The Museum and the Computational Imaging Technology of Mobile Phones.

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Introduction

Ideas about photography's relationship with current technology are changing. The urgencies associated with the medium at the start of the twenty-first century have evolved into new languages and archives, yet a seismic shift continues as the medium expands into new territories. This shift is intertwined with the infrastructures of the digitally networked world and the evolution of advanced computation, now including AI forms of image making. This text and associated practice-based research argues that recognising the conceptual frameworks for understanding current imaging processes is crucial in all areas of visual culture. Therefore, it is necessary to find appropriate methodologies, case studies, and contexts to explore how imaging technology affects our perception through computational processes. This project aims to suggest strategies for addressing these concerns through practice-based and phenomenological engagement, with a particular focus on museums as they exist in western cities, specifically within what Tony Bennett[1] might reference as the industrial museum exhibitionary complex of central London.

In the context of this project, the photographic image is questioned for its implicit role in perpetuating imperial dominance regarding power structures, languages, and knowledge claims in its computational form within the museum. Ruha Benjamin's categorisation of the *New Jim Code* encapsulates this problem, as it is enacted through "the employment of new technologies that reflect and reproduce existing inequities but that are promoted and perceived as more objective and progressive than the discriminatory systems of a previous era."[2] The inherent contentions within knowledge claims—examined through the use of new forms of digital imaging processes in museums, the contexts of display, and the interpretative languages applied to artefacts—are similarly evident in emerging forms of digital imaging technology in consumer-level mobile phone technology.

Throughout the project it is emphasised that there are fractures in conceptualising computational forms of imaging created through algorithmic process in ways historically associated with photography. This is particularly evident in concerns about empirical

[1] Tony Bennett, *The Birth of the Museum: History, Theory, Politics* (London: Routledge, 1995). 75
[2] Ruha Benjamin, *Race After Technology: Abolitionist Tools for the New Jim Code* (Cambridge: Polity Press, 2019). 5-6

evidence and the replication of likeness and similitude in representational form, especially with technologies such as 3D photogrammetry and Light Detection and Ranging (LiDAR) which are created through computed sensor inputs. These ruptures become more apparent as we develop an awareness of how they interlock with other forms of infrastructure beyond the analysis of visual practice and concepts of representation.

As Asko Lehmuskallio points out,[3] when contemporary imaging apparatus is referenced, it often pertains to technologies that employ a camera or other device to capture electromagnetic sense data from the world. This input is then processed through algorithmic software for specific purposes, which may extend beyond making images for human viewing. Nonetheless, these current forms are still often considered in relation to traditional image capture technologies of the nineteenth and twentieth centuries. While the conceptualisation of the medium may still involve the idea of *index*[4] and *presence,*[5] recent forms of photographic technology are now also inextricably linked to the visualisation of sensor input, algorithmic processes, and what Sy Taffel refers to as computational photography[6]—forms of mediation which are referenced in this thesis as being computational images. However, these latter concerns are dominated by the former, by what the image represents and purports to show. Even though we are aware of iterations such as deepfakes and have been taught to read images with scepticism, new forms of digital images are not often viewed as part of a computational infrastructure, which is as important as, if not more than, its relation to the thing pictured through a screen interface.

The project explores the potential of thinking with recent imaging technology to challenge institutional museum spaces' claims to the universal or encyclopaedic nature of their collections. The driving force of practice-research is that these assertions of universality are problematic, as they are defined by specific academic fields within set limitations and positions of knowledge, both in the context of the phenomenological experience of museum buildings and on the internet. These claims need to be contested. In this context, practice-based research aims to explore new ways of questioning how various technological

[3] Asko Lehmuskallio, "The Camera as a Sensor," in *Digital Photography and Everyday Life*, ed. Edgar Gómez Cruz and Asko Lehmuskallio (New York: Routledge, 2016), 243–66.
[4] Rosalind Krauss, "Notes on the Index: Seventies Art in America," *October* 3 (1977): 68–81.
[5] André Bazin, "The Ontology of the Photographic Image," *Film Quarterly* 13, no. 4 (1960): 4–9.
[6] Sy Taffel, "Google's Lens: Computational Photography and Platform Capitalism," *Media, Culture & Society* 42, no. 7–8 (2020): 1210–26.

processes of visualisation are utilised in exhibition display systems. It focuses particularly on how the production and exhibition of algorithmically generated images, created from sense-data inputs, reinforce the museum's construction of knowledge and power. The solution introduced throughout the thesis is the *Museum of Computational Image Artefacts (MoCIA)*, situated on the online platform *New Art City*. This platform provides a navigable 3D environment where the practice outputs are placed relationally in a simulacrum of a museum space.

On a practical level, creating the museum on New Art City serves several purposes. The practice engagement, focused on constructing the 3D imaging capabilities of mobile devices, created a personal archive of scanned materials, like a photo album app. However, there are few networks available for others to view these experiments easily. While Microsoft Word and Adobe Acrobat can contain 3D files, their presentation is less than ideal in terms of usability and requires considerable computing capacity. Online repositories of 3D images, such as TurboSquid and SketchFab[7] act as networks to browse components for gaming construction or 3D animations. They do not consider how these 3D images act or function, especially in the incomplete states typical of their creation through mobile apps during this research process, where on these platforms they are simply perceived as faulty, incomplete, or less than ideal for their intended purposes as digital assets meant to replicate other forms of materiality in exacting detail.

Creating the navigable digital space aims to propose a phenomenological experience that exists between various referential and layered states. The choice of this platform over other forms of virtual exhibition sites is important because of New Art City's core ideologies. Their aim as a company is to develop an accessible toolkit for building virtual installations, prioritising those "disadvantaged by structural injustice."[8] New Art City's efforts to foreground issues of access and foster inclusive and redistributive communities[9] resonates

[7] SketchFab, originally a peer-to-peer sharing site, is now owned by Epic Games, which also designs Unity, the largest mass-consumed game creation platform. This relationship creates a feedback loop where culturally specific Western content from SketchFab is used in Unity games, leading to a lack of diverse 3D assets and culturally varied artifacts. Consequently, game aesthetics are shaped by these culturally determined factors, influenced by access to digital tools and knowledge

[8] New Art City, "Mission & Values," 2024.

[9] There is an active attempt within their governance to ensure that their tools are accessible, including testing and working with the disabled community. Furthermore, they state their intention as "transferring knowledge,

with the practice-research's positionality, as the tools and methods required for the work are both widely available and non-specialist.

The intention of this output is to challenge the notion of computational apparatus and algorithmically created images as passive, transparent forms of picture-making that represent a direct memetic reproduction of the world. This engagement critically examines the institutional use of computational technologies as part of explanatory narratives in museum display systems. Practice serves as the driving force of this project, particularly through direct engagement with specific museum spaces and an experimental process to determine effective modalities of engagement. A key focus of the work has become examining how computational images mediate specific concerns related to the museum.

The thesis is designed as being an experimental process, with the output, the MoCIA, serving as an iteration of how this format could be developed in future work. A key aspect of the potential afforded by the online virtual space is the distribution of practice among multiple interlocutors that are in different global locations. In this instance, the rooms of the MoCIA have been shaped by a series of practice-based workshop outputs, highlighting significant potential to expand the methodologies initiated in this project to other forms of engagement. The project presented in the context of this practice-based research represents a process of scaffolding, where the onto-epistemology of both the conditions of display and the computational image processes are explored. The concept is that visitors, using mobile devices, can create archives and repositories of personal experiences, which can then find a second life within this type of virtual environment. At the same time, processes of engaging with institutional spaces through new forms of imaging technology are framed as part of a broader process of conditioning, shaped by both the museum and the computational operations of the devices used to view these spaces.

The focus of this engagement is on how current forms of computational imaging available on mobile devices are understood. These apparatuses utilise sensor inputs to create images that are mediated by computation after the capture process is complete. The practice

space, money, and visibility from those who have it to those who don't." New Art City, "Mission & Values," 2024.

engagement explicitly incorporates video, photographic stills, LiDAR scans, Gaussian Splats, photogrammetric images, and augmented reality (AR)—technologies that have only recently become available on mobile phones in their current form.[10] The scope of the engagement also encompasses the analysis of high-resolution medical imaging technology, particularly the museum's use of Computed Tomography (CT) scans. However, the primary emphasis lies on the capture of electromagnetic sensor data from specific environments using the sensor-based capabilities of mobile phones. This focus contrasts with the devices' ability to produce computer-generated imagery (CGI), commonly associated with the green screens of contemporary cinema and often described as digital, computational, or algorithmic.

