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Virtually Rebuilding Çatalhöyük History Houses

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Chapter 10 Virtually Rebuilding Çatalhöyük History Houses

Abstract
A 3D reconstruction of part of the Çatalhöyük 'Shrine' 10 sequence has been developed with the aim to analyze, visualize, and interpret a number of buildings rebuilt multiple times in the same place. More than twenty years of excavations on the East Mound at Çatalhöyük have produced comprehensive interpretations of the repetition of architectural elements and buildings over time, providing thorough understanding of social organization, property, power, and religion in early settled life. Current visualization technologies allow us to simulate the tridimensional context, shared material culture, and experiential aspects of the unique urban environment at Çatalhöyük. However, these modern applications require archaeologists to address methodological questions such as: "what is the significance of virtually rebuilding Çatalhöyük history houses?" and "Can a 3D visualization of a sequence of buildings tell us more about the religious rituals, social organization, and history making practices at Çatalhöyük?" This chapter discusses the 3D reconstruction and interactive exploration of three Çatalhöyük history houses ('Shrine' VIA.10, VIAB.10, and VII.10) with the objective to define a new approach to digital archaeology and heritage interpretation that integrates a plurality of data in a visual-analytical environment, where advanced interactive techniques simulate the cosmology, building practices, material culture, and history-making aspects of Çatalhöyük.

Keywords: history houses, history-making, digital archaeology, 3D reconstruction, virtual simulation, interactive exploration, virtual place-making.

INTRODUCTION

In 2012 Çatalhöyük became inscribed on the UNESCO World Heritage list because of its universal value and exceptionality. As a consequence, the site has gained additional visibility with both the general public through social media and with Turkish and international visitors who increasingly travel to Çatalhöyük in the late spring and summer seasons. Thus, providing visitors and internet users with interpretations of the site's archaeological heritage and explanations of the complex religious and social organization at Çatalhöyük has become even more crucial. The work of the Çatalhöyük Visualization Project on the Visitor Center and the interpretation of the archaeological record for visitors ("Çatalhöyük Visual Assemblage" 2017), as well as the on-site tour guide activities led by licensed professionals and tour guide students, the outreach initiatives on Çatalhöyük such as the Temper Project and the Çatalhöyük Summer Workshop led by Gülay Sert (Bartu-Candan 2007), and the web-based and social media communication directly managed by the Çatalhöyük Research Project team, are all initiatives that play or have played a central role in the wide dissemination of knowledge on Çatalhöyük and related public engagement.

Current 3D visualization techniques and digital archaeological methods make it feasible to further explore alternative means of meaning making in archaeology based on nonlinear narratives, three- dimensional perspective, and virtual simulation. Hence, this chapter discusses the use of digital technologies as a new, nonlinear way of conveying information on Çatalhöyük's art, religious ritual, and social organization to the general public.

In 2015 the Virtually Rebuilding Çatalhöyük Project was initiated as a joint effort among the University of California Merced, Stanford University, and the e-learning firm Corinth with the goal to simulate a sequence of Neolithic buildings in a data-driven, accurate, and engaging way. More specifically, this chapter illustrates how 3D visualization and interactive data curation performed on tablet-based applications, namely Corinth Classroom ("Corinth Classroom" 2016) and Lifeliqe ("Lifeliqe for Windows 10" 2016; "Lifeliqe for iPad" 2016), can contribute to expand the debate on history making in early agricultural societies, involving an audience of non-specialists, community members, and young students. In this regard, our digital archaeology initiative strives to represent in 3D the continuity of building practices in the stratigraphy of a number of Çatalhöyük houses located in the South Area on the East Mound that were rebuilt multiple times in the same place (figure 10.1). Excavation on the Çatalhöyük East Mound documented the repetitive practices of rebuilding domestic features or entire houses in the same fashion over time as a manifestation of physical constraints on-site as well as social memory (Hodder and Cessford 2004). The 3D visualizations and interactive data explorations discussed in this chapter also aim to provide both archaeologists and the general public with digital tools that enable a visual-interactive interpretation of the data collected in the excavation on the East Mound by both James Mellaart in the 1960s and the current Çatalhöyük Research Project. Our approach strives to foster an open and inclusive debate on the archaeological evidence that documents the conscious repetition of buildings and artworks at Çatalhöyük, as well as the intentional destruction of features in overlaying buildings, as an example of memory construction or history-making practices (Hodder and Pels 2010; Hodder 2016).

The virtual simulation of Çatalhöyük history houses—or more elaborated buildings that were rebuilt multiple times in the same place (Hodder and Pels 2010, 163–64)—aims to define a three-dimensional approach to archaeology that integrates a plurality of data in a visual-analytical environment where advanced interactive visualization techniques simulate the cosmology, building practices, material culture, and history-making aspects of Çatalhöyük.

The three-dimensional approach discussed in this chapter is based on the assumption that a data-driven, 3D reconstruction of an archaeological site or building is a powerful tool for the spatial visualization and interactive exploration of the archaeological evidence. Thus, a 3D reconstruction of history houses has the potential to shed new light on the temporal depth of history making by presenting a new way to visualize, discuss, and interpret stratigraphic and spatial information related to the special type of buildings. For instance, the photorealistic approach to the 3D reconstruction of history houses used by Grant Cox produced highly evocative virtual simulations of Building F.V.I, or the "Shrine" of the Hunters. Cox's work proved that a data-driven 3D reconstruction can be successfully merged with subjective interpretations to pro- duce new knowledge as well as aesthetically pleasant visualizations of the past (Cox 2011; ArtasMedia 2016a, 2016b) (figure 10.2). Current technology facilitates 3D data exploration performed through inexpensive virtual reality (VR) displays. For instance, the head-mounted display Oculus Rift and the VR controller Oculus Touch ("Oculus Rift" 2016) enable new three-dimensional ways to visualize and interact with our data (Lercari et al. 2013, 2014, 2017). The virtual simulation provides archaeologists, heritage practitioners, and historians with new tools that generate additional and redundant information on their case studies using a three- dimensional and spatial approach that goes beyond the textual dimension of a database or the bi-dimensional visualization of a traditional Geographic Information System (GIS) (Forte et al. 2012, 2015; Lercari et al. 2011; Lercari 2016a) (figure 10.3). For the above reasons, this chapter strives to demonstrate that the interactive approach used in the Virtually Rebuilding Çatalhöyük Project makes a 3D reconstruction a valuable nonlinear tool for the interpretation of the past that aims to become instrumental to the study of history making at Çatalhöyük.

