# Chapter 9
# Resurrecting Hor: The Philosophical Application of the Digital Tradition

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**Abstract**  This chapter considers the degree to which digital technology extends ontologies of the distant past by comparing modern interactions with a digital dimension to those of the ancient Egyptians with a divine dimension. Its technical foundation is provided by the methodology used to 3D scan and digitally reconstruct the fragmentary statue of the admiral Hor in the Manchester Museum (Acc. no. 3570), merging the authentic reproduction with a digitally sculpted reconstruction to grant Hor renewed presence. In Egypt, the deceased's body parts were ritually enumerated and associated with gods, transposing the individual, piece by piece, into the divine dimension. The reduction of an object to a collection of data points, and its reconstitution in digital space, would have equally been seen to be laden with magical potential, with the model transcending the original. Ancient textual sources demonstrate further parallels, such as those between the programmer's method and the priest's ritual or the inherent dangers of exposed identities in a virtual dimension. The chapter aims to recontextualise work in digital heritage by exploring how digital technology can be reinterpreted, within the context of ancient belief systems, to gain new insights into both the past and the present.

**Keywords** Digitality · Egyptology · Statues · Reproduction · Reconstruction

## 9.1   Introduction

> [I]t seemed to me that any obscurity which yet hangs over the problem of life and thought in ancient Egypt originates most probably with ourselves (Edwards 1888, p. vii).

My father began his career as a computer programmer, so I was fortunate enough to have daily access to a computer from an early age, which was by no means a given in the late 1980s. When I was 6 years old, my parents and grandparents took me to see the touring *Ramesses the Great* exhibition in Dallas, Texas. As we rounded the final

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corner, I was stopped in my tracks as I caught sight of the king's 7.5-m colossus, which I now know had been restored from fragments only three years prior. There began my fascination with ancient Egypt. My parents bought me books and periodicals, I joined the local chapter of the American Research Center in Egypt, and I began compiling a digital record of my research illustrated with line drawings I had drawn, pixel by pixel, in Microsoft Paint. By the age of 11, I was publishing *The Egypt Connection: The Weekly Journal of Ancient Egypt*—after the first issue, it became *The Monthly Journal of Ancient Egypt*—which I printed on our dot-matrix printer, laid out using a pair of scissors and Scotch Tape and sold at school for 25 cents an issue. The digital eventually won out, and I pursued a career in graphic design and digital art. After a few years in the field of advertising, my rediscovery of an Egyptological website I had begun in my early teens rekindled my earlier passion, and I enrolled in the University of Manchester's accredited Egyptology Online programme soon thereafter.

I bother with this personal preamble, because it also serves as an analogy for the topic of this chapter. Digital technology does not merely afford us the opportunity to document and explore our past; it extends it, representing a further link in the chain of our intellectual development that has inherited the behavioural patterns of our cultural memory, of which it now finds itself guardian (e.g. Foucault and Melican 2007). I here consider these patterns by comparing our interactions with the digital dimension to those of the ancient Egyptians with a divine dimension. The parallel narrows the perceived gap between 'us' and 'them' by recalibrating our modern objectivity and helping to reveal otherwise lost experiences, while maintaining a firm foothold in the 'larger discipline' of archaeology (Perry and Taylor 2018, p. 11). Indeed, the digital 'provides an opportunity, within the framework of scientific modernity, to connect with the mystical or spiritual, or at least with the more-than-physical', and 'better aligns us with the ontologies of the assemblages we study' (Opitz 2019). The digital hardly 'represents a huge break from all previous ways of interacting with the world' (thus Jeffrey 2015, p. 145). On the contrary, the redistribution of our existence across both a physical and non-physical plane recaptures a world that had already existed, but that was previously confined to our imaginations. In this regard, to interface with the digital is to experience the past.

The heart of this study is my photogrammetric scan and digital reconstruction of the fragmentary naophorous—'shrine-bearing'—statue of the admiral Hor in the Manchester Museum (Acc. no. 3570; Fig. 9.1). Beyond his statue, Hor is not definitively attested (Price 2017, p. 369). To meet the man, we are entirely dependent upon the information it gives us. He lived during Dynasty 26 (664–525 BCE): a chapter of Egypt's Late Period (747–332 BCE) often termed the 'Saite Renaissance' in reference to the dynasty's capital at Sais in the Western Delta. He was a devotee of the goddess Bastet, within whose temple his statue was erected and whose lion-headed figure he embraces before him. He was an 'admiral of the royal fighting ships in the Mediterranean Sea' and was likely stationed where the statue was found, at Tell el-Yahudiya in the Eastern Delta along the Nile's Pelusiac branch (Price 2017, p. 374). The location was of strategic importance for its communication with both the Nile Valley and the Mediterranean. From there, he was also a 'commander of

**Fig. 9.1** Scan and reconstruction of the admiral Hor. Polished quartzite. Preserved height 88 cm. Restored height 138 cm (C. G. Elkins)
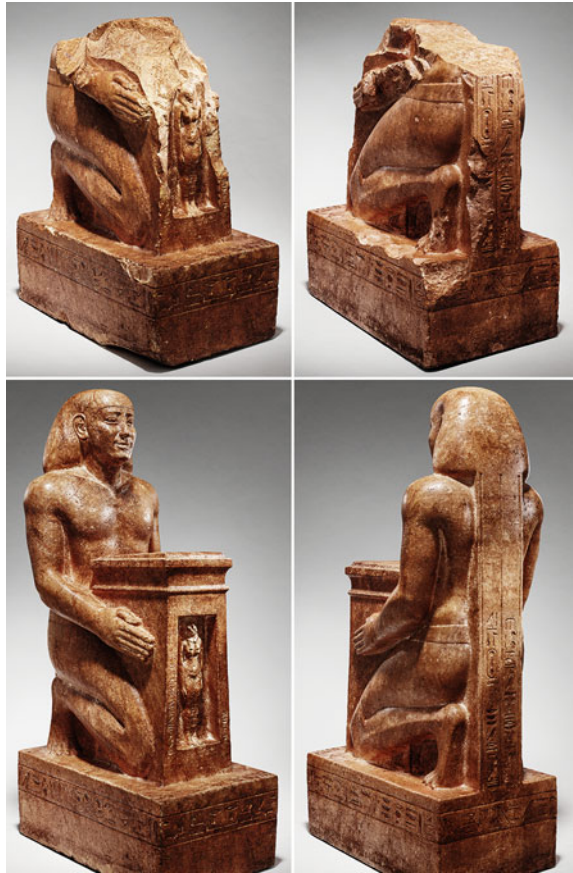


Greek mercenaries' (the Ionians and Carians of Herodotean fame: Herodotus II, 154; cf. Price 2017, p. 373). His mother's name was Taanetenpawia.