However, in the later parts of the thesis and throughout the MoCIA practice engagements, this approach is expanded to include new forms of text-to-image, text-to-video, and text-to-3D file imaging processes generated via advanced forms of computation considered under the umbrella term AI. The emergence of text-to-image AI processes, which mimic image forms derived from sensory data, such as digital photographs, while incorporating the added complexity of sourcing data from images scraped from the web, raises questions about whether this definition fully captures where the conceptualisation of practice outputs ultimately reside. In the coda of the thesis, the original parameters of the engagement outlined here are revisited, and starting points for further research are highlighted. This is particularly relevant to understanding these more recent computational image types, which do not rely on the same sensor input as those discussed in this text.

However, as they are still scraped from photographic images and other forms of online visual media, a vicarious relationship to sensor input remains present — albeit as a minimal trace. This is coupled with the significant issue that most images produced today are designed for machine-to-machine communication. While there are always exceptions, this does not invalidate the original positioning—most of the work of practice-based research utilises technologies with sensors that extract data from their immediate environment, which

[10] For example the first LiDAR scanner was introduced on the iPhone 12 in 2020 see Apple, "Apple Introduces iPhone 12 Pro and iPhone 12 Pro Max with 5G," *Apple Newsroom*, October 13, 2020, https://www.apple.com/uk/newsroom/2020/10/apple-introduces-iphone-12-pro-and-iphone-12-pro-max-with-5g/.

is then transformed by algorithmic computational processes into images for human perception. The definitions provided are sufficient for distinguishing these new forms of imaging from the conceptual and material practices associated with the 19th to mid-20th centuries, which form the primary focus of this work.

The specific focus of this practice-based research is the imaging capabilities of smartphones, or what I term mobile phones—small personal devices that have become ubiquitous in global culture and central to much of the world's image-making. Throughout this text, I use terms such as 'computational image,' 'algorithmic image,' or 'digital image' to describe visual outputs created through technologies that capture electromagnetic sensory data via cameras or other devices. This data is processed through algorithmic software, often serving purposes beyond creating images solely for human visual consumption, yet these outputs remain connected to traditional image-capture methods like photography.

Where a specific imaging process is being discussed, it is explicitly identified, such as in the case of photogrammetry or 3D video created through LiDAR. However, to conceptually address these digital forms of imaging process, I also use a range of terminologies that often reflect broader concerns regarding their relationship to photographic theories. My exploration of this area stems from my professional background as a practitioner, researcher, and educator, alongside my engagement with ideas that examines the specificities of these imaging technologies. Computation is a central concept throughout the text, with 'computational image' often used as shorthand for the application of mobile phone technologies to produce 'images generated from electromagnetic sensor data via a technical apparatus, transformed by algorithmic processes into visual outputs viewed through a software interface.' While this definition is accurate, it is unwieldy for repeated use within the text.

In specific instances, particularly relating to Heidy Geismar's work with a Māori cloak,[11] the term 'post-photographic' is used alongside these other terminologies. Geismar's perspective aligns with mine in that she explores the challenges of understanding these types of computational images through the lexicon of photography. It is important to

[11] Haidy Geismar, "Post-Photographic Presences," Photographies 8, no. 3 (2015): 301–19.

highlight that I interpret the prefix 'post' in this context not as meaning 'after,' but as signifying a rupture or fracture in the conceptualisation of the photographic[12] and related processes. It indicates an attempt to consider how mediation transitions towards other entangled forms of understanding in recent usage and technological development. This is specifically understood in relation to Jean-François Lyotard's idea that the 'post' in 'postmodernism' represents a fracture in the modern, where the postmodern is defined as "an incredulity towards metanarratives."[13]

I empathise with the usage of the term in the instance of Geismar's work but have chosen not to adopt it consistently in the thesis, primarily due to its polemic associations with other 'post-' movements that align with specific knowledge claims and intellectual positions—such as post-internet,[14] post-digital,[15] and post-cinema.[16] These terms are used to provide new forms of reflection on emerging practices, experiences, and enactments of technology, in relation to the theories that have historically conceptualised them. While this concern is present and serves as a driving force in this thesis, the broader focus lies in the capacity of computational imaging processes, enabled by consumer-level technology, to intervene in, comment on, or position knowledge claims made by the museum. This focus is particularly directed at the museum's use of similar technological imaging practices within onto-epistemological terms, rather than aiming for conceptual alignment with a broader intellectual movement.

In situating this project, imaging processes are still considered through the positioning of the body in space and time and as a linguistic message pointing towards the visual frame of the image. It is useful to read computational forms of visualisation related to photography relationally to the extent that images become illustrations of anthropological,

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[12] For an expanded viewpoint and debates between 'photography' and 'photographic' as pieces of terminology, see first Rosalind Krauss, "The Photographic Conditions of Surrealism," *October* 19 (1981): 3–34, then Craig Owens, *Beyond Recognition*, ed. Scott Bryson et al. (Berkeley: University of California Press, 1992), 278 and Olivier Richon, "Thinking Things," in *Where Is the Photograph?*, ed. David Green (Brighton: Photoworks, 2003), 71–79.

[13] Jean-François Lyotard, *The Postmodern Condition*, trans. Geoff Bennington and Brian Massumi (Minneapolis: University of Minnesota Press, 1984), xxiv

[14] For an exploration of this term from a curatorial perspective, see Orit Gat's *'The Digital Culture Odyssey of Post-Internet Art,' Frieze*, November 7, 2023, https://www.frieze.com/article/post-internet-art-239.

[15] For example, see Ryan Bishop, Kristoffer Gansing, Jussi Parikka, and Elvia Wilk, *Across & Beyond: A Transmediale Reader on Post-Digital Practices, Concepts, and Institutions* (Berlin: Sternberg Press, 2020).

[16] For a positioning of this concept as distinct from 20th-century forms of moving image, see Shane Denson and Julia Leyda, eds., *Post-Cinema: Theorizing 21st-Century Film* (Falmer: REFRAME Books, 2016)

archaeological, social, political, or visual theory. However, it is also necessary to foreground theories of computational media and broader considerations of the onto-epistemology of technology as being an operative assemblage in new algorithmic forms of imagining presented in the museum.

The project draws upon the expanding body of research that examines the impact of computational digital processes, pushing the limits of current thinking about these mediations and questioning some historic perspective of photography, particularly regarding the operativity of computation. This is an urgent concern because of the increasingly agential role of technological apparatus in determining how computational imaging processes are created. For example, Benjamin Bratton states that the understanding of the image in the context of algorithmic software processes is very different from the understanding of the image through human eyes, as there is no necessity for the image data to be pictured as such. An "algorithm programmed to discern a particular pattern or anomaly can 'see' it directly in the data itself. It does not necessarily need that data to be projected, as if for a mammal, and then re-seen and re-interpreted back into code."[17]

Similarly, in *Invisible Images: Your Pictures are Looking at You,* Trevor Paglen argues that the current shift towards machine-to-machine communication represents a critical departure from the tradition of human-centric visual culture. He posits that "the overwhelming majority of images are now made by machines for other machines, with humans rarely in the loop."[18] This insight provides a framework for understanding practices that engage with new forms of digital image, which have become part of an ecology increasingly governed by automated systems, where their connection to human perception is diminished or entirely severed. Computational forms of imaging related to the photograph are characterised as networked,[19] operational,[20] and poor,[21] playing instrumental roles in the

[17] Benjamin H. Bratton, *The Stack: On Software and Sovereignty* (Cambridge, MA: MIT Press, 2016).
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[18] Trevor Paglen, "Invisible Images (Your Pictures Are Looking at You)," *The New Inquiry*, December 8, 2016.
[19] Daniel Rubinstein and Katrina Sluis, "A Life More Photographic: Mapping the Networked Image," *Photographies* 1, no. 1 (2008): 9–28.
[20] Trevor Paglen, "Operational Images," *e-flux Journal* 59 (2014).
[21] Hito Steyerl, "In Defense of the Poor Image," *e-flux Journal* 10 (2009).

age of surveillance capitalism[22] and potentially existing solely for machine use.[23] These digital imaging processes are understood through discussions of agency, power structures, geologies, and enmeshed assemblages of meaning, as well as intersectional phenomenological positionalities.