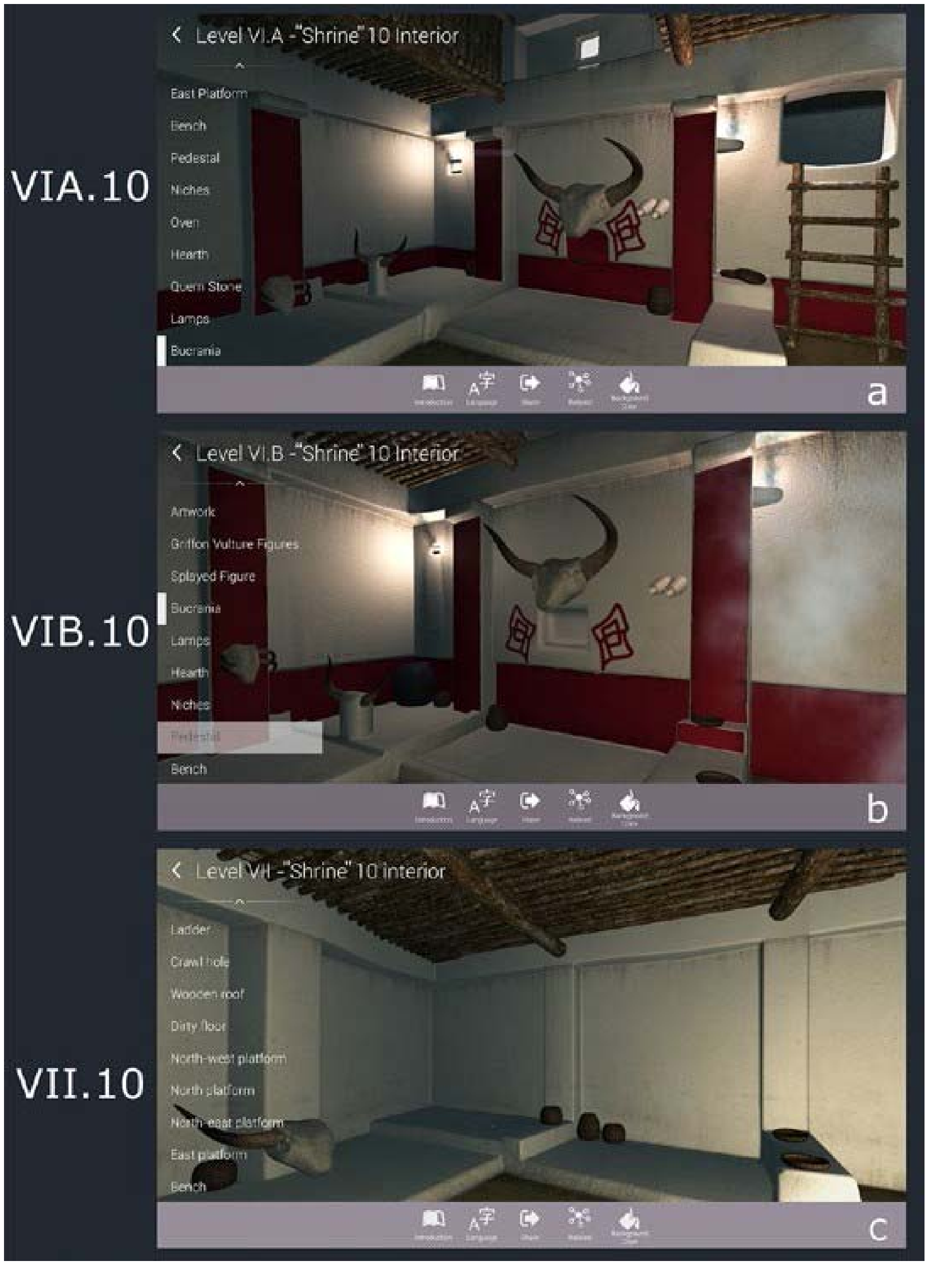

Figure 10.1. Overlaying view of 3D reconstructions of (a) "Shrine" VIA.10, (b) "Shrine" VIB.10, and (c) "Shrine" VII.10 in Lifeliqe app for Windows 10. Source for a–c: author.

Figure 10.2. View of a highly evocative 3D reconstruction of Çatalhöyük history house F.V.I, or the "Shrine" of the Hunters. Source: Artas Media, reconstruction by Grant Cox.