The statue is of such extraordinary workmanship that it likely originated in a royal atelier, though only its lower half now survives. Sometime before being put on display in Manchester, the shrine was damaged further still, and the portion of the inscription bearing the title of 'admiral' was lost. Fortunately, it is preserved in both a photograph and an illustration within the excavator's original publication (Petrie 1906, Pls. XV, XX), serving as a fitting testament to the importance of documentation and visual reproduction.

It is Hor's Egypt whence our analogies are drawn. The theological concepts and textual sources to follow are largely taken from those contemporary with him, or of which he would have at least been aware. Though his tomb's location is unknown, it could be hidden among those of contemporary naval and military officials at Saqqara, near modern Cairo (Price 2017, p. 375). Thus, we might assume that Hor's tomb and sarcophagus were also inscribed with excerpts from funerary literature such as the Old

Kingdom (c. 2686–2160 BCE) Pyramid Texts, the Middle Kingdom (c. 2055–1650 BCE) Coffin Texts and the New Kingdom (c. 1550–1069 BCE) Book of the Dead, the latter having been revived and standardised in Dynasty 26. Other Underworld 'books' initially inscribed in the tombs of New Kingdom pharaohs, such as the Amduat and the Book of Gates, were inscribed in the tombs of Hor's southern contemporaries, such as that of the 'Chief Lector' Padiamenopet, whose title suggests that he was 'intimately familiar with the current religious thought […] of his age' (Bianchi 1982, col. 991). These texts are also made use of here.

The technical and artistic process behind the reconstruction is described in Sect. 9.3. The subsequent discussion in Sect. 9.4 builds upon the philosophical premise put forth in Sect. 9.2 to recontextualise the technology behind that process. Section 9.4.1 explores ancient Egyptian beliefs surrounding the potential of models to become the very thing they represent, thereby granting them immutability and the named individuals immortality. It investigates the parallels between ancient ritual and digitisation, looking at the technology required and culminating in Sect. 9.4.2 in the augmented ritual of Hor's rebirth in the 'temple of the muses': the museum. The remaining discussion is the software to the preceding sections' hardware. It concerns our movement between dimensions and continues the narrative of Hor's resurrection by exploring the aspects of our digital world anticipated by his beliefs: the nature of our interfaces in Sect. 9.4.3, the code we use to manipulate the digital dimension in Sect. 9.4.4 and the securities we require on our journey in Sect. 9.4.5. The digital and the divine are largely syncretised into a single 'virtual' dimension throughout the chapter; only context indicates which is meant. Translations are based upon Allen (2005) (Pyramid Texts), Faulkner (1985) (Book of the Dead) and Hornung and Abt (2014a) (Amduat) and (2014b) (Book of Gates), unless otherwise specified.

## 9.2 Background: Heritage, History and Digital Divinity

> Any sufficiently advanced technology is indistinguishable from magic (Clarke 1973, p. 39).

My use of the term 'resurrection' is not figurative. In Egypt, to create an image was to 'give birth'. The sculptor was *sankh*, 'one who causes to live'. The image was ritually reared to ensure that it, like the natural body before it, was of sufficient maturity for its senses and faculties to serve the deceased (Roth 1992, pp. 118–122). Destroying its nose prevented it from being used to breathe, hence the patterns of damage so common to Egyptian statues. Just as human beings are reduced to an inanimate corpse, so must inanimate objects be capable of receiving life.

The restoration of monuments was, therefore, a sacred act. Postscripts to several Book of the Dead spells detail their mythical discovery during temple inspections or while undertaking restoration work. Crown Prince Khaemwaset, fourth son of the great Ramesses II (r. c. 1279–1213 BCE), was still revered as a sage and magician over a millennium after his death for his own reverence of Egypt's past and restoration

of her already ancient monuments. Upon restoring a 1,200-year-old statue of a son of Khufu, the builder of the Great Pyramid, he records:

> It is the … King's Son Khaemwaset, who was glad over this statue of the King's Son Kawab, and who took it from what was cast (away) for debris(?)…. Then … (he) decreed that [it be given] a place by favour of the gods, … so greatly did he love antiquity and the noble folk who were aforetime, along with the excellence (of) all that they had made… (from the throne of Kawab's restored statue; translation after Kitchen 1996, p. 566).

But a restored statue is useless without an active cult to provision it. The inscription goes on to describe Khaemwaset's restoration of the statue's cult, 'which had fallen into oblivion [in the remembrance] of men'. By restoring and providing for Kawab's statue, Khaemwaset had effectively secured his resurrection: 'that he may attain (the status of) "given life"' (Kitchen 1996, p. 566).

In Egypt, 'life' was more a cultural than a natural process, because cultural engagement—such as the social reciprocity of the mortuary cult: 'One who acts is one for whom the like will be done' (maxim from the 26th Dynasty statue of Nebnetjeru [Cairo JE 37413]; translated from the German in Jansen-Winkeln 1999, p. 58)—was the means to extending life beyond nature's limitations (Assmann 2010, p. 16). We might see culture as the first artificial intelligence: 'Like the intelligence of a machine, culture can solve problems'; it 'applies its own logic, has a memory, endures after its makers are gone, […] and can induce action' (Christakis 2015). Like culture, digital technology overcomes restrictions imposed by our biology. It too evolves, and some would say it is becoming a self-sustaining force, a 'technium' on par with nature (Kelly 2010), which in a world increasingly without gods assumes the functions of the supernatural. Indeed, it invites interactions taking the form of the religious (e.g. Lam 2001). 'Evangelists' propagate software companies' visions of the future, while the annual ritual of the product release—like the festal procession in which the cult image otherwise guarded from view and shrouded in mystery is unleashed upon the masses—results in congregations lining the streets.

In the ancient Near East, supernatural knowledge—that is, knowledge that human beings alone cannot extract from nature—was deemed divine knowledge (Assmann 2010, p. 6). In the Old Babylonian myth of the mortal Adapa, the divine king, Anu, attempts to grant Adapa eternal life in the company of the gods for the superior wisdom granted him his divine father, which is unbefitting a human being (Speiser 1978, pp. 101–103). In the Old Testament, Adam and Eve partake of fruit from the Tree of Knowledge, thus becoming enlightened and 'like God' (Gen. 3:5, New Revised Standard Version), but they are condemned to mortality for ultimately being unworthy of it. In Egypt, to possess the sun-god's knowledge of the Underworld's secrets was to be transfigured and live forever: 'He who knows these images is like the Great God himself' (Amduat, first hour).