The project posits that practices utilising new forms of imaging technologies are intrinsically linked not only to conditions of subjugation and control historically exerted by imperial powers but also to the state of computational infrastructure. This necessitates a redefinition and re-conceptualisation when referencing images designed to represent different forms of materiality to be viewed on screens, as well as an acknowledgment of their broader implications in their networked form. The text addresses this issue by advocating for attentive behaviours and exploring the positionality and affordances offered to visitors within the museum space.

The term visitor is preferred over words such as spectator, clients, user, public, perceiver, participant, audience, or other descriptors of those who experience the museum. The choice is deliberate due to the term's implications. It suggests a need for care, as it implies being a guest who requires attention. Additionally, it carries the connotation of having authorisation or permission to be present, as in the rights of visitation. In another context, it refers to someone who resolves disputes. The term's linguistic roots in French and early English encompass meanings related to comfort or benefit, as well as to inspect, examine, or even afflict—such as in the visitation of sickness—which resonate with the intentions of this project.

The research thus encourages the visitor, through practice-based approaches, to reflect on both the conditions of the museum and the computational aspects of recent imaging process through engagement with the space, particularly when viewed through the lens of the screen. Screens are intrinsically linked with physical extraction in a mining context and the violence these processes entail but also to a mediated interface between body and world. These factors contribute to a broader understanding of the infrastructure of the tools through which we now see. This is particularly relevant when considering the assemblage of

[22] Shoshana Zuboff, *The Age of Surveillance Capitalism* (New York: PublicAffairs, 2019).
[23] Trevor Paglen, "Invisible Images (Your Pictures Are Looking at You)," *The New Inquiry*, December 8, 2016.

disparate elements, both literally, in terms of the mineral extraction required for the technology, and metaphorically, in terms of the content depicted within the frame of the image.

In the project, computational images are considered complex, resistant to definition, and inherently difficult to trace, leaving gaps and inconsistencies in the attempt. However, it is certain that there has always been a need to draw on what Achille Mbembe calls "other archives"[24] to attempt the process. This necessity arises to account for the image within broader assemblages, where the image and technological apparatus are considered agential and operative, but also to address historical and ongoing inequities regarding what is considered knowledge and what resides outside these refined definitions. There is a concern that if the institution remains unchanged, existing inequities will persist. Additionally, it is crucial to shift the debates in which the new forms of computational imaging resides in Western academia and to question the meanings created with and through this form of mediation for the same reasons. There is much to unlearn, [25] and the museum serves as an ideal setting to explore these concerns.

Chapter 01: Unlearning the Imperial Museum Space: Onto-epistemology of Computational Imaging Processes and Methods of Practice-research

The first chapter of the thesis is grounded in the phenomenological experience of the universal museum space, specifically the British Museum in London. By examining how the museum visitor's gaze is controlled by the institution and considering the physical documentation and experience of the museum, it becomes evident that current display systems are heavily filtered through the lens of technological apparatus. The argument aims to problematise the way technologies are often presented to visitors as transparent, self-explanatory, or ubiquitous, while museums use these technologies to establish and reinforce specific knowledge claims within defined academic parameters. Foregrounded in the argument of the chapter is the positionality of the gaze as a layered and constructed set of relations.

[24] Achille Mbembe, "The Power of the Archive and Its Limits," in *Refiguring the Archive*, ed. Carolyn Hamilton et al. (Dordrecht: Kluwer, 2002), 19–26.
[25] Ariella Aïsha Azoulay, *Potential History: Unlearning Imperialism* (London: Verso, 2019).

This chapter references and discusses historical attempts to disrupt hegemonic viewpoints through lens-based media, focusing on the use of 360-degree panning shots in Laura Mulvey and Peter Wollen's experimental film *Riddles of the Sphinx* (1977). It also explores Ariella Aïsha Azoulay's analysis in *Potential History: Unlearning Imperialism* (2019), examining the positionality inherent in acts of viewing within the museum space and the necessity of active attention in this mode of inhabitation. The potential of new forms of digital imaging apparatus as active agents in shaping knowledge claims within the museum space is asserted. Consideration is given to the display and creation of these new forms of computational imaging and the constructed positionality of the visitor in this space, in relation to the onto-epistemology of power structures and surveillance highlighted through practice-based research.

Chapter 02: Enactment of Alternative Archives and Tactics for Critical Positioning in the Museum Space

The way that *The Violence of a Civilization Without Secrets*, a 2017 video work by Jackson Polys, Adam, and Zack Khalil, addresses the display of human remains, notions of indigeneity, hierarchies of knowledge, the museum space, and scientific taxonomic methodologies resonates with the issues of museum display discussed in Chapter 01. The film explores wider issues surrounding scientific knowledge through the entangled positionality of the forensic anthropological gaze and the way media outlets categorise ideas of race, belonging, and indigeneity. From this perspective, Polys and Khalil's consideration of conceptual interlocutors (referenced in the video) and how these form certain critical positions become important to analyse. These mediated references, in the context of practice, relate to wider truth claims and perceptions of what constitutes appropriate forms of knowledge, counterbalancing my approach to the Museum. The chapter's practice-based research aims to position the work within a deliberate conceptual framework, particularly regarding the conceptualisation of the mobile phone as a computational imaging apparatus. It explores whether intervention in the museum through this lens can offer alternate readings beyond those highlighted by the institution and beyond a specific understanding of post-modern pastiche and multiplicity.

The chapter highlights the performance or enactment of a gaze through mobile technology as being reflective and refractive. Through this conceptual lens, observational studies of the museum completed through engagement with museum's "object trails"[26] and completion of photogrammetric images, presented in the *Enlightenment Room* of the MoCIA, catalyse a shift from viewing the museum visitor as a passive subject to an agential and operative one. Assemblages of relations—comprising the system of museum display, the human interface with mobile technology, and materiality of the devise—are partial elements through which new understandings of computational images in this space can be re-conceptualised. Achille Mbembe's work, particularly his notions of the necropolitical in relation to the museum space, becomes a critical tool for thinking about computational imaging technologies and apparatus used to perpetuate imperial understandings of the museum. Chapter 02 of the thesis explores how the museum's layout controls and positions the visitor in a heterotopic space, where multiple places, times, and forms of knowledge are incongruously yet physically proximate under the guise of universality.

Engaging visitors with imaging processes on mobile phones can foreground situated knowledge and narratives outside the museum, offering new perspectives despite institutional resistance to change. However, the restitution of the past and the museum's message, whatever it may be, is now subsumed under the conditions of computation, exemplified by the attentiveness that mobile technologies demand. This does not diminish the importance of restitution, repatriation of objects, and connections to collections through embodied experiences with artifacts behind glass screens and display cabinets. Instead, it complicates debates surrounding how digital artifacts act, the governance they hold, and what Mbembe terms the brutalism[27] we are subjected to through their conceptualisation.

Chapter 03: Computational Imaging, Digital Repatriation, and Display of Volumetric Computational Images in the Universal Museum

Chapter 03 focuses on how the institutional museum space utilises computational imaging technologies. A case study in this chapter is the Early Egyptian Gallery of the British

[26] British Museum, Object Trails, n.d.
[27] Achille Mbembe, *Brutalism*, trans. Laurent Dubois (Durham, NC: Duke University Press, 2024), xii

Museum, specifically the 'interactive visualization display' of a 5000-year-old predynastic natural mummy known as *Gebelein Man A*. Described by the exhibit's creators (RISE Interactive) as a 'Virtual autopsy' or 'Inside Explorer,' the display consists of an annotated, graphically rendered Computed Tomography (CT) scan, which museum users interact with through a large touch screen placed adjacent to the physical remains of the body.

Building on the arguments of Chapters 01 and 02, practice-research engagement with this site presented in the *Docile Bodies Room* of the MoCIA explores how medical technologies in the context of the universal museum are used to form knowledge claims through display systems. The positionality of the 'Virtual Autopsy' not only refers to the historical condition of predynastic mummies and the display of these human remains but also involves engagement with the body as a data set. This is explored in practice through the experience of stripping back virtual layers of skin, tissue, and bone visualised through computational image data in the museum space.