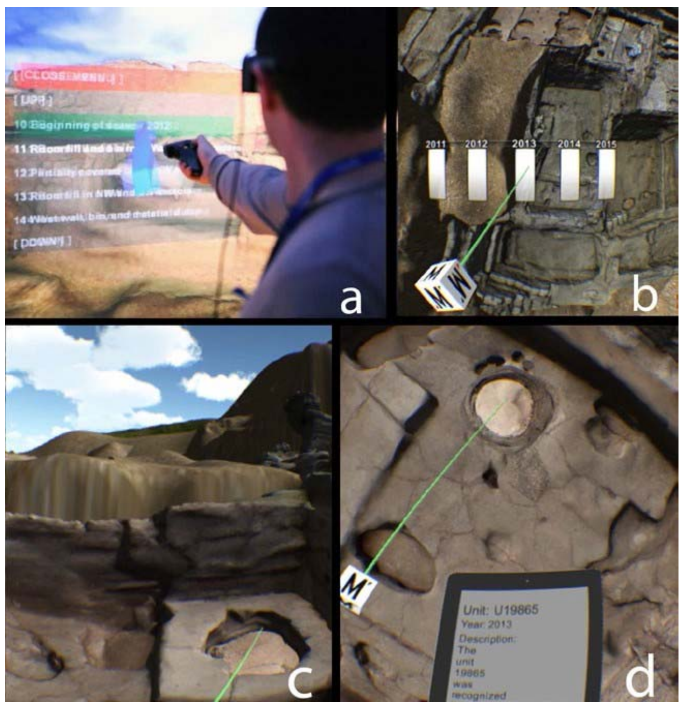

Figure 10.3. View of (a) 3D models and immersive interaction of Building 89 in the Duke Immersive Visualization Environment (DiVE), (b) time line to filter 3D data by year of excavation in Dig@IT, (c) immersive interaction with B.89's burials in Dig@ IT, and (d) interactive metadata browsing on a virtual tablet linked to the Çatalhöyük database server in Dig@IT. Source for a–d: author.

INTERACTIVE VISUALIZATION AND 3D RECONSTRUCTION OF ÇATALHÖYÜK HISTORY HOUSES

The outcome of reconstructing Çatalhöyük history houses in 3D was first discussed at the symposium Religion, History, and Place in the Origins of Settled Life in the Middle East chaired by Ian Hodder at the SAA 80th Annual Meeting in San Francisco (Lercari 2015). The preliminary virtual simulations and 3D data presented at the event were created by the author of this chapter together with Ondrej Homola, Iveta Kalisova, David Motalik, and a team of 3D artists and engineers from the e-learning firm Corinth as part of the University of California (UC) Merced–led collaborative research project Virtually Rebuilding Çatalhöyük (Lercari 2017). As anticipated at the start of this chapter, the project's case study is the visualization of building variation at Çatalhöyük East Mound, with a specific focus on history houses and the practice of history making. Rebuilding Çatalhöyük history houses in 3D is particularly relevant to this volume as our three-dimensional perspective on the archaeological record aims to start a debate on whether the stratigraphies of a site can tell us more than just chronological information related to sequences of buildings. In addition, our data-driven perspective on the 3D reconstruction of Çatalhöyük history houses strives to generate a more inclusive approach to the study of history making in early agricultural societies with the aim to engage the general public of muse- ums, visitor centers, and the internet, as well as young students, on this topic.

This section of the chapter presents the preliminary visualizations and 3D reconstructions produced by the Virtually Rebuilding Çatalhöyük Project in the period 2015–16 (Lercari 2016b, 2016c). This initial phase of the project focused on the 3D reconstruction of three history houses (Buildings VIA.10, VIB.10, and VII.10) that belong to Mellaart's "Shrine" 10 sequence. This case study was selected because Mellaart's excavation in the 1960s and then Hodder's work in the last two decades testify that "Shrine" 10 is one of the longest and most repetitiously reconstructed buildings ever documented at Çatalhöyük (figure 10.4a). In particular, this preliminary work addresses the 3D reconstruction of "Shrine" 10 in Mellaart's Levels VIA, VIB, and VII, displaying three highly decorated overlaying buildings excavated by James Mellaart in 1962 and 1963 (Mellaart 1963, 1964, 1967).

Work on Çatalhöyük history houses identifies building variation as a key element to understand Çatalhöyük religious rituals by highlighting the fact that Mellaart used the parameter of architectural remaking among overlaying houses to identify a predominant religious function in "special" buildings defined as "shrines" (Hodder and Pels 2010, 163–64; Hodder 2016). More than twenty years of excavations by the current project on the East Mound have produced comprehensive interpretations of the repetition of architectural elements in buildings, providing evidence that most of the dwellings at Çatalhöyük had both domestic and ritual functions (Hodder 2000, 2005a, 2005b, 2007, 2014; Hodder and Ritchey 1996). Drawing on seminal work regarding building variation that provides thorough understanding of social

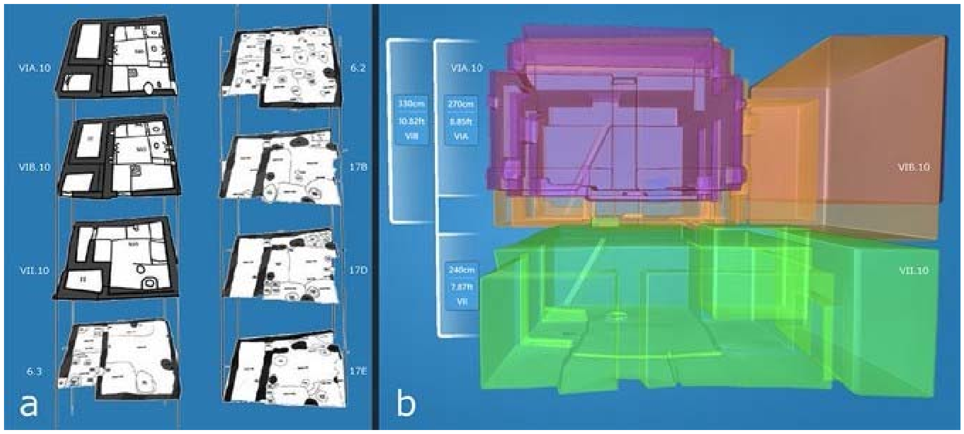

Figure 10.4. (a) Drawings of the complete "Shrine" 10 sequence. Source (a): Çatalhöyük Research Project, drawing by Tim King. (b) View of Mellaart's "Shrine" 10 in Levels VIA, VIB, and VII rendered as transparent overlaying layers, including estimated elevation, in Corinth Classroom (author copyright).

organization, property, power, and religion in early settled life (Hodder 2006, 2010), this chapter seeks to disseminate information and interpretations related to the concept of history making to the general public and young students.