Prior to the Third Industrial Revolution, obtaining knowledge was the purview of the human brain and thus a natural process. But the digital is capable of superhuman calculations and the execution of simultaneous processes. Big data can harvest digital identities to create complex computational models that predict human behaviour. Computational linguistics promises to surpass human translators in rendering even the rarest languages—in both written and spoken form (e.g. Asgari and Schütze

2017)—and unlock those long extinct that yet remain to be deciphered (e.g. Luo et al. 2019). Digital simulations create situations devoid of any actual consequences. We can scrub backwards through time, inhabit solid geometries, and move freely in three dimensions. In the virtual dimension, we can fly. Knowledge gained in silicon is beyond that which can be derived solely from nature and must, therefore, be classified as divine knowledge. In these ancient terms, the digital dimension is by its very nature divine, and the human beings who navigate this virtual dimension, like the transfigured dead, therefore inherit divine status.

Yet, we remain mortal. Seen from an ancient Egyptian perspective, this dichotomy would equate each of us with Pharaoh, who as the human son of the sun-god was the only mortal authorised to navigate both dimensions. Digital technology represents the ultimate democratisation: the universal right of all human beings to transcend our biological limitations while still alive. As a result, we inherit the responsibility of maintaining the king's 'struggle against the gravitational pull of the alienation of meaning' (Assmann 2001, p. 6) that accompanies progress and change. For most of us, that battle for meaning is fought in the trenches of history.

But the ancient Egyptians' sense of history was decidedly ahistorical. Progress and change were deteriorations of cosmic order: a distancing from the harmony of that mythical time when gods ruled on earth. With each king's accession, the calendar was reset to Year One. However, by Hor's Dynasty 26, Egypt had become deeply aware of her long history. Initially spearheaded nearly two centuries earlier by competing dynasts looking to bolster their legitimacy by invoking 'classical' Egypt, the period not only saw a resurgence of ancient artistic and liturgical styles but also inspired 'remixes' in which they were consciously updated or combined to make something original. The ancient Egyptian élite had always experienced an intimate connection with their past, but this level of engagement was unprecedented; this was a 'cultural revolution' (Assmann 1996, p. 377). Archives were studiously pored over for draughtsmen's original plans. Artists and their patrons scanned ancient monuments in search of elements that could be stylistically appropriated, and they applied square grids to make faithful copies. Some are so faithful, in both style and quality, that there has been debate as to whether they are originals or 26th Dynasty 'facsimiles' (e.g. Bothmer et al. 1960, pp. 42–43). The past was no longer being exploited on ideological grounds to legitimise the present but rather utilised to redefine it and give it new meaning. Parallels with the work of heritage professionals presented in this volume hardly require further comment.

## 9.3   Methodology

We do not wish to penalise the machine for its inability to shine in beauty competitions, nor to penalise a man for losing in a race against an aeroplane. The conditions of our game make these disabilities irrelevant (Turing 1950, p. 435).

The primary technical foundation upon which this chapter builds is provided by 3D scanning. Photogrammetric workflows such as the one used to scan Hor's statue are sufficiently documented and are not delved into here. The project began as a proof of concept for reconstructive augmented-reality (AR) applications in museums, so speed, software accessibility and cross-platform compatibility were of utmost importance. Images were taken with an Apple iPhone, and Agisoft Metashape was used for mesh and texture generation.

An exactly contemporary kneeling statue in Paris (Louvre A 94) served as the reconstruction's primary reference (for a full bibliography of references used, as well as the reconstruction's art-historical implications, see Elkins and Price 2022). Frontal- and side-view photographs were loaded into orthographic views in Blender (had the schedule permitted, the original in Paris would have been scanned instead to provide an undistorted basis), and Hor's upper body was cursorily modelled, as a separate mesh, following the Paris statue's proportions. To negate any inaccuracies caused by perspective and lens distortion, orthographic views of the reconstructed model were tested against the grid of the artistic canon of proportions: the very grid applied by 26th Dynasty copyists to ancient monuments (on using 3D models to investigate the canon's use in statuary, see Elkins and Heindl 2022). Blender's sculpting tools were then used to shape the reconstructed mesh, carve out final details and introduce imperfections, such as tool- and pockmarks, in restored recesses and crevices.

Texturing required a more specialised approach. First, it was necessary to prepare the scanned texture for transfer to the reconstruction. A physically based rendering (PBR) specular/glossiness workflow was adopted to simulate the stone's material properties. The amount of light reflected off of a given surface at a $0°$ (perpendicular) angle of incidence serves as the specular reflectance value (Fresnel zero, or F0) in PBR shaders and can be derived from a substance's real-world index of refraction (IOR) using a simple formula (see Akenine-Möller et al. 2018, p. 321 [Eq. 9.17]; cf. Lagarde 2013). The sedimentary quartzite, or orthoquartzite, of which Hor's statue is carved is a sandstone whose grains are heavily cemented with quartz (Aston et al. 2000, p. 53), of which it is up to 99% composed. Quartz's IOR is widely attested in reference tables available to 3D artists (e.g. Autodesk 2014) and falls within [1.544, 1.553], giving an F0 for Hor's statue within [0.0457, 0.0469].

Substance Painter was chosen for texturing given the need to both 'paint' the scanned texture onto reconstructed surfaces and procedurally generate lighter details in restored crevices. The high-poly mesh generated in Metashape was imported into Substance Painter, and mesh maps were baked using the mesh's geometry. I chose to manually de-light the Albedo map for increased control over overlapping shadows from the museum's lighting and to avoid the artefacts of automated tools. An inverted Ambient Occlusion (AO) map with simulated ground plane served as a mask for global levels adjustments, while localised adjustments—using colour selections generated from the World Space Normal map—equalised directional lighting and further brightened surfaces facing the dark pedestal and floor. Hard shadows were manually masked out and brightened accordingly.

While F0 can be obtained from real-world refractive indices, the greyscale Glossiness map defining surface irregularities and resultant light diffusion is more subjective. Its precise effect also depends upon the render engine (Lagarde 2011). I arrived at a base linear value of 0.6—introducing slight variation up to 0.7 using the de-lit Albedo map—to simulate the statue's polished surface in WebGL applications, which would be the reconstruction's primary deployment beyond the initial Unity-driven prototype. Using the de-lit Albedo map, it was possible to isolate the dark grains and pebbles comprising the stone's veining and the much lighter, unpolished crevices and darken them within the Glossiness map. The Albedo and Glossiness maps were then exported for later use.