The chapter particularly highlights the relationship between the human remains and surrounding artifacts with the presentation of 3D images in the virtual autopsy; the touch screen; the ways instructions of use are conveyed; and how interactions with the 'Inside Explorer' are presented to other museum users in the gallery. This discussion serves as a way to reflect on the positionality of computational forms of imaging mediation, both within this space and as part of broader assemblages of use and relationality. The affective register of the experience is interlinked with the attentive conditions demanded by interactive displays. The use of the data serves as a functionary of wider research conducted by the museum towards specific academic disciplines and readings of historical context, but also reflects the narrowness of debate and imperial principles that, as Ariella Aïsha Azoulay states, underpin interpretation of objects in that, "objects and documents are not what we have been socialized and trained to see: stand-alone artifacts whose inscribed content exists for experts to interpret."[28]

These relations are contextualised within debates surrounding the onto-epistemologies emerging from the discipline of digital anthropology, particularly the work of Heidy Geismar at UCL. Alternate understandings of the potentiality of 3D scan data are proposed outside

[28] Azoulay, *Potential History*, 2019, 30

specific frameworks of photographic theorisation, moving beyond narratives that focus on the extent to which the algorithmically determined mediation of 3D scan data resembles the object scanned. Practice-research in this discussion highlights the importance and possibilities of negotiating between various differing investments in debates surrounding the computational forms of imaging in the context of Western academia. From this point, the exploration of algorithmically determined image practice is used to push initial understandings related to the data visualization of the body created through CT scan technology, framed through Azoulay's notion of unlearning imperialism.[29]

Chapter 04: Resistant Visitor, Consumer Level Computational Imaging Apparatus, and Mobile Reality Capture Process.

In Chapter 04, the argument that computational imaging technologies can serve as a site of creative resistance to the hegemonic and universal claims of museums is furthered through reference to Jan Nikolai Nelles and Nora Al-Badri's 2016 work, *The Other Nefertiti*. In this project, the artists ostensibly created high-resolution scan data of the painted stucco-coated limestone bust of Nefertiti (c.1345 BCE), against the regulations of the Neues Museum Berlin. They released this data online at the *Chaos Communication Congress* in Berlin in 2016. Simultaneously, the scan was converted into a 3D print and brought back to Egypt, where it was exhibited at the *Something Else Off Biennale* in 2016 in Cairo, as an act of symbolic repatriation.

The chapter concludes with a discussion of this act in relation to the potential agency of 3D imaging processes used in or directed towards museums. By decontextualizing computational imaging processes from the museum space into alternate contexts, outside institutional dictate, the agency residing with the museum as the gatekeeper of meaning can be questioned. However, the chapter also posits that even if interventions reside outside the specific power structures of the museum, they are not necessarily liberated from ideological constraints. Thus, the focus of the project in further chapters transitions from systems of representation in specific museum sites to new contexts and positionalities.

[29] Azoulay, *Potential History*, 2019, 13

Chapter 04 concludes with the possibility of expanding embodied practice to interact with the museum as an agential force. In this context, the creation of computational images, which require embodied performance—such as in digital forms of photogrammetry—is employed to explore ways of understanding imaging technologies generated through data sensor input, particularly in relation to the conditions of the body within systems of museum display. Referring to the practice-based workshop, *3D Digital Objects and the Postcolonial Museum Space*, as a starting point for different ways of engaging with museum collections through computational imagining, practice-research involving mobile technology is posited as an active and critical process. The gaze present in the museum space through and with mobile technology is considered in relation to ideas of assemblage, situatedness, and entangled embodiment. These concepts offer museum visitors a way to understand how computational technology is affective, rather than merely a transparent mediator of museum rhetoric.

At the end of Chapter 04, the work of N. Katherine Hayles[30] is introduced to further underpin conceptually how these types of algorithmic imaging technologies could be understood. New forms of imaging technology are considered an assemblage of different types of cognition, with the computational algorithmic element being a non-conscious form where meaning is irrelevant to its functioning. This perspective may offer a new understanding of how these processes operate within intentional spaces of use in the museum.

The positioning of computational images implies that theorising the combination of various cognitive processes, including algorithms, creates a form of understanding fundamentally different from human interpretation. This needs attention in broader processes designed to consider their agency. It suggests that the way algorithms process information and generate outcomes does not align with human notions of meaning, as computation does not function through concepts of consciousness or subjective embodied experience in the way humans do. Therefore, applying human concepts of meaning to understand black-boxed algorithmic processes is problematic, as these processes operate in a fundamentally different manner.

[30] N. Katherine Hayles, *Unthought* (Chicago: University of Chicago Press, 2017).

There is an active process of choice enacted in the production of images, even if it is between a 1 and a 0. The distinction between photography and computational forms of imaging in this context is that photography in its historic form, in Hayles' terms, constitutes the material elements of a cognitive assemblage, whereas algorithmically determined forms of image creation consists of nonconscious agents of a cognitive assemblage. A date often ascribed to the start of this conceptualisation is 1957, when the first digital image was created using a rotating-drum scanner invented by National Institute of Standards and Technology (NIST). However, like the arguments for certain traits of human exceptionalism or the start of the Anthropocene, this date could be contested. What is important is that new iterations of technologically determined images exist in multiple forms, across different platforms and positionalities.

Chapter 05: The Brutalism of Museums: Exploring Institutional Collections on Web-Based Platforms, COVID Lockdown, and with Augmented Reality (AR) Technology

While the problem that practice-research seeks to address in earlier chapters is the seemingly transparent action of imagining the museum through computational technologies, this last chapter considers how the museum is extending its boundaries by engaging with other knowledge-creating infrastructures. The focus of the text shifts from the experience of the museum space as an exhibition display to considering how new imaging technologies are used in creating institutional identity beyond the walls of the specific buildings in which collections are presented.

The use of computational imaging technologies via websites and mobile apps is now a ubiquitous part of gallery experiences and has become even more prevalent in museum rhetoric and use since the closures due to COVID-19 lockdowns in 2020 and 2021. This chapter explores the borders between different forms of interaction through imaging technologies and examines to what extent the museum is considered both present and absent to the user through these mediations. Concerns surrounding how exchanges, actions, and experiences are envisaged or imposed on the user become points of contestation. The partial experience of museum collections in this context is necessarily related to the larger repository of information that the internet represents.

Through reference to the work conducted by the Milan-based company *Factum Arte*, and particularly the conceptualisations of the aura of digital materiality,[31] future usages of imaging technologies are anticipated to become ever more exacting and accurate forms of replication of cultural artifacts. However, the concept of repatriating digital objects from Western Museum spaces to invested communities, perceived as achievable using computational image processing, remains contested if the conditions of power and the top-down approach of cultural heritage companies and institutions continue to drive these projects.

The chapter contrasts these ideas by considering practice-based research conducted through Augmented Reality (AR), which offers the potential to experience photorealistic 3D images superimposed onto live camera feeds of mobile devices. Through the screen interface, digital artifacts, downloaded or scanned via photogrammetric mobile apps, can be placed onto kitchen tables and bathroom floors in one's own home. Works associated with this concept are displayed in the *Remote Access Room* of the MoCIA. Consequently, while engagement with the museum space on the internet highlights the limitations of institutional knowledge claims and their reach, AR technology becomes intertwined with ideas of place-making. This creates a strange fissure between the embodied phenomenological experience of space and the imaginative or fictive understanding of what the site might be like in a different geographical context, experienced through the screen of a mobile device. These relationships reveal the disjunction between the conditions of museal display and the re-contextualisation of digital 3D artifacts.

This fissure emphasises issues raised by the notions of digital repatriation discussed in Chapters 02 and 03, as processes inherent in the use of AR technology constitute forms of knowledge creation in themselves. The role of the 3D object in relation to ideas of mimesis and replication is subverted by re-contextualisation, as the function of the artifact is entangled with the site in which it is re-positioned through the screen. Scenes of lived experience mediated through the interface are also linked to broader operative imaging technologies, intertwined with the autonomous perspectives of users, shaped by these

[31] Adam Lowe, Guendalina Damone, and Carlos Bayod Lucini, eds., *The Materiality of the Aura: New Technologies for Preservation* (Madrid: Factum Arte, 2020), available at: https://www.factum-arte.com/resources/files/ff/publications_PDF/the_aura_in_the_age_of_digital_materiality_factum_foundation_2020_web.pdf.

collaged or layered computational images, often referred to as mixed reality.[32] These concerns are explored with reference to the gaming app Pokémon Go and practice engagement with this platform presented in the *Courtyard* of the MoCIA.