To achieve this goal, the Virtually Rebuilding Çatalhöyük Project leverages the capabilities of Corinth Classroom, a user-friendly digital learning software that allows users to browse collections of 3D content and metadata, make annotations on the 3D models, take quizzes, capture snapshots and drawings, and participate in interactive discussions on the simulated material ("Corinth Classroom" 2016). In 2015 Corinth Classroom was provided to the UC Merced team by the e-learning firm Corinth under a memorandum of understanding and collaborative research initiative facilitated by the Çatalhöyük Project. Corinth Classroom is capable of displaying textual and visual information, such as 2D images and graphics, and 3D interactive content with incredible realism and advanced shading and lighting effects.

In 2016 the Virtually Rebuilding Çatalhöyük Project wanted to expand the reach of the 3D reconstructions of Çatalhöyük history houses developed by UC Merced and Corinth. Thus, we published the interactive data explorations discussed in this chapter in the Apple Store as free content for the mobile application Lifeliqe. This app is a powerful visual learning tool for mobile devices capable of interactively visualizing 3D content in high quality and detail. Lifeliqe is designed by the media company LifeLiQe to engage students in the K–12 curricula in visual learning experiences. Lifeliqe supports both 3D interactive explorations, such as the 3D reconstructions of the Çatalhöyük's history houses we designed, as well as augmented reality content that may constitute a feature development of our project. iPad users can download and install Lifeliqe on their tablets free of charge ("Lifeliqe for iPad" 2016). Accessing Lifeliqe as "guests," iPad users can freely explore the 3D reconstructions of the three history houses created by our team. As of June 2016, Lifeliqe became available to download for free from the Windows Store ("Lifeliqe for Windows 10" 2016). Thus, this app and our 3D reconstructions can also be installed on tablet PCs running Windows 10. The most noteworthy features of Lifeliqe are (a) its ability to display high-quality 3D interactive real-time visualizations, (b) its ability to support visual learning with a bilingual view (English and Spanish), (c) its ability to display back-ground information and metadata side by side with the 3D reconstruction, (d) the possibility to interactively annotate the 3D models with comments and custom descriptions, (e) its ability to share snapshots and views of the 3D reconstructions displayed in Lifeliqe directly in a PowerPoint, (f) augmented reality capabilities that merge the 3D reconstructions with the real world, for instance, overlaying a 3D model of "Shrine" 10 in Level VI with the space where the building was excavated by Mellaart, and (g) its ability to zoom on the 3D data from a wide-angle view to a very close-range view of the 3D data.

HISTORY-MAKING IN 3D

The 3D reconstructions and interactive explorations of history houses discussed in this chapter belong to the preliminary phase of a larger digital archaeology initiative. The overall goal of our project is to virtually rebuild the entire sequence of "Shrine" 10 from Mellaart's Building VIA to Building 17, including the different phases of such building that were excavated by Ian Hodder in the late 1990s and then again in 2015 (see figure 10.4a). At first, the Virtually Rebuilding Çatalhöyük Project focused on the information included in Mellaart's report on the excavation season of 1962 when a "Shrine"10 was identified in Level VI (Mellaart 1963, 70–73). Such a building had burials in the Central East and North East platforms and was highly decorated, with an abundance of ritual artwork and features. Using the CAD drawings of Mellaart's levels that were produced by the Çatalhöyük Research Project team (figure 10.5), we reconstructed in 3D a large "Shrine" 10 in Level VIA measuring approximately 5.75 meters × 4.35 meters, with well-preserved walls approximately 2.7 m high and a roof access near the south wall and a crawl hole in the southern part of the east wall (Mellaart 1963, 70). The 3D reconstruction of this history house meticulously illustrates the northern platforms characterized by two lips dividing their surface into three parts, as well as by a bull pillar. The north wall of VIA.10 was highly decorated with panels painted in red: a one-of-a-kind double-horn ram head in the middle and a plaster box for offerings. The 3D visualization of VIA.10's east wall also illustrates an elaborated ritual composition made of two painted plastered posts, a painted bull head located between them, a wall painting surrounding the bucranium, and a painted niche underneath it (figure 10.6).