With the texture maps prepared, it was necessary to retopologise and decimate the mesh, transferring high- and medium-frequency surface details to the Normal map so they could be painted onto the reconstructed areas. The scan was retopologised using Instant Meshes and reimported into Blender for final decimation and UV mapping. The low-poly mesh was then imported into Substance Painter and a new Normal map was baked from the high-poly original. The previously exported Albedo and Glossiness maps were remapped to the new mesh's UVs using Substance Designer's Transferred Texture from Mesh baker. Together, these three texture maps would serve as the material for 'painting' the reconstruction.

The high-poly scan was merged with the sculpted mesh in Blender using a simple Boolean modifier. The resultant mesh was retopologised and decimated using the same process as above, and the scan's Albedo and Glossiness maps were again transferred using Substance Designer. The merged low-poly mesh was imported into Substance Painter, where mesh maps were baked from the high-poly Boolean union. Baked seams between the scanned and reconstructed meshes were painted out of the Normal map using the Clone tool, making sure to only paint on reconstructed areas. The low-poly scan's Albedo, Glossiness and Normal maps were then loaded as channels into the Projection tool to texture the arms, torso and head. The projected material was rotated as needed to follow the contours that would have been created by the stone's 60° lateral veining. Finally, a series of procedural mask generators created lighter, unpolished details within restored crevices and imperfections using the baked Curvature and AO mesh maps (Fig. 9.2).



**Fig. 9.2** Crevices in the de-lit Albedo map. **Left** Junction of left heel, buttock and back pillar (as scanned). **Right** Restored junction of left clavicle, neck and wig (procedurally generated) (C. G. Elkins)

## 9.4  Discussion

I etch a pattern of geometric shapes onto a stone. To the uninitiated, the shapes look myste-
rious and complex, but I know that when arranged correctly they will give the stone a special
power, enabling it to respond to incantations in a language no human being has ever spoken.
I will ask the stone questions in this language, and it will answer by showing me a vision: a
world created by my spell, a world imagined within the pattern on the stone. […] The stone
is a wafer of silicon, and the incantations are software (Hillis 1998, p. vii).

### 9.4.1  Reproduction

Attempts to reproduce the materiality of real-world objects in another dimension are
in no way a recent development. Sometime around 2650 BCE, an official named
Hesyra commissioned a monumental tomb at Saqqara within which a 37-m-long,
finely plastered corridor was to be decorated with beautifully painted polychrome
diagrams of the objects he wished to take with him to the afterlife (Fig. 9.3). In earlier
tombs, provisions were included by the thousands within enormous superstructures
subdivided into dozens of storerooms. Hesyra's paintings were to circumvent not
only the massive cost of this system but also its inherent dangers of looting and
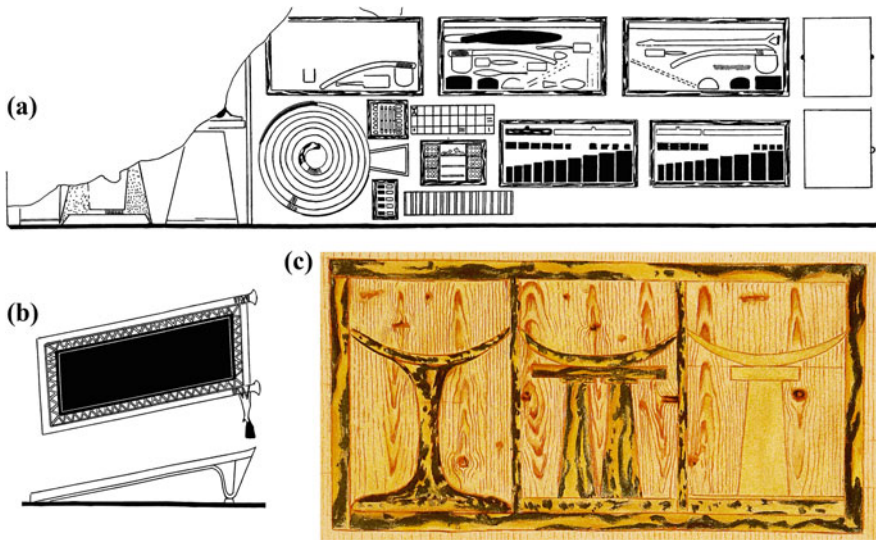decay by essentially providing blueprints for the objects' virtual construction. For,



**Fig. 9.3**  Hesyra's schematics. **a** Line drawing of a section containing gameboards and boxes of
tools, weights and measures (after Quibell 1913, Pl. XVI). Height of the represented portion approx.
1 m. **b** Top and side views of a bed from a section depicting furnishings (after Quibell 1913, Pl.
XIX). **c** Colour facsimile of a wooden box containing headrests, also of wood (after Quibell 1913,
Pl. XIV). The box was painted just to the right of the beds (C. G. Elkins)

beyond the physical medium that contains it (and barring any further sampling: e.g. Dawson and Reilly 2019), the virtual object is free of decay (Reilly 2015, p. 229). This is not unlike our consolidation of various media and communications to a single device, and it would have undoubtedly resulted in a similar socioeconomic shift as the industries in charge of production were reorganised and the surplus redistributed. The redistributed surplus would ultimately help support a workforce large enough to build the first pyramid.

The new system's underlying magical principles were older still. Already in the more modest graves of the late Predynastic Period (c. 3500–3000 BCE), model boats and tiny model vessels such as pots and jars were provided with otherwise simpler burials. Using later parallels, we might assume that these miniatures were thought to become their full-size counterparts in the virtual dimension, while the placement of model granaries in the tomb a century or two later would support the needs of food production.

Hor's Underworld books were themselves reproductions, 'executed like this original in the secrecy of the Underworld' (Amduat, first hour). No matter how often our typed words are copied or reformatted, they would not exist but for that initial pressing of the key. This is how the model maintains its effectiveness, by directly channelling the original and creating a present reality that could 'not exist without a prior reality' (Ch′ng and Gaffney 2013, p. 3), and why the ancient Egyptians felt no need to risk the tides of history as long as repetition and proliferation maintained a channel to the purity of the original moment of creation. Indeed, in the proper context, interaction with a model can even be more effective than interaction with an 'original' (on the digitally produced facsimile's potential for superior 'authenticity', see Latour and Lowe 2011; Jones et al. [2018, esp. pp. 345–346] would here include the digital object itself).

These channelling principles applied equally to the human sphere. The prototype of successful transmutation was the god Osiris, of whom the mummy was ultimately a replica. His is the transmutational potential of new life and describes how a plant grows from 'an apparently lifeless seed' (Allen 1988, p. 35). The sun-god descends at night to become one with Osiris; thus, united with potentiality itself, he hopes of being reborn the next morning. Later stories tell of his dismemberment and the scattering of his body parts throughout Egypt. They were then gathered and reassembled by the magic of his wife, Isis, who fashioned a model of his missing phallus to conceive their son, Horus.