Camille Henrot's video installation *Grosse Fatigue,* (2013) further illustrates this issue by contrasting the internet as a knowledge repository with the taxonomic conservation in museum spaces and personal research methodologies. The work utilises the languages and actions of internet search processes and experiences, narrating global creation myths alongside research conducted at the Smithsonian Institution, where Henrot was a resident artist in 2012. The film's aesthetic mimics a computer desktop, with the narrative unfolding through the opening and closing of various browser windows. This approach connects the viewer to the diverse forms of attention in internet browsing, highlighting the museum's place within a broader assemblage of references through which knowledge of the space is perceived.

The chapter is informed by the work of Achille Mbembe's writing on *Brutalism*,[33] which consider the enmeshed and interwoven relationality between things under which we all are becoming subject. These ideas form the basis of engagement as the mobile phone as material apparatus is explored through practice engagement with historic displays in the *Natural History Museum*, London, presented in the *Mineral Room* of the MoCIA. By working with the display system in this context—within a gallery that maintains the original oak display cabinets from 1881 and houses a large collection of mineral artifacts gathered at the height of the British imperial project—the material composition of mobile devices is presented as entangled with both current and historic extractive global colonial processes.

So, the engagement with image making, rather than being considered exclusively in relation to the visualisation produced, is also thought of in relation to historic taxonomic systems of display in an imperialist museum space. Furthermore, the difference between the utopian promise of imaging technology—towards better clarity, greater resolution, and

[32] See Jay David Bolter, Maria Engberg, and Blair MacIntyre, *Reality Media: Augmented and Virtual Reality* (Cambridge, MA: MIT Press, 2021).
[33] Mbembe, *Brutalism*, 2024, xii.

more exacting precision—is underscored by its relation to violent extractive mining processes and the problem of universal forms of categorisation.

Practice-research for this engagement was initiated through a series of workshop projects entitled *Camera Phone Recording its Own Mineral Condition*, where participants were encouraged to find links between the material displayed in the gallery and the process of documentation through their mobile phone screens. Through image-making apparatus, practice-research begins to relate mining practices, geological categorisation, and historic and ongoing imperial collection to aesthetic and embodied experiences with processes of extractive computation. The implications of these connections are explored regarding the potential impact of digital imaging technologies on knowledge production and the minerality of mobile devices, as referenced through taxonomic display.

Chapter 01:

Unlearning the imperial museum space: Onto-epistemology of computational imaging processes and methods of practice-research.

Unwrapping and unlearning the agency of museum artefacts.

By discussing the importance of the materiality and ritualistic processes of wrapping in ancient Egyptian mummification, Christina Riggs considers the problem of archaeological interpretation to be that often the "preoccupation with getting through the wrapping has discounted the significance of the wrapping itself."[34] Riggs contrasts acts of conservation occurring behind the scenes of the museum space, where artefacts are wrapped with diligence, attention, and care, with the violent removal of linen and other materials placed on statues and religious objects from Ancient Egyptian tombs during colonial acquisitions of the late 19th and early 20th century for the purpose of making objects coherent for museum display. Through this comparison she points out that "sanctity depends on its integrity as a museum object, which is predicated on a certain kind of visibility."[35] This preoccupation with visibility led early western proto archaeologists to rip, tear, grind, and dismember ancient bodies in the pursuit of a specific perception of the truth, or for the purpose of acquiring artefacts concealed in the wrapping or body itself for financial gain. The corpse and its material container in this extractive form of exchange are considered expendable for the creation of wealth, entertaining spectacle, so-called public betterment through education, or academic acquisition of knowledge.

The relationship between, or rather in-between, wrapping, body, materiality, and knowledge corresponds to problematic considerations of extrinsic and intrinsic body terrains seen in polar opposition. Whilst not suggesting equivalence between different practice and timespans Riggs points out that in various other context such as contemporary Japan, Ancient Mesoamerica and rituals of Polynesia[36] wrapping is more related to the creation of a barrier between lifeworld, often characterised as a form of protection than the

[34] Christina Riggs, *Unwrapping Ancient Egypt* (London: Bloomsbury Academic, 2014), 23.
[35] Riggs, *Unwrapping Egypt*, 2014, 23.
[36] Riggs, *Unwrapping Egypt*, 2014, 22.

concealment of things from the visible. In these processes the material itself absorbs potency or other properties from forces that are unseen or created through encoded meanings, part of ritualistic process, or restricted knowledge. In the instance of Ancient Egypt culture, the myriad forms of cosmological association and invocations relating linen to deities she concludes that the "wrapping was as important as the thing being wrapped."[37]

The issue with the wrapping process, when examined from the perspective of museum artefacts, is that the distinction between what is considered living and what is considered dead often reflects Western ideology rather than the perspectives of the ancient Egyptians. The treatment of the physical corpse and its material encasements—from sarcophagi to funerary items and the wrappings themselves—is framed through specific academic practices. This approach mirrors the historical exploitation of the lands where these artefacts were found, as well as the populations within them, under extractive imperial policies and methodologies, both in the museum space and beyond.

Riggs' analysis of the mummy begins with a material and physical examination of the wrapping, offering a counterpoint to the mediation of objects through 3D imaging technologies explored in this text. Creation and attention to computational imaging are investigated as practice-based research methods to examine the universal claims made by large survey museum spaces. By questioning the expectations surrounding usage, interpretation, and knowledge claims, the text highlights how these technologies frame conceptual processes within museums through engagement with the space. The research challenges the assumption that new digital capture technologies are objective, neutral, evidentiary, or transparent. This exploration considers the phenomenological experience of creating computational images, the gaze activated by the technology, the knowledge claims embedded in display interfaces, and how institutional narratives generated by these technologies can be reimagined through practice

Ariella Aïsha Azoulay, in *Potential History: Unlearning Imperialism*, emphasises the need for active processes of *unlearning* in relation to the museum and academic positionalities

[37] Riggs, *Unwrapping Egypt*, 2014, 23.

within this space. She establishes a relationship between the display of objects in Western museums and the extractive imperial violence involved in their acquisition, addressing both historical global conditions and the ongoing biopolitical impacts on displaced peoples. Central to her argument is the consideration of spectatorship's positionality, particularly how it is framed within a naturalised and singular global understanding, interpreted through iterations of enlightened knowledge claims that she finds problematic.

She highlights the performative enactment of spectatorship and the way a certain type of engagement is activated in the museum space. The social conditions and expectations of how and by whom the museum is used create a specific set of dialogues. These are underscored by the notion that museumgoers, "cherished as cultivated citizens, are trained to make themselves familiar with others' cultures, devouring them gracefully, soothing the wound of military violence that 'opened up diverse cultures' looted objects." [38] This context challenges the naturalised consumption of cultural artefacts, questioning the role of the museum in perpetuating imperialist ideologies through its displays and the cultivated behaviours of its visitors. The categorisation of the museum experience is considered one of active passivity, where visitors are encouraged or controlled to refrain from action, yet at "the very same time, spectators are invited to perform a certain type of action – bearing witness, mainly in the context of viewing images of atrocity."[39] In Azoulay's analysis, images of atrocity do not only reference specific incidents of historical or current violence but rather atrocities considered to be embedded in the system of display itself.

This positioning is considered in relation to acts of erasure, particularly how systems of knowledge that inform display systems through the languages of archaeology, ethnography, anthropology, history, and scientific materialism may function. The potential danger is that reductive and incomplete readings of ancient cultures can be acts of imperial violence in themselves, implicit in the very performance of looking or bearing witness in this space. By framing the museum experience as one where spectators are invited to passively witness atrocities embedded in the display, Azoulay highlights how such exhibits perpetuate imperialist ideologies and violence. The act of looking, within this context,

[38] Azoulay, *Potential History*, 2019, 141.
[39] Azoulay, *Potential History*, 2019, 498.

becomes complicit in these systems of power and control, reinforcing the very narratives that uphold imperialist histories.

