Atıflar ve Kaynakça Yazımı

- Her makale, metin içinde atıfta bulunulan çalışmalardan oluşan ve "Kaynakça" başlığı altında düzenlenmiş bir referans listesi içermelidir.
- Metinde atıfta bulunulan tüm çalışmalar "Kaynakça" başlığı altında listelenmelidir.
- Eğer mevcutsa, dergi makaleleri için mutlaka DOI numarası eklenmelidir.
- Metin içi atıf ve kaynakça yazımında APA 7 kuralları geçerlidir:
  - https://apastyle.apa.org/style-grammar-guidelines/citations
  - https://apastyle.apa.org/style-grammar-guidelines/references

Teşekkürler

Varsa teşekkür edilecek kişi ve kurumlar, ana metnin hemen arkasında, Kaynakça'dan önce, Teşekkürler başlığı altında verilmelidir.

Ekler

Arkeoloji Bilimleri Dergisi çalışmayı destekleyici veri setleri, tablo ve şekilleri ek materyal olarak kabul etmektedir. Lütfen çalışmanızı destekleyici ekleri XLSX (veri setleri ve tablolar için), veya Word (şekil ve görseller için) formatında gönderiniz.

ARKEOLOJİ BİLİMLERİ DERGİSİ

TURKISH JOURNAL OF ARCHAEOLOGICAL SCIENCES

Article Submission and Author Guidelines

Article Acceptance Criteria

Submitted articles must fall within the aims and scope of the Turkish Journal of Archaeological Sciences (see: Aims and Scope). Priority in publication is given to articles that contribute new insights to archaeological interpretation, present interdisciplinary approaches, propose new methods and theories, and report analytical results.

Articles must be written in Turkish or English. The author(s) are responsible for translating the manuscript into the language of publication. If the author(s) are not fluent in the manuscript's language, the text should be reviewed by a native speaker of Turkish or English before submission.

If the author(s) are not fluent in Turkish or English, the editorial board may undertake the translation of the abstract and keywords into Turkish or English.

Each article should be between 4,000 and 10,000 words. The manuscript must include an abstract in both Turkish and English, not exceeding 200 words, and five keywords. The abstract should not include references.

The text, figures, and other files should be submitted via e-mail or WeTransfer to:
archaeologicalsciences@gmail.com

Article Checklist

Please ensure your manuscript includes the following information:

- Authors (the authors' full names and contact details should be provided in this order directly below the article title)
- Affiliation (if applicable)
- E-mail address
- ORCID ID

The manuscript must include the following components:

- Title
- Abstract (in Turkish and English)
- Keywords (in Turkish and English)
- Main text
- References
- Figures, tables, etc.
- Supplementary materials (if any)

Formatting Guidelines

Text and Headings

- The text must be written in Times New Roman, 12-point font, justified alignment, and single-line spacing. The article must be submitted in Word format.
- Words in foreign and ancient languages should be written in italics.
- The main title should be 14-point and in bold; subheadings should be 12-point and in bold; lower-level subheadings should be 12-point and italic.
- Headings should not be numbered or underlined.
- The first letter of each word in titles and subtitles should be capitalized.

Referencing Guidelines

See also: In-Text Citations and Reference List Formatting

- References must be cited in the text using the following format (Author, year, page number).
- Multiple references within the same parentheses should be listed in alphabetical order.
- The use of footnotes and endnotes for references should be avoided. If necessary, footnotes may be used for explanatory notes.
- Footnotes must be written in Times New Roman, 10-point font, justified alignment, and single-line spacing, and should be added at the bottom of each page, numbered continuously.

Figures and Tables

- A list of figure and table captions must be included at the end of the article. Sources for images should be cited when necessary. Each figure and table must be referenced in the text (e.g., Figure 1 or Table 1).
- Images must not be embedded in the Word document; they should be submitted separately in JPG or TIFF format.
- Image resolution must be at least 300 dpi at the intended print size.
- Images should be submitted in their original, unaltered form, without manipulation in Photoshop or similar software whenever possible.
- If tables or graphs have been prepared in Excel, both the PDF and the original Excel files must also be submitted.

Writing of Numbers

- Please use the abbreviation BCE without periods (e.g., BCE, not B.C.E.).
- Please use "… millennium" rather than variations such as "thousand years" (e.g., 9th millennium BCE).
- Please use "century" instead of other abbreviations (e.g., 7th century BCE).
- For dates with five or more digits, please use a dot to separate groups of three digits counting from the right (e.g., 10.500 BCE).
- Please do not use a dot in dates with four or fewer digits (e.g., 8700 BCE).
- Please write out numbers between zero and ten in words rather than numerals (e.g., "eight renewed floors" instead of "8 renewed floors").

Punctuation and Use of Symbols

- Please prefer em dashes (—) for parenthetical sentences. Do not leave a space before or after the dash.
- Please use a hyphen (-) to separate page numbers, dates, and place ranges: 1989-2006; Istanbul-Kütahya.

Abbreviations

- Commonly used abbreviations:

Approximately:	approx.	Circa:	ca.
See:	see	Calibrated:	cal.
For example:	e.g.	And others:	et al.

Special Fonts

If a special font has been used in the article (Greek, Arabic, hieroglyphic, etc.), the font file and a PDF of the original text must also be included among the submitted files.

In-Text Citations and Reference List Formatting

- Each article must include a reference list under the heading "References," consisting only of works cited in the text.
- All works cited in the text must be listed under the "References" heading.
- Where available, a DOI number must be included for journal articles.
- APA 7 guidelines apply to both in-text citations and the reference list:
  - https://apastyle.apa.org/style-grammar-guidelines/citations
  - https://apastyle.apa.org/style-grammar-guidelines/references

Acknowledgements

If applicable, individuals and institutions to be acknowledged should be listed immediately after the main text and before the References under the heading "Acknowledgements."

Supplementary Materials

We accept supporting datasets, tables, and figures as supplementary materials. Please submit supplementary materials in XLSX format for datasets and tables, or in Word format for figures and images.