Like the resurrected Osiris, Hesyra's schematics were products of a visual system that reflected a worldview in which all of existence was an assemblage of disparate elements. The body could be referred to using a collective noun meaning 'body parts', Egypt was the 'Two Lands' (Upper and Lower) and the cosmos was 'sky and earth' (after Assmann 2010, p. 35). The aims of this deconstructive lens resemble those of modern data-driven approaches to reasoning:

> In a digital way of reasoning, we accept […] vast masses of non-contiguous elements, expecting the hidden connectivity to emerge as we tickle the individual pieces. Thus it is that we come to feel instinctively that the dislocation is there to be bridged, […] subject to an articulation that reveals the polarities and the resulting unity (Buccellati 2017, p. 175).

The deconstructive approach to image-making was also taken in ritual. To be transferred between the physical and virtual dimensions, objects and beings were first encoded. During the funeral ceremony, the enumerative association of the deceased's limbs with gods—a 'member apotheosis'—served as the transfer protocol by which the body was encoded, transposed and subsequently decoded in the virtual dimension:

My hair is Nun,

My face is Ra,

My eyes are Hathor,

My ears are Wepwawet,

[…] (Book of the Dead, spell 42).

The spell, variants of which are known from all major works of ancient Egyptian funerary literature, goes on to enumerate the remaining parts of the body, from the molars and incisors to the breast and spine down to the digits of the hands and feet: a literal digitisation of the individual. Should the transfer not be executed properly, and the spell (i.e. code: see Sect. 9.4.4 below) be corrupt or incomplete, the deceased would be disfigured and perish: 'I will not become corrupt, […] I do not perish, my brains are not destroyed, I am not mutilated' (Book of the Dead, spell 154; adapted after Zandee 1960, p. 147).

In another spell, the boat intended to ferry the digitised individual across the celestial river is in pieces in the dockyard of the god Aqen, and it must first be properly encoded that its transfer may be requested. Aqen asks the deceased, 'Are you complete?'; the deceased answers, 'I am complete' (Book of the Dead, spell 99). The pieces of the boat are then summoned by means of member apotheosis, but not before the deceased has proved themselves master of digitising principles by declaring, 'I know how to count my fingers'. Sixteen discrete parts are enumerated, from the mooring-post and mallet to the sail and halyards, even the ribs of the hull.

Our reduction of an object to a collection of data points, and its reconstitution in virtual space, realises these ancient processes (Fig. 9.4). The scanning of an object would have been seen to be laden with magical potential, with the digitised model, reborn into the virtual dimension, becoming immune to decay and eternal: 'Rise on your bones of bronze and on your limbs of gold, for this body of yours belongs to a god. It does not perish, it does not decompose, it does not consume' (Coffin Texts, spell 519; translated [as Pyr. Neith, 653] in Zandee 1960, p. 58). Like the gold-plated brass rods of a quantum computer, the gods' metal bones were covered in flesh 'made of gold, and thus immutable' (Allen 2005, p. 95 n. 32).

The body I am referring to is not the mummy. By virtue of its inanimation, the mummy is promoted to the status of liminal image. The ritual associated with the revived mummy was, in origin, a statue ritual (Otto 1960, pp. 1–33) or later syncretised with a statue ritual already in parallel existence (Roth 1993, pp. 74–77). The objects of this 'Opening of the Mouth' were largely those of the sculptor: chisels, adzes, even a saw. It was the woodcarving adze, held to the mummy's mouth, that ultimately revived the individual. The mummy was the seed, not the plant: a storage medium whence the encoded individual was transferred to the virtual dimension, where they were then decoded to live out a new life in an immaculate, virtual body.
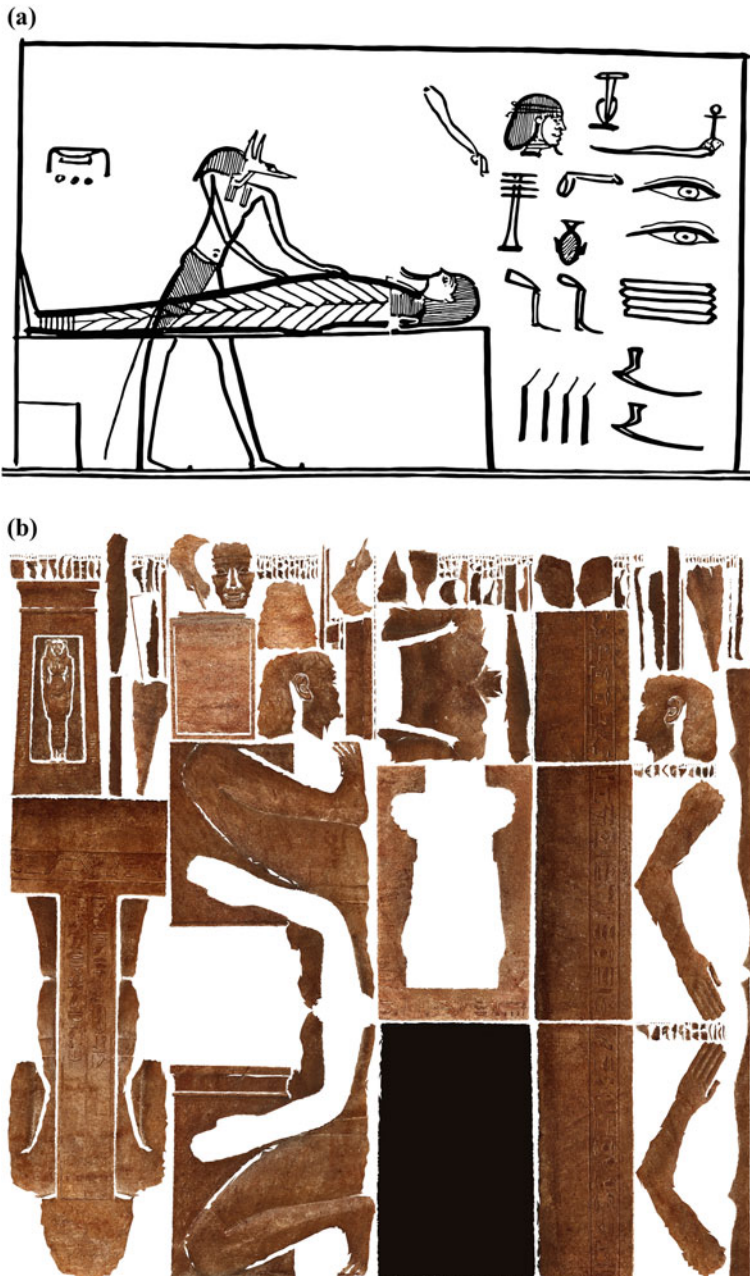
(a)