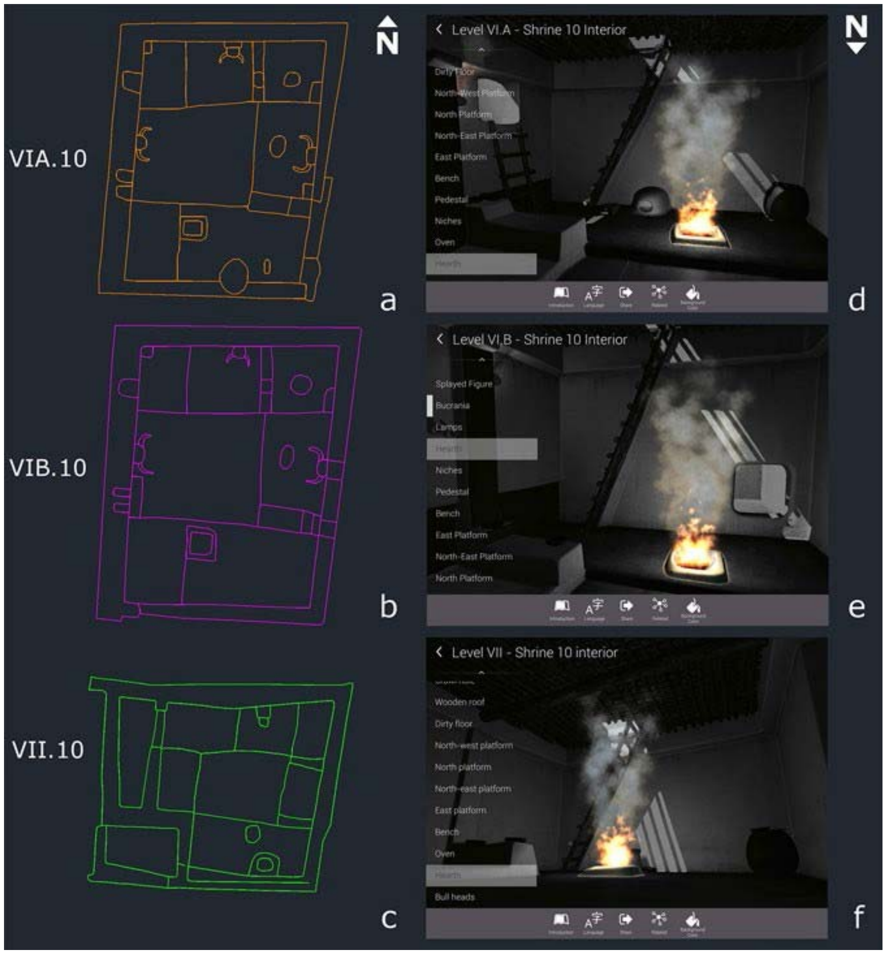

Figure 10.5. Overlaying view of CAD drawings of (a) VIA.10; (b) VIB.10; and (c) VII.10 and overlaying view of house-based history making in the “Shrine” 10 sequence, displaying the repetition of the hearth in Level VIA. Source for a–c: Çatalhöyük Research Project. (d), VIB (e), and VII (f) rendered in Lifeliqe app for Windows 10. Source for d–f: author.

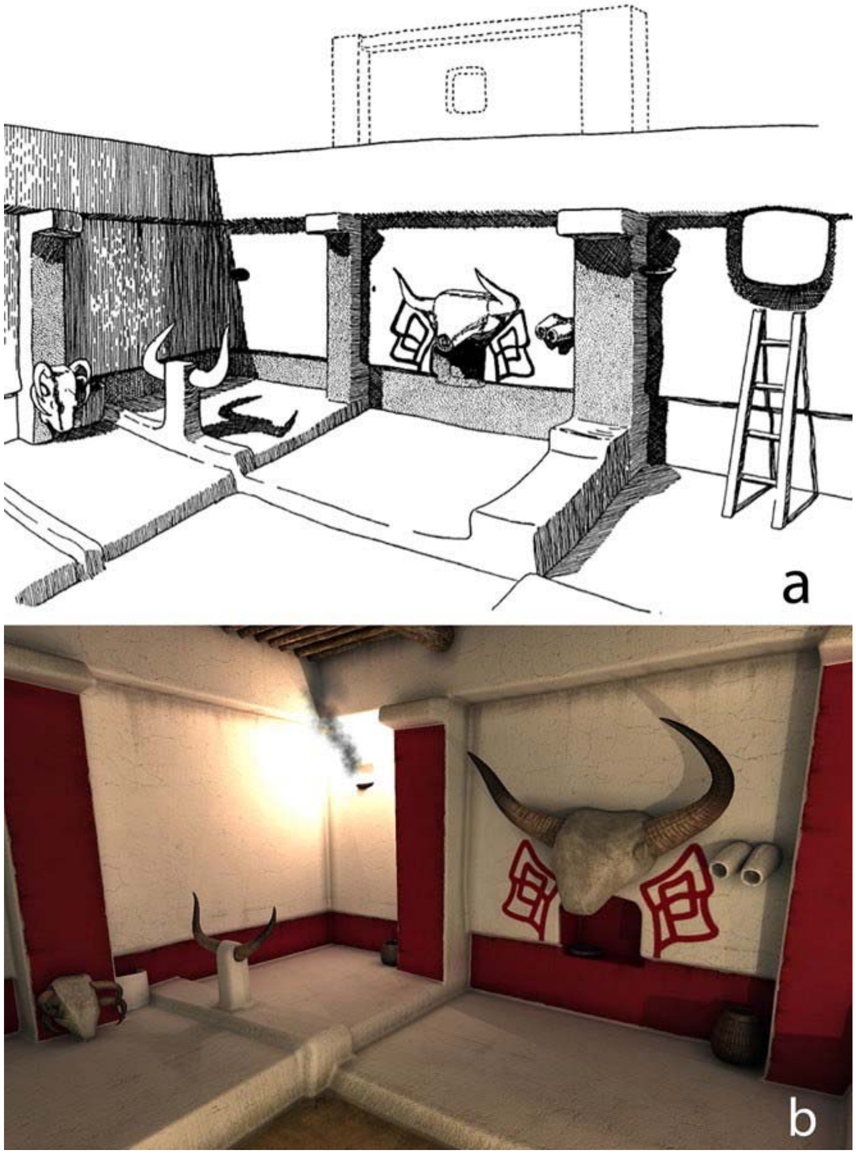

Figure 10.6. Comparative view of (a) Mellaart's visual restoration of the eastern part of "Shrine" 10.VIB. Drawing by Grace Huxtable in Mellaart 1963, 72. (b) 3D reconstruction of the eastern part of "Shrine" 10.VIB in Corinth Classroom (author copyright).