This contestation provokes a series of questions for this project. Is the gaze adopted by visitors within the museum always complicit with the institution's ideology of universality? To what extent are the parameters of imaging technologies shaped by the institution's conditions for knowledge creation? Can these questions address the relationship between the museum visitor's gaze and institutional ideologies, as well as the role of computational forms of imaging in reinforcing or challenging forms of narration? By examining how institutions shape the meanings derived from new imaging technologies, can we better understand how the gaze and visual representations within museums either perpetuate or challenge hegemonic ideologies, particularly regarding the potential erasure of agency among invested communities?

Azoulay's concept of *unlearning* is urgent in this context, as the processes and discussions of expert knowledge are embedded in the conditions that demand mediation to have its own narrative and historiography, distinct from the imperial rights that enabled the technology to operate. In Azoulay's framework, the activation of the shutter represents a process of extraction that must be critically examined. Narratives about capturing and fixing images, as well as the histories of technical devices, should be reconsidered in light of their association with imperial practices emerging in the early 19th century. In Azoulay's argument, the shutter of the apparatus is considered a distinguishing device, and the act of imaging is viewed as an imperialist technological process that effectively separates objects from their lifeworlds, transitioning them into other territories and forms of categorisation. Modernist understandings of the development of the medium should not start with the invention of the apparatus; rather, technologies of separation are predicated by wider historic apparatuses of imperialism. Azoulay states that:

"In a split second, the camera's shutter draws three dividing lines: in time (between a before and an after), in space (between who/what is in front of the camera and who/what is behind it), and in the body politic (between those who possess and operate such devices

and appropriate and accumulate their product and those whose countenance, resources, or labor are extracted).”[40]

This conceptualisation represents an important positionality to acknowledge within the context of this research. When defining the construct of imperial separation, it is important to consider the role of the shutter in new forms of imaging technology thought relationally to the photographic. Although it does not exactly replicate historic photographic mechanisms—particularly the necessity of a physical shutter—computational images still entail separations of time, space, and the socio-political or onto-epistemological dynamics involved in their production. This includes considerations of who directs the usage of the apparatus and what is consumed by it. Computational 3D images, often created from amalgamations of various image data sources through algorithms, amplify these separations. Understanding these positionalities involves more than just examining technologies or apparatuses; it requires analysing the methods used to separate lives, objects, cultures, and senses of belonging, and how these processes are enacted. Therefore, practice-based research in the museum space of this project focuses less on differentiating imaging technologies and more on Azoulay’s concept of *unlearning* positionalities.

Elizabeth Edwards, by examining the relationship between photography, its usage in anthropological research, and the context of ethnographic museum displays, posits the agency of images as having *rawness.*[41] In this context, Edwards considers the understanding of these forms of images and what they represent.

“Photographs cannot simply be reduced to signifiers of social forces and relations, premised solely on models of alterity, nor to models of spectacle within a socio-political matrix, although they are indisputably active and potent, as both makers and sustains within these discourses.”[42]

[40] Azoulay, *Potential History*, 2019, 5.
[41] Elizabeth Edwards, *Raw Histories: Photographs, Anthropology and Museums* (Oxford: Berg Publishers, 2001, 5.
[42] Edwards, *Raw Histories*, 2001, 3.

This assertion resonates with the way computational forms of image are now also operative within the museum context. Although there remains a relation between the image and notions of observational evidential facticity in computational imaging, tracing how technology functions as an agential part of a broader and entangled process of unfractured meaning is an important aspect of this text. This relation is complex, as Edwards states, "because we are lured into a pattern of expectancy inappropriate to the true nature of a medium, which can be simultaneously fragmented, unarticulated, and resistant, yet challenging."[43]

If we view the agency of computational image technologies in ethnography and anthropology as dynamic rather than fixed, accessed through various kinds of language, then the mediation's agency lies in the continual renegotiation of meaning over time. This also involves attending to relations between established knowledges. Edwards contends that, forms of imaging "cannot be fully understood at one single point in its existence—for instance, perhaps, the inscription of the colonial gaze—but must be examined through the processes of its production, exchange, and consumption. Things have accumulative histories that draw their significances from intersecting elements in their histories."[44]

Discussed in relation to the violence of the shutter, as posited by Azoulay, there is also a relationship established in the museum between the taking of objects from contexts and communities, the display of these objects in museums, and the taking of images by the institution in the context of the display, as well as those by the museum visitor as operative agents. Therefore, the computational image, considered a site of performativity, has a specific and intentional affective tone under particular conditions and at specific times. However, these are neither fixed nor associated with an essence of the technology.

What thus becomes important is whether the distinctions between disciplines, taxonomies, and classifications defined by academic boundaries become ever more porous under the umbrella of computational imaging. Considering how new forms of visualisation technology address the precarity of the things they are tied to, in conjunction with other ways of

[43] Edwards, *Raw Histories*, 2001, 9.
[44] Edwards, *Raw Histories*, 2001, 13.

thinking, is particularly relevant when questioning or rethinking the museum space as enacting extractive processes. Finding alternate modes of thinking requires the exploration of new methodological approaches and forms. The aim of practice-based research necessitates expanding the conceptual, methodological, theoretical, and performative imaginaries of the photographic.

In the film *Un-Documented: Unlearning Imperial Plunder* (2020), Azoulay employs a narrative essay form to offer an alternative interpretation of objects displayed in museum cabinets. The film employs a handheld or body-cam aesthetic that both replicates and inhabits the gaze of the museum visitor, while simultaneously opposing the aesthetic of sanctioned access, characterised by ultra-high definition and smooth movement designed to evoke a disembodied experience. The movement of the camera lingers, and shifts focus between certain objects, replicating the attention of a particularly observant visitor. This imagery is counterbalanced with a critical narrative voiceover, addressing the problem of plundered objects "uprooted from the communities in which they were made"[45] and placed within the context of the museum. This narrative contrasts sharply with the institution's expected narrative of display. While the objects are isolated and separated from their source communities and lifeworld, they nonetheless retain their potency.

Contrary to the view presented in Alain Resnais and Chris Marker's film *Statues Also Die* (1963), which portrays the museum space as a sepulchral site entombing objects in their final resting place, Azoulay argues that museum artefacts continue to possess agency and power. In fact, they survive and remain alert, even though they are confined to the museum's glass cabinets, "awaiting reunion with their people." [46] For the purpose of this text, this difference in approach is explored to illustrate how the condition and experience of computational imaging technologies, derived from sense-capture input, are understood and perceived, highlighting diverse perspectives on the dominance and agency attributed to the museum.

[45]Ariella Aïsha Azoulay, *Un-Documented: Unlearning Imperial Plunder* (Film, 2020), Vimeo.
[46] Azoulay, *Un-Documented*, 2020.

In *Statues Also Die,* the filmmakers position the museum, specifically ethnographic collections, as places that deaden objects. The process of categorising artefacts entering the museum space is equated to embalming them: "classified, labelled, conserved in the ice of showcases and collections, they enter into the history of art, the paradise of the forms, where the most mysterious relationships are established."[47] The conditions of spectatorship in the museum, as conceptualised through the lens of art, differ significantly from the functionality of objects within other types of lifeworld. Artefacts, when positioned within enlightenment display systems and framed for admiration in western art galleries, are presented in such a way that the original contexts and uses of these objects are largely obscured for the spectator.

This condition of objects being frozen in the context of the museum resonates with the understanding of the photograph conceived through the metaphor of ice and stasis, used to differentiate the experience of moving and still images. In *On Photography*, Susan Sontag evokes this image while describing the disjuncture of the still images in Robert Siodmak's film, *Menschen am Sonntag* (1930). Sontag states that in a scene where a group of working-class Berliners are about to have their photograph taken, the "movie camera lingers in close-up to let us savor the mobility of each face; then we see the face frozen in the last of its expressions, embalmed in a still. The photographs shock, in the flow of the movie—transmuting, in an instant, present into past, life into death." [48] Here it is the photograph's capacity to interrupt the flow of cinematic time through a process of freezing that not only elicits a metaphysical understanding of the subject's condition but also draws attention to the photographic medium's relation to death.