(b)



**Fig. 9.4** **a** The reassembly of Osiris, with the individual members of his unwrapped body displayed to the right (after Vandier 1962, Pl. VI). From a mythical papyrus of the Graeco-Roman Period. **b** Computer-generated, UV-unwrapped mesh fragments of Hor's reconstructed statue (C. G. Elkins)

In ancient terms, this virtual body was also an 'image' of the individual. When the sun-god traversed the Underworld's waters, calling the names of the transfigured dead to induce their rebirth, *seshemu*, 'images', came forth. In a text illustrating the king's role as sun-priest, dating to the Middle Kingdom but still in use in Hor's Dynasty 26 (Assmann 1970, pp. 3, 4–5), the king 'knows the one who is in the day-barque, the great *seshemu* that is in the night-barque' (translated from the German in Assmann 1970, p. 21). During the day, the sun-god was himself, but at night, in the virtual dimension, his image occupied the solar barque. The word is the same as that for the divine cult image, which is archetypically made of gold, thus alluding to the immutability of the virtual. Then, as now, images were the extradimensional manifestations of another reality.

### 9.4.2 Resurrection

As the mummy was but a storage medium to be utilised between lives, compressed into a tightly wrapped shell and hidden in the cool, rejuvenating darkness of the tomb's core, the individual required more accessible images capable of receiving their digitised instantiation. By means of such an image, their name remained spoken and their needs for nourishment were satisfied, for, although we can immerse ourselves in the virtual dimension, we are ultimately in need of this-worldly sustenance. But this was not an otherworldly image like the *seshemu*; it was a this-worldly image, or *tut*: that is, a statue or relief. All of creation could be referred to as both the 'image', *tut*, of the creator and as *medu-netjer*, 'divine speech', the Egyptian term for hieroglyphs: for 'all creation is a hieroglyphic text of the creator's original concept' (Allen 1988, p. 45; cf. Assmann 1996, pp. 391–392). In a world composed of images, an image is the thing itself.

An anointing ritual performed alongside the 'Opening of the Mouth' (thus Roth 1993, pp. 67–69) has the statue 'filled' with oils: '[When I fill you] with it (oil), it will tie together your bones, join together your limbs for you, collect your flesh for you' (Pyramid Texts, spell 637). The ritual served as a transfer of power and energy to the matured statue, as indicated by the deceased's seizure of a crown at the end of it (Otto 1960, p. 124). The tying together of bones, joining of limbs and rejuvenation of flesh are qualities attributed blood in ancient Egyptian conceptions of anatomy (Bardinet 1995, pp. 128–135). Thus, the matured client-statue was equipped with a power source and brought online for the digitised individual's upload, with an artificial heart in place of a central processing unit and artificial veins in place of circuits. Indeed, it would seem that 'what matters about digitality is not so much the technical dimension of the electronic mechanism used, but the intellectual dimension which gives rise to it and nurtures it' (Buccellati 2017, pp. 204–205).

Many futurists believe that our future lies in digital brain emulation: the uploading of our consciousness to achieve 'digital immortality' (e.g. Sandberg and Bostrom 2008, p. 5). It seems the mechanics of our future ambitions promise not to differ much from those of our past. Sensors would allow us to see and hear, while an

electroacoustic device would simulate our voice that we may speak: provisions for sustained integration into the social substrate that were the very objectives of the 'Opening of the Mouth'. Were our digitised self to be deleted subsequent to the death of our natural body, we would suffer what the ancient Egyptians feared most: the ultimate annihilation, a second death. 'My face is opened. My heart is in its place. My crown is with me. […] I will not die for the second time' (Book of the Dead, spell 44; translation after Zandee 1960, pp. 187–188).

I call it a substrate in the biological, life-sustaining sense. The social substrate ensured that the deceased was provided for—whether by actual offerings or the recitation of an offering formula—and their name spoken. The offering formula inscribed on monuments was ultimately 'an offering that the king gives' at the altar of a deity, and the deceased was invited to participate: a shared meal at the divine family's table. By Hor's time, a prevalent means of achieving this virtual integration was the statue's initiation into a temple. Today, the museum can be seen as that temple. As inner sancta of cultural identity, museums 'enshrine' what we hold 'to be significant and valuable' (Cameron 1971, p. 17). Like the institutional 'Houses of Life' installed in ancient Egyptian temples as record-keepers and seats of wisdom, the museum 'is, in concept, the temple of the muses where today's personal experience of life can be viewed in the context of "The Works of God […]"' (Cameron 1971, p. 17).

It was in the House of Life that the ritual knowledge required to sustain the solar cycle was preserved. As the sun occupies each of the Underworld's gated regions during this cycle—one for each of the night's 12 hours—its digitised inhabitants are temporarily granted new life: 'He breathes air at his hour' (Amduat, third hour, closing text). When we view Hor's digitally reconstructed statue within the museum, his hour has come. His image is restored and his name spoken, while the museum's steady stream of visitors maintains his cult of veneration. By placing his restored statue in a mixed-reality environment, we also bring him back into the realm of the living (the ancient Egyptian name for the Book of the Dead was the Book of Coming Forth by Day), blurring the boundaries between the physical and the virtual. But the virtual dimension bears no temporal relation to earth. In Egypt, to sleep was to temporarily experience it, and just as eight hours of sleep are traversed in the blink of an eye, so do dreams unveil mysterious worlds and permit participation in elaborate, timeless narratives. For Hor, an hour lasts a lifetime.

### 9.4.3   The Interface

How would Hor cope with a world in which we no longer worship the ground we walk on or the air we breathe? Beyond the deconstructive processes undertaken to restore his surrogate body, it is likely our navigation of the virtual from within the constraints of the physical that he would most recognise. As already seen with the Predynastic tomb models, the capacity for miniaturisation absent loss of effectiveness permeated the ancient Egyptian worldview. Entire monuments could be reduced to a

single 'false' door that assumed all of the magical properties of its larger prototype. It was by means of this door that spirits could re-enter the physical dimension and partake of the offerings presented before it. Multiple recessed frames surrounded a central door-niche above which a semi-cylindrical drum simulated a reed mat rolled up to grant passage. Its multi-layered construction gave birth to interpretations of its containing multiple cosmic layers within a single interface: the entire tomb in microcosm (Brandt 2016, pp. 12–33).