Most remarkably, the 3D reconstruction of this building includes "three superimposed bull heads" attached to the west wall and the approximately 1-meter-tall splayed figure that Mellaart interpreted as a "goddess giving birth to a ram." This artwork was discovered partially preserved at the bottom of the west wall. These splayed reliefs are interpreted by the current project as depicting a bear rather than a goddess. The size of the monumental splayed figure brought Mellaart to hypothesize the presence of a clerestory of about 3 meters in the central part of the building (Mellaart 1963, 70).

The 3D reconstructions discussed in this chapter also draw on the evidence and visual information provided in Mellaart's report on the excavation season during 1963. In this publication, Mellaart modified his initial interpretation of "Shrine" 10 in Level VI, identifying a later phase (VIA) and an earlier phase (VIB) (Mellaart 1964, 40–42). Evidence in "Shrine" VIB.10 showed that burials in this earlier phase were located in the same Central East and North East platforms (see figure 10.5b). Unfortunately, Mellaart's reports do not provide detailed information on the burials documented in "Shrine" 10 during the 1962 and 1963 field seasons. The lack of information on voluntary retrieval of skeletal remains from burial pits in Mellaart's documentation does not allow our virtual simulations to include the dynamic aspects of active history making that occurred in Mellaart's Levels VI and VII. Nonetheless, our 3D reconstructions of "Shrines" VIA.10 and VIB.10 stress the fact that these two phases are an outstanding example of the practice of history making based on the renewal of ritual artworks and features. The elaborated bucrania and wall painting that adorned the west, north, and east walls of VIB.10 were maintained in situ and renewed in VIA.10, even though the southern part of the house was modified. This evidence suggests a clear and intentional display of a common history among the people who occupied "Shrine" 10 in subsequent periods. Our 3D reconstructions of "Shrine" 10 in Levels VIA and VIB also include the splayed figure that decorated the west wall in both phases. Our virtual simulations also render two different reconstructions of the clerestory as proposed by Grace Huxtable, the illustrator working with Mellaart in the 1960s (figure 10.7).
This chapter's contribution to the interpretation of history making at Çatalhöyük is further represented by the ability of our virtual simulations to provide scholars, students, and the general public with a three-dimensional perspective on the stratigraphy of these buildings. This option makes it easier for our users to create mental connections among data, features, and areas of a building to find direct spatial relationships between the hearths documented in the history houses that we reconstructed in 3D. The overlaying view of the "dirty" areas of VIA.10 and VIB.10 (see figures 10.5d and 10.5e) visually depicts how the hearth occupies an almost identical location in VIA.10 even after the renewal of VIB.10.

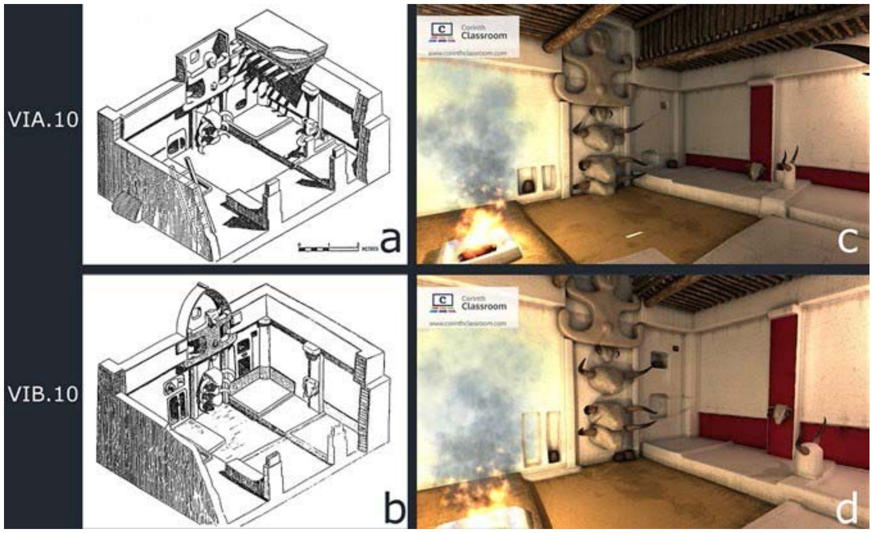

Figure 10.7. Overlaying and comparative views of (a) Mellaart's visual restoration of "Shrine" 10.VIA. Drawing by N. Alckock and Grace Huxtable in Mellaart 1963, 71. (b) Mellaart's visual restoration of "Shrine" 10.VIB. Drawing by Grace Huxtable in Mellaart 1964, 51. (c) 3D reconstruction of "Shrine" 10.VIA in Lifeliqe for Windows 10, and (d) 3D reconstruction of "Shrine" 10.VIB in Lifeliqe for Windows 10.