The understanding expressed by Sontag echoes Roland Barthes' perception that the photographic process is an ever-present recollection of mortality,[49] and André Bazin's position that the photograph is equivalent to processes of embalming. [50] This distinction between moving image and still image is continued in Peter Wollen's *Fire and Ice*, (1984)

[47] Chris Marker and Alain Resnais, Les Statues Meurent Aussi (Film, 1953).
[48] Susan Sontag, *On Photography* (London: Penguin Books, 1979), 70-1.
[49] Roland Barthes, *Camera Lucida: Reflections on Photography*, trans. Richard Howard (London: Vintage Publishing, 1993).
[50] Bazin, "Ontology of the Photographic Image," 1960.

where photography is thought to be motionless and frozen in that "it has the cryogenic power to preserve objects through time without decay."[51]

The objects behind the glass of display cabinets are, in *Statues also Die*, indefinitely and glacially preserved. Museumification enables artefacts to be misinterpreted through a culturally flat or singular process of comparison within a defined framework. In acts of connoisseurship inhabited by the museum visitor, by looking and understanding how the exhibition is categorised, we "recognise Greece in an old African head of 2000 years; Japan in a mask from Logoue; and still India; Sumerian idols; our Roman Christ; or our modern art." [52] Resnais and Marker thus posit the relationality between art and life as the thing that the museum space negates. The experience and presence of artefacts pre-museum, where the functionality of the object, specifically in the context of usage and handling, and the form of the object are intertwined, is subverted in the process of display. Artefacts not only reside beyond physical touch but are also encompassed within debates and terminology of art.

The museum is often viewed as a space of pristine, hermetic preservation, where the original conditions of objects are transformed into a state of perpetual stasis, framed by the language of history and the veneration typical of the white cube tradition. However, as Azoulay argues, these conditions are mistakenly taken as self-evident rather than as products of "much violence, deception, and manipulation." [53] Despite variations in the acquisition contexts of items displayed in museum spaces, the power dynamics remain inherently unequal. In this dialogue, the relationship between documentary forms of technology and the act of looking, performed as an agential subject, provides a framework for unpacking the relations evident in the space. From a phenomenological perspective, analysing the artefact through the positionality of the visitor and the lens of computational imaging may become a study of occupation, understood not only through its placement within the exhibitionary system of display but also as a component within a broader technological infrastructure.

[51] Peter Wollen, "Fire and Ice," in *The Photography Reader*, ed. Liz Wells (London: Routledge, 2009), 77.
[52] Chris Marker and Alain Resnais, *Les Statues Meurent Aussi*, film (1953).
[53] Azoulay, *Un-Documented*, 2020.

The parameters of cinema as a form of mediation are contrasted with the movement of visitors within the museum space. In *Un-Documented: Unlearning Imperial Plunder*, the activity of the visitor enacts a specific positionality, yet the museum objects resist the extractive conditions of their gaze. In *Statues Also Die*, the relationship between the still image and the moving image is implicitly explored in relation to museum objects. This is further complicated by the museum's empowered position to subjugate objects in their care. The moving image might be seen as representing the present, with the filmmaker's critical gaze shaping the work, while the still artifacts remain frozen in their sepulchral glass cases. Could this apparently settled relationship be challenged through new technological processes? In the case of digital forms of 3D imaging, the distinction between still and moving images becomes blurred. The dynamism of the moving image and the static nature of multiple sensory data inputs are combined in the experience of the image through a navigable software interface.

Rather than focusing on the two seemingly opposing forms of still and moving images and relating them to the condition of the museum context, a constant process of re-evaluation, flux, or becoming may better describe computational image's onto-epistemology. This is also expanded in the context of networked culture, where files are constantly circulating, reinterpreted, and repurposed. The fluidity and interconnectedness of computational images challenge static interpretations and invite ongoing reassessment of meaning. Similarly, artefacts within the confines of the museum space could be seen as inhabiting a place of resistance, where their lifeworld exist outside of governance such as conservation strategies and hermetic seals of display, rather than being in perpetual stasis under the imperial gaze. However, this does not mean they are not both contested under extractive conditions.

Azoulay's focus on the agency of objects instigates a dialogue not only about seeing but also about embodying. In the interplay of viewing depicted in Azoulay's film, the spectator becomes aware of the specificity of their own gaze and physical movements as they navigate the museum. This creates a multi-layered experience: the display as a depiction to be unpacked, the display mediated through film as an interpretive apparatus, and the

visitor's experience both within the museum space and as a viewer of moving images – particularly through social media sharing platforms such as Vimeo.

However, the positionality explored in *Un-Documented: Unlearning Imperial Plunder* reiterates the problems highlighted by Marker and Resnais regarding the interpretation of museum objects as art. Azoulay states that while items displayed in museums are considered art, she relates to them as objects "in which the rights of violated communities are inscribed."[54] Her proposition of unlearning is important to consider as it "involves different types of 'de-,' such as decompressing and decoding; 're-,' such as reversing and rewinding; and 'un-,' such as unlearning and undoing."[55] Questions about where and how meaning is interpreted during moments of encounter, and how the relationship between display and viewer is shaped by the institution, become urgent in this context. This is because the experience of the museum space is complicated by the visual practices enabled by technological apparatuses synonymous with the operative technology of the shutter.

In *Un-Documented: Unlearning Imperial Plunder*, the narrator's voice shifts the comprehension of artefacts in the museum from being passive objects contained within institutional categorisation to requiring attention that recognises their own agency. This shift in comprehension views the displayed items not as beholden to Western imperial readings but as imprisoned embodiments of practices that still hold potency. This is poignantly highlighted in the film's section focusing on wooden sculptures extracted from Africa. The voiceover states that even "the objects themselves are not completely settled down. Look at them and you will see signs of boredom, exhaustion, pain, rage, longing, and disorientation after decades of being kept in places where they do not belong."[56] Contrary to Resnais and Marker's sentiment, the statues have not 'died' but are rather imprisoned and dislocated from their original time and space, awaiting release.

[54] Azoulay, *Potential History*, 2019, 31.
[55] Azoulay, *Potential History*, 2019, 141.
[56] Azoulay, *Un-Documented*, 2020.

By emphasising embodied experience and the phenomenological relationship between museum and visitor, the film challenges the encyclopaedic claims of the museum by highlighting acts of refusal against undocumented narratives and the imperial legacies imposed by colonial forces. In the film and in the argument of *Potential Histories*, acts of undocumented migration are considered a counter-expedition against the imperial wealth extracted from different peoples and places throughout history. To view the movement of people as potentially reparative, Azoulay asserts that we must first acknowledge the violence inherent in separating objects and people into two distinct regimes—a process implicitly linked to the history of photography and the presence of the shutter. Experts and academics document, preserve, and care for objects within museum collections. However, this ideological positionality stands in stark contrast to the exclusionary and extractive regimes of control imposed on displaced people. Azoulay compares the condition of extracted objects in museum collections with that of refugees, whose undocumented status subjects them to biopolitical controls and policing by nation-states. This comparison is particularly evident in systems of movement, where the universal museum both borrows from and lends to select others, transferring knowledge to those deemed part of a broader collaborative system. In contrast, the cultural wealth of invested people often remains inaccessible to them.

The way that *Un-Documented: Unlearning Imperial Plunder* is produced focuses the viewer's attention on the relationship between the act of looking through filmic practice and the act of re-inhabiting or re-evaluating the conditions of imperial perspective in other global political realities. In this phenomenological sense, there is a concentration on the interface or enactment of positionality between self and world, which is also replicated in the museum. The role of relationality, as framed through the visual, posits affect as existing in the relation in-between, rather than solely in the visitor’s gaze or the museum display itself.

The film suggests that an understanding between the theoretical interpretation of the museum, the linear history often framed through systems of display, and the specific expression of experience described in intimate physical proximity is urgent and necessary. It is within these parameters that a shift may occur, representing an alternate form of reading,

interpretation, or way of inhabiting the space. It effectively argues that analysis solely limited to combinations of iconographic historical content, social function, material constituents, or formal quality may be reductive in scope and depth, as it perpetuates the acts of violence she seeks to redress.

When positioned within the space, the purpose of the artefact becomes known as its function within the lifeworld of the vitrine. Signage, among other symbolic and linguistic forms of direction, conveys the idea that spectatorship is a discursive exchange, but it is also this very signage that dictates the parameters of the debates to be held within this space. There is scope for freedom of interpretation from the perspective of the visitor, where multiple readings of the display may be possible. However, there is also a set of singular thematic readings through which to understand the history revealed through academic study presented to aid these conditions.