Where they had doors, we have Windows. Our screens' frames give way to the operating system's bars within which windows layered upon windows frame access to the virtual dimension and the composite parts of our virtual existence. Complex architectures are reduced to a single device and made useable by a single interface. Like the polychrome patterns simulating colourful reed mats decorating the false door, we incorporate skeuomorphic elements, from rudimentary switches and sliders to the texture of a piece of paper and tabs of a folder. Archaising icons communicate function by essentially hieroglyphic means, in that they are symbols of things that must be unambiguous and immediately recognisable. When graphical user interfaces introduced icons, their creators 'toyed with using the word glyphs instead' (Negroponte 1995, p. 110). So, the alkaline battery becomes a symbol for all batteries to communicate charge level even on devices powered by lithium ions. We set alarms by tapping on a twin-bell alarm clock; we have trash cans, recycle bins, clipboards and notepads, and we still save 'files' via the image of a 3.5-in floppy. Some 30 years have passed since the personal computer became capable of antialiasing, yet we still use pixelated fonts to communicate a sense of the digital, the technical, indeed even the futuristic. We invoke these metaphors for the same reasons as the ancient Egyptians in their use of skeuomorphic elements in religious architecture, which invariably served as a portal between dimensions. Skeuomorphs 'disguise the monstrosity of transition between the digital and the analogue worlds. The taming of the monster is done by transferring familiar attributes onto unfamiliar territory' (Minkin 2016, p. 121). In cases both ancient and modern, past realities are engaged to communicate purpose and meaning.

### 9.4.4  The Code

The Underworld books are adaptations of rituals concerned with the iterative perpetuation of the first sunrise (Assmann 1970, esp. pp. 56–57). The rituals were imagined sustaining ordered existence within an infinite loop: the solar cycle. They are like a dramatic play's script (Allen 1988, pp. 27, 35, 57), with the gods acting out their roles in endless iterations. They are formulated in terms of divine actors executing cosmic functions and divine speech serving as instructions that were preprogrammed at the first sunrise. Documents written in this divine language represented knowledge, not belief. The locations and beings therein were referred to using the verb *rekh*, meaning 'to know', 'to learn', 'to experience' (consider German *Wissenschaft*, 'science', from *wissen*, 'to know', and Latin *scientia*, 'knowledge'). Holders of this knowledge were

somewhat akin to Laplace's demon; to know the nature and movements of all things is to know the past and future.

These methods were invoked by the priest, whose anthropomorphising code made persistent use of the generational relationships between divine 'parent' and 'child'. We could easily call this a scripting language. Like the computer programmer, priests and magicians utilised highly specialised language and syntax to manipulate the virtual dimension. I would amend traditional analogies to physics and the natural sciences (e.g. Hornung 1975, cols. 185–186; Allen 1988, p. 56) by also seeing the ancient Egyptian *Götterwelt* as an information science, which takes us, by way of informatics, to the computer sciences.

This can be better demonstrated by examining ancient Egyptian code in its original formatting. Some 1,100 years before Hor (thus Parkinson 2009, p. 157), a collection of at least 24 separate documents—perhaps amassed over several generations by a family of professional 'magicians' (Parkinson 2009, pp. 149, 159)—was deposited in a lector priest's tomb. Most were concerned with healing and protection. Three were liturgical in nature, one of which is generally seen as the archetype of dramatic, scripted ritual (P. Ramesseum B, commonly known as the Ramesseum Dramatic Papyrus). According to a recent interpretation, it concerns a ritual for the placement of a statue of King Senusret I (r. c. 1956–1911 BCE) in a temple shrine dedicated to his mortuary cult (Geisen 2012, pp. 238–245).

Its 139 columns are divided into 48 'scenes' (Geisen 2012, pp. 31 n. 69, 37–38). We can see each scene as a function. In scene 35 (Fig. 9.5), the lector priest brings a ceremonial *qeni*-garment to the prescribed location and—assuming the role of Osiris's son, Horus, speaking to his grandfather, Geb—recites the words, 'Embrace for me this father of mine who became weary' (translation after Geisen 2012, p. 140). An embrace between father and child was a generational transfer of life force and, if shared between king and prince, dominion, while 'weariness' was a common euphemism for death. The word for 'embrace' is likewise *qeni*. Through clever use of homonymy, the *qeni*-garment serves as an object-variable, whose presence in this dimension brings about Osiris's embrace in the virtual dimension when called. It is the anchor that tethers the ritual action performed 'here' to the divine action enacted 'there' (after Assmann 2001, p. 89).

The syntax of all scenes is standardised (I follow the model put forth in Geisen 2012, pp. 32–34). A new function is defined using the phrase 'It happened that' followed by a heading describing the function to be performed, which can be considered its name. This is followed by an informal comment introduced by a copula, 'It is', which serves only to remind the priest of the function's symbolic meaning and is ignored at runtime (cf. Assmann 2001, p. 92). The body of the function follows, comprising up to four statements exchanged between two divine parties. This is the portion of the code to be executed, by means of recitation, during the ritual. Finally, a deity is associated with one or more ritual objects that carry with them, by means of their names' phonetic similarity to words describing divine actions, a hidden meaning. Translated to modern code, scene 35 reads:

**Fig. 9.5** Object-oriented programming: a function of the lector's script (adapted from Sethe 1928, Pl. 20). Blue marks the function definition, grey the explanatory comment to be ignored, yellow the function's statements—one per column—and red the statements' respective object-variables. The remaining row declares the location within the temple where the function is to be called (C. G. Elkins)
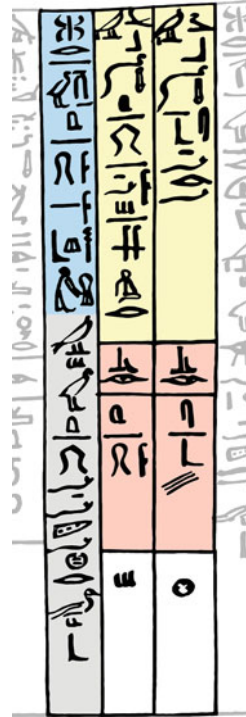


```
function lectorPriestBringsQeni () {
  /* It is Horus, who embraces his father whom he turns
     towards Geb. */

  const Osiris = { qeni: 'embrace', seneb: 'healthy' };

  Geb.listen();
  Horus.speak(Osiris.qeni +' for me this father of mine who
  became weary');
  Horus.speak('May my father indeed be '+ Osiris.seneb);
}
```

The second key in the Osiris object, *seneb*, is a type of ceremonial fringe (both the garment and fringe are articles of royal attire). It is also the word for 'healthy'.

An understanding of such frameworks and their hidden meanings constitutes the secret, divine knowledge that has so often been referenced above: 'It is efficient for a man on earth: a true remedy, (proven) a million times' (Amduat, second hour, introduction). The script was compiled with others into an extensive library, which was ultimately deposited in the lector's tomb. Not unlike his family of magicians, we use code in the diagnosis and treatment of diseases (e.g. Elenko et al. 2015; Stroud et al. 2019), and, like them, we also invoke it for our protection.