Our 3D reconstructions of VIA.10 and VIB.10 also help users of Corinth Classroom or Lifeliqe to visually identify the discontinuity that characterizes the "dirty" areas of the two phases of "Shrine" 10. Major discontinuities between these two phases are substantiated by a reconfiguration of the access to storage rooms or other buildings through crawl holes located in the south- ern part of the east wall in "Shrine" 10.VIA. However, in the western part of the southern wall in 10.VIB, differences in the "dirty" areas are rendered mostly by the absence of an oven in 10.VIB and by the reduced size and number of the niches in the west wall of 10.VIA (see figures 10.7c and 10.7d). It is important to highlight the renewal process of features and artwork that we meticulously created and rendered in our 3D reconstructions of "Shrine" 10. Hodder (this volume) argues that the compulsive repetition of new hearths in the same location for decades or even hundreds of years documented at sites such as Aşıklı Höyük and Çatalhöyük is evidence of embodied history-making practices in the Neolithic. To reinforce this assumption, we looked at the repetition of the hearth in the building below VIB.10 that was documented in Mellaart's 1963 excavation report. This publication discusses evidence of another "Shrine" 10 built in Level VII, just beneath VIB.10 (Mellaart 1964, 57). Such a building presents the same cosmology and usage of ritual space as the later phases of "Shrine" 10, but it is smaller and significantly less decorated, and it has one or two adjacent storage rooms or small buildings located west of the main environment. A crawl hole connects the storage room in the north- west part of the building to the main environment.

Most important for this discourse on history making in 3D, the hearth documented in VII.10 shares a very similar location with the hearths excavated in the later VIA.10 and VIB.10 (see figures 10.5d, 10.5e, and 10.5f). Again, we can see how our 3D visualizations of “Shrine” 10 help users of our virtual simulations picture a type of history making based on the repetition or renewal of buildings at Çatalhöyük.

The 3D reconstruction of “Shrine” VII.10 also shows that this building was less ornate compared to its later remakes in Levels VIA and VIB. Even if the plan of VII.10 strictly resembles the one of VIB.10, this earlier history house only had one plaster relief in the north wall and did not present evidence of wall painting. Mellaart’s reconstruction of 10.VII shows another plaster artwork in the northeast corner of the building, specifically, “a stag on a rock” (Mellaart 1964, 57). This feature was consciously omitted from our virtual simulation of VII.10 because its interpretation was not adequately supported by the photographic documentation provided by Mellaart in a later publication (Mellaart 1967) (figure 10.8).

To conclude this section on history making in 3D, our work strived to render the continuity in building and ritual practices among houses that belong to the same stratigraphy with the aim to help interpret the practices of memory construction and history making that linked the inhabitants of “Shrine” 10. At the time this chapter was written, only three of eight phases or reconstructions of “Shrine” 10 were rebuilt in 3D (see figure 10.4). Hence, future developments of the Virtually Rebuilding Çatalhöyük Project will need to continue the study of the history house excavated by Hodder in the late 1990s and again in 2015.

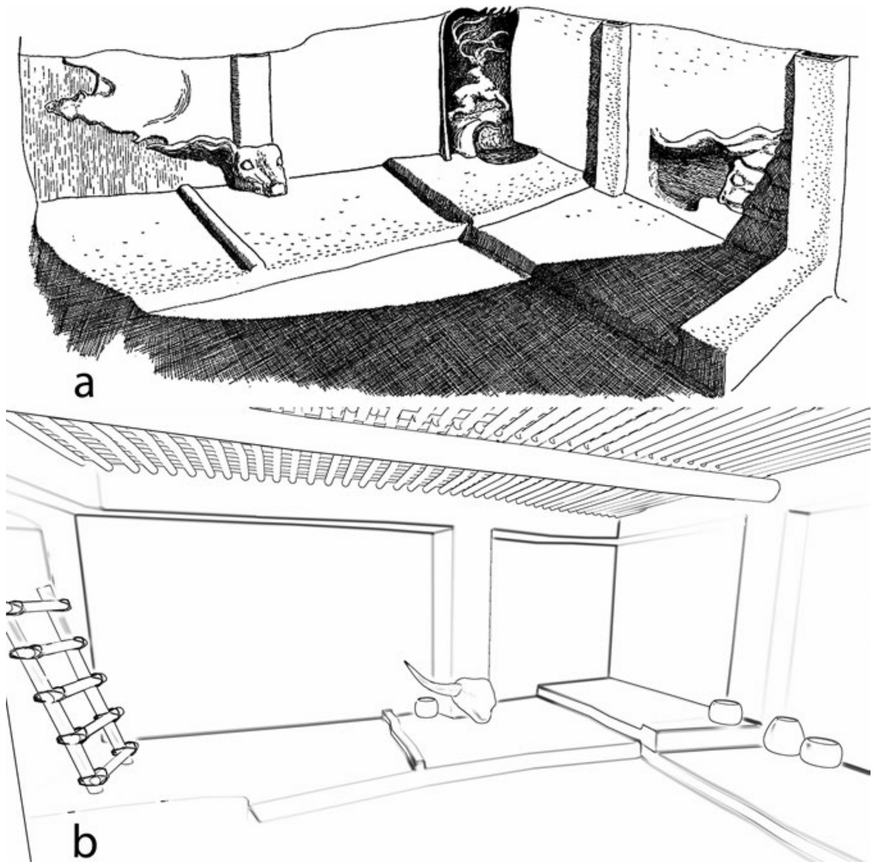

Figure 10.8. *Comparative view of (a) Mellaart's visual restoration of "Shrine" 10.VII. Drawing by Grace Huxtable in Mellaart 1964, 60. (b) isometric drawing of "Shrine" 10.VII automatically generated by Corinth Classroom (author copyright).*