### 9.4.5   Security and Maintenance

The gods' names were actually epithets; one's true name was kept hidden to prevent its misuse in malicious spells. The digitised individual was one 'whose (own) mother does not know his name' (Pyramid Texts, spell 273). In a spell intended to heal the bite of a scorpion, the sun-god explains why he refuses to reveal his identity: 'I have concealed it in my belly from my children in order to prevent the use of a […] magician's force against me' (translated in Borghouts 1978, p. 52).

We too adopt secure virtual identities and epithetical usernames to prevent the misuse of our true identities in this world (e.g. Cotoc 2017, pp. 149–186). But our reputations can nevertheless be targeted in virtual communities by malevolent entities who, by means of their anonymity, face no real consequences. Major social networks, therefore, require the use of one's true name to maintain a climate of reciprocal vulnerability in the hope of heightened security (some governments consider this an inherently dangerous requirement in violation of one's right to virtual anonymity: e.g. Cellan-Jones 2012). In ancient Egypt, a damaged reputation was as lethal as a damaged image, as both resulted in detachment from the social substrate (Assmann 1984). In a New Kingdom text known from four sources contemporary with Hor (see Black 2002, p. 266), man is prescribed good behaviour, 'So that he may be rescued from the mouths of the rabble' (Instruction of Amenemope [1, 11]; translated in Black 2002, p. 542).

Increased security demands zones of increasingly restricted access. At the threshold to the virtual was a wall of fire granting access to the worthy, while subjecting the unworthy to a fiery doom: 'Open, sky's door! You sealed door, open a path for N on the blast of heat where the gods scoop water (to extinguish the fire)' (Pyramid Texts, spell 313; gloss after Zandee 1960, p. 134). In Middle Kingdom maps of the Underworld, the labyrinthine ways of land and water are separated by a fiery lake and subdivided by gates of fire. The names later given these gates emphasise this aspect: for example, 'Red-hot' (Book of Gates, eighth gate), 'Fiery One' (Book of the Dead, spell 146, fifth gate), 'Burning of Flames' (Book of the Dead, spell 146, eighth gate). The gates themselves are secured by guardians whose names served as passwords that must be properly recited before access may be granted: 'Make a way for me, for I know you, I know your name and I know the name of the god who guards you' (Book of the Dead, spell 146).

Beyond the walls of fire, those with insufficient protection in the form of spells faced being hacked to pieces by knife-wielding demons: 'My head is not chopped off; my neck is not cut off. My name is not known among the spirits' (Coffin Texts, spell 229; translated in Zandee 1960, pp. 149–150). Thus, the documents containing the necessary code and passwords were encrypted. Like the Underworld books, the dramatic script from the lector's library was written in retrograde orientation (see Fig. 9.5), with the columns to be read counter to the direction in which the hieroglyphs were written. In some texts, cryptographic writing was employed to obscure the meaning of words (e.g. Drioton 1953, pp. 359–361).

Despite similar precautions today, we yet feel exposed, aware that we might be targeted at any moment from beyond the threshold: our virtual existence hacked, our identities stolen, our devices 'infected by disruptive, contagious bugs' (Minkin 2016, p. 122; on 'cyberphobia', see Sandywell 2006). We purchase 'spells' to detect such intrusions and infections, but we fear the use of other potentially protective measures in our surveillance and manipulation (e.g. Lupton 2015, pp. 33–38). Such is the ambivalence of the intangible. Lacking are the guarantees of the physical world. Things we own in the virtual dimension are free of decay but hardly permanent. As with the temple, tomb or statue, access is contingent upon the physical maintenance of our hardware, its compatibility with our software and our software's compatibility with our data (e.g. Richards et al. 2013). Like the priest charged with the regular maintenance of a statue's cult, we invest endless hours of 'digital labour' (Minkin 2016, p. 122) into our digital worlds, nurturing our virtual selves. Like the labour force supported by the redistributed surplus of Hesyra's day, our labour builds the 'data pyramid' (e.g. Jennex 2017) of today: 'Where once it was the physical labour of workers that produced surplus value, now the intellectual labour of the masses has monetary value, constituting a new information economy in which thought has become reified, public and commodified' (Lupton 2015, p. 22).

We perceive a great deal of liberty throughout this process. Like Hor's youthful image and idealising biography, our virtual appearance is heavily idealised, from the images we post to the information we make public. For what is the maintenance of our virtual existence but a daily ritual perpetuating idealising self-presentation, thereby maximising offerings of 'Like' on the socially prescribed understanding that they will ultimately be reciprocated (e.g. Lupton 2015, pp. 175–180).

## 9.5  Conclusion

> On this view, anthropological analysis has little to do with trying to determine how other people think about the world. It has to do with how we must think in order to conceive a world the way they do (Henare et al. 2007, p. 15).

The epigraph with which this chapter began was employed somewhat misleadingly. Its Victorian author attributed the 'obscurity' in our understanding of the ancient world to the relative simplicity of ancient thought. However, investigations into the mechanics of ancient belief systems reveal inherently complex and elaborately reasoned approaches to understanding and interacting with the world. Digitisation is but the latest deconstructive iteration in our age-old quest to transcend nature's limitations: the pinnacle of an already ancient digital tradition.

As a virtual dimension again grows ubiquitous in every aspect of our lives, our future promises to bring us closer to our past by demanding increasingly intimate interactions with the intangible. The simultaneously transcendent and transient nature of the digital offers a level of authenticity in engaging with the past of which the physical alone is incapable. We experience not only the transcendence of a non-physical

dimension but also the anxiety caused by exposure to invisible dangers, and we build virtual walls to keep the fire at bay. Recontextualising our digital world in these terms can help us better understand and indeed experience past realities. Barring considerable advances in Complex Systems Science, the nuances of ancient behaviour shall remain largely lost to us, but we can scan the landscape of commonalities to generate a model of related experiences. We can then '"listen", sympathetically, with self-awareness and self-effacement, and without imposing our own voices more than is appropriate for a dialogue' (Parkinson 2002, p. 290).

In Hor's Egypt, two- and three-dimensional images were the technology of immortality. They thrived in a world in which coded scripts granted inanimate hardware function and meaning. And, with the deconstructive and retrospective lenses worn by a cultural revolution, the answers to the future were found in the works of the past. 'People derive identity from shared remembrance—from social memory—which in turn provides them with an image of their past and a design for their future' (Alcock 2002, p. 1). Perhaps that design was the digital dimension all along: a self-fulfilling prophecy realising a dimension we could always imagine but never see.

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