The aim of future developments for this project would be to complete the 3D reconstruction of the remaining phases of Buildings 6 and 17 that were documented underneath Mellaart's "Shrine" VII.10. In addition, our goal is to conduct new research at UC Merced to develop a custom 3D visualization and interactive data exploration platform that will build off the work on house-based history making presented in Corinth Classroom and Lifeliqe. Our vision is to develop a custom 3D viewer using the 3D game engine Unity 3D ("Unity 3D" 2016) or similar technology, enriched by custom features specifically designed for the virtual simulation of different types of history making. For instance, the new 3D data curation platform will address in greater detail the visualization of active history-making at Çatalhöyük with the goal to provide its users with a better under- standing of the ritual practice of removing skeletal remains, stone tools, and ritual objects from a house and then replacing or reburying them in another building or in the foundation of a new building. The new virtual simulation platform will also feature interactive tools that allow users to simulate and display the conscious destruction of features and intentional burning of entire buildings that were documented in "special" history houses such as Building 77. To accomplish this goal, the UC Merced team will leverage virtual reality technologies, as well as custom animations, 3D diagrams, and hyperlinks between building components. The new platform will also display to users the connection between the 3D reconstructions of Çatalhöyük his- tory houses and the related sources, metadata, or images that were used to create the 3D visualizations. In this regard, our team has already made significant progress on developing custom programs that link a 3D model and its components to the Çatalhöyük Database ("Çatalhöyük Database" 2016) or the Çatalhöyük Image Collection Database ("Çatalhöyük Image Collection Database" 2016). Further work still needs to be done to integrate our 3D reconstructions onto the Çatalhöyük Living Archive's website (Grossner et al. 2012; "Çatalhöyük Living Archive" 2016).

CONCLUSION

This chapter demonstrates that a contemporary discourse on the virtual simulation of the past and the 3D reconstruction of its relics must adopt a reflexive perspective and go beyond the discussion of technological improvements and methods that often characterizes digital archaeology scholarship. History making in 3D, virtual place making, the role of spatiality and temporality in a historical virtual environment, and the representation of multiple viewpoints on history are almost unchartered territories in a virtual simulation of the past that future research in this field should address.
The significance of virtually rebuilding Çatalhöyük history houses derives from the fact that a 3D reconstruction "attracts" people inside the archaeological context and involves them in a synesthetic process of meaning making in which both tangible and intangible elements of the past can be discussed, shared, and understood (Lercari 2010, 130). The three-dimensional approach to the study of "history making" presented in this chapter seeks to expand the potential of archaeological interpretation by producing new knowledge on the archaeological record both during the design and implementation phase of the virtual simulation and during the interactive exploration of its data performed by users.
The author of this chapter strongly believes that in the next few years, 3D GIS and other digital-visual analytical tools will push the boundaries of archaeology, creating novel methods for the interpretation of the past. Innovative 3D visualization technologies such as 3D game engines like Unity 3D, with analytical capability and real-world coordinates, have already started to contribute to the development of new paradigms for the digital visualization of the past. Such technologies present great potential because they are able to reduce the gap that still exists between the processes of data collection and interpretation, on one hand, and the dissemination of archaeological data, on the other. For instance, the users of a virtual simulation

created in Unity 3D can take part in simulated religious rituals or social activities, embodying themselves as digital avatars that represent the people who were living in a specific place at a given time.

Phenomenology assigns a fundamental role to our body, arguing that the cognition and interpretation of the world in which we live occur through our sensorimotor system (Merleau-Ponty 1945). Drawing upon these theories, cognitive science emphasizes the importance of embodied mind, situated cognition, and enaction in the interpretation of complex data (Varela, Rosch, and Thompson 1992).

The virtual simulations of "Shrine" 10 presented in this chapter can thus be enhanced by an embodied interactive exploration of the 3D reconstructions, where users can experience the simulated scenario through the virtual bodies of their avatars while collectively reenacting the past and socializing with each other.

The power of virtual simulation in archaeology is consolidated by new, peculiar typologies of spatiality and temporality, typical of a 3D reconstruction. According to our perspective, such formal structures allow users to identify, analyze, discuss, and interpret the spatial and temporal dimensions of Çatalhöyük history houses with greater ease when compared to a traditional form of data curation such as a textbook or a photo collection.

Building off the theories on virtual place making discussed by Champion and Dave (Champion and Dave 2007, 333, 340–43), this chapter highlights the significance of visualizing and simulating the past by providing evidence of the epistemic value embedded in these new interactive and collaborative ways of interpreting the past. The proposed approach also strives to frame digital visualization and virtual simulation within the new revised reflexive methods used at Çatalhöyük (Berggren et al. 2015) and emphasizes the significance of promoting multiple viewpoints on history in the process of virtual recreation of Çatalhöyük history houses.

Beyond the pedagogical value of the proposed virtual reconstructions of "Shrine" 10 in Levels VIA, VIB, and VII, the significance of the preliminary results discussed in this chapter derives from the possibility of visualizing the three-dimensional relationship of features across multiple levels as rendered in Corinth Classroom (see figure 10.4b).

This chapter argues that a 3D virtual simulation allows users to better visualize and read the conscious or unconscious repetition of building patterns and the rebuilding or destruction of features in overlaying buildings. For instance, the users of our 3D reconstructions can verify the repetition of the hearth in three history houses belonging to the "Shrine" 10 sequence that were simulated in Lifeliqe (see figures 10.5d, 10.5e, and 10.5f). This type of comparative 3D visualization also informs its users of the estimated height of each building and correlates this information with a tri-dimensional perception of the stratigraphy of the visualized buildings.

As mentioned in the previous section, future work will finalize the simulation of the stratigraphy of "Shrine" 10, completing the 3D reconstruction of Building 6 in Level VIII and Building 17 in Level XI as they were excavated and documented by the current project (Hodder and Pels 2010, 170).

To conclude, our final aim is to conduct additional research on history making in 3D and to develop a custom 3D visualization and interactive data exploration platform that will build off the work on house-based history making presented in this chapter. Our ultimate goal is to design and develop a custom 3D data curation platform that leverages virtual reality and real-time computer graphics technologies—for instance, using the 3D game engine Unity 3D—and that is capable of enabling a more immersive and multi-vocal visualization of the past through the interactive exploration of different types of history making.

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