The function of the visitor's gaze in the museum, from the perspective of the institution can activate the status of artefacts, differentiating their display conditions from other items. This kind of spectatorship implies that the institution positions collections as a naturalised way of understanding objects, bodies, and things: distant, detached, beyond touch, to be contemplated, read, and understood within textual reference, curatorial statements, annotated images, diagrams, or through the screen of technology. Artefacts with diverse usages and intentions are singularly placed in a consumption framework for the positionality of the visitor in relation to the contextualised museum artefact—accessioned, numbered, conserved, and preserved in perpetuity. This has the strange consequence of creating dissonate forms of equivalence between mosaics, statuary, gift shop items, audio guides, postcards, and human remain, all activated through embodied acts of visitation. This is particularly highlighted through the framing and use of the screen, especially with new forms of imaging technologies, which also operate through these conditions.

The connection between the act of looking and the theorisation of the visitor's gaze necessitates an exploration of bodily and temporal experience, which is often complicated or entangled with mobile technology usage. It is thus important to examine how objects and artefacts are positioned to shape expectations of attentiveness. This resonates with

Michel Foucault's discussion on acts of control staged by institutions through conditioning aimed at creating what he terms the *docile body*, [57] designed to elicit specific performative acts. Azoulay views this as part of a process of engineering museum visitors who remain unaware of the imperial violence inherent in the museum's construction. However, she argues that this perspective can be contested and potentially transformed through a process of decoding. She states that while the museum expected us to forever view plunder "through the lens you forced on us as if we were machines, you had the right to programme,"[58] there is also the possibility of confronting imperial violence, even if this is over a long period of time. Engagement and criticality in the museum space may thus act as "an antidote for their poisonous origins. As if we were responding to implants, our bodies will resist your violence and your apparatuses."[59]

Azoulay views the institution's call to understand humanity through universal display conditions and its efforts to include a more diverse range of people as insufficient. She argues that these measures fail to address the deeper, ongoing memory of violence within the space if the fundamental relations of exchange remain unchanged. This approach represents a colonial gesture of inclusion that does not effectively adjust power dynamics or rectify the imperial acts of violence that have been perpetuated. Within the museum space, the narrative of universality, or the encyclopaedic prevail. The concept of the universal, and the equitable or interchangeable relationship between divergent cosmologies, was only made possible through the extensive acquisition policies of Western museums. These policies extracted artefacts and peoples from every corner of the globe via expeditionary force, perpetuating historic and ongoing conditions of inequitable exchange.

Echoing Edwards' conceptualisation, Azoulay asserts that the museum often presents the plunder of imperialism as though it were a gift, supported by photographic images from anthropological journeys that aim to contextualise the objects' origins and the experiences of the communities that produced them. In the display system, there is a disjuncture between the object's current state within the institution and its distant place of origin. We

[57] Michel Foucault, *The Birth of the Clinic: An Archaeology of Medical Perception*, trans. A. M. Sheridan Smith (London: Routledge, 2003), 135 – 170.
[58] Azoulay, *Un-Documented*, 2020.
[59] Azoulay, *Un-Documented*, 2020.

are expected to make an imaginative leap, as if transported to another time and space, distancing ourselves from the present conditions and immersing ourselves in the narrative projected by the signage within the display system.

Simultaneously, objects are being physically dislocated from their lifeworld through their presence in the museum space. The curated vitrines serve as embodiments of utopian fantasy, diverting attention from the museum's actual conditions and projecting viewers into an imagined elsewhere. The visitor's positionality and experience through mobile imaging apparatus thus involve navigating complex interactions with the narratives produced through comparisons and understandings of different locations, times, and conditions of experience.

For many museum visitors, gallery spaces, if not a specific stop on a guided tour, are experienced within a limited timeframe and attention span. Predominant engagement is often mediated through sensor-based apparatuses on mobile technologies, which frequently become intertwined with the act of looking. In this context, the development of practice-based research has been catalysed by the multi-temporality of these interactions. Azoulay's film explores the relationship between the narrativization of the museum and the modes of lens-based spectatorship, exemplified by camera movements that mimic acts of looking. However, it does not address the conditions under which visitors experience the display, which are increasingly intertwined with ubiquitous forms of mobile imaging technology.

For Maurice Merleau-Ponty, perception is fundamentally grounded in a specific viewpoint, which involves considering the body oriented in both space and time. In *The Phenomenology of Perception* Merleau-Ponty grapples with the paradox of how "there is for-us an in-itself," [60] exploring the dynamic relationship between self and world. In this framework, perception is seen as mobile, encompassing multiple spectacles simultaneously. This condition underscores how situated perspectives contribute to a phenomenological understanding of the functioning of computational imaging technologies. It is within this space that the meanings of the museum, shaped by new forms of imaging technologies,

[60] Maurice Merleau-Ponty, *Phenomenology of Perception*, trans. Colin Smith (London: Routledge, 1999), 74.

can be both examined and contested. This practice-based research is founded on the recognition that the act of creating images, alongside the collection of technologically mediated sensor-based data and text-based material from the museum space, constitutes a positional act. This involves considering how this process serves as a critical framework for the project's development, much like Gayatri Spivak's notion of homework,[61] which refers to the act of critically investigating one's own positionality and role. The reflexive stance adopted—encompassing the roles of both researcher and visitor within the museum space—is subject to scrutiny and contestation.

While the process aims to facilitate unlearning in both the museum space and towards the computational image—by reconsidering "what one's ancestors inherited from their ancestors and them from theirs, as solid facts and recognisable signposts, in order to attend to their origins and render imperial plunder impossible once again"[62] —it is also at risk of replicating the imperial gaze it seeks to critique. The context of the British Museum, when engaged through mobile technology, is markedly different from the context and intent of Azoulay's film. Nonetheless, the role of spectatorship remains comparable in both instances. This is particularly evident in the way the space is experienced and interpreted phenomenologically through embodied engagement, and how the museum's underlying ideology influences this experience.

To explore this further, it is essential to ground the discussion in the adoption of a specific type of gaze associated with the creation of digital forms of imaging, particularly algorithmically determined 3D forms. This approach will help examine how particular narratives and affects shape the visitor's attention. Additionally, the discussion aims to determine the parameters and usage of computational forms of mediation by considering how the process of creating these images through mobile technology in the museum space influences the visitor's perception.

Positionality of computational imaging processes and methods of embodied practice-research.

[61] Gayatri Chakravorty Spivak and Sarah Harasym, *The Post-Colonial Critic* (New York: Routledge, 1990), 62.
[62] Azoulay, *Potential History*, 2019.

Starting with practices in 1970s avant-garde cinema, where the materiality of the filming apparatus was intentionally used to challenge and disrupt hegemonic perspectival gazes—particularly in feminist practices—provides a relevant framework for understanding how 3D images, such as digital photogrammetry, might be operational within the museum space for this project. A key example is the use of 360-degree circular pans in Laura Mulvey and Peter Wollen's *The Riddle of the Sphinx* (1977). This technique was designed to challenge the phallocentric gesture and positioning of the camera in conventional cinema. By incorporating these pans, the camera was not only able to capture the dynamics of the subject and space but also to reveal the construction of the film as a medium. In one scene, the crew and camera are visible within the rotation, highlighting the camera's agency and operativity in the scene's creation.

Mulvey reflects on this process, noting, "we liked the way that the machine had an autonomy, and the mechanics of the cinema took over and could determine the structure of the film. But we were also interested, as we were making the film, in the way in which different kinds of spaces changed and modulated the movement of the camera."[63] This approach demonstrated how the apparatus could intervene within the scene itself as an operative agent and disrupt traditional expectations of spectatorship, thus altering the viewer's positionality in relation to the actions depicted within the frame.

In *Riddle of the Sphinx* the strategy of making—especially Mulvey and Wollen's resistance to extensive editing processes—emerges as a distinct methodology. Their approach contrasts with the prevalent processes in contemporary blockbuster cinema, which, as Steve Shapiro discusses, often exhibit post-cinematic[64] conditions with fragmented temporality compared to classical narrative forms. The use of 360-degree pans and a focus on capturing the camera's movement became emblematic of a broader conceptual approach to filmmaking. This approach was particularly relevant in exploring themes related to the

[63] Chris Fennell, "Laura Mulvey Remembers Shooting Avant-Garde Classic *Riddles of the Sphinx*," *BFI News*, 2017.
[64] Steven Shaviro, *Post-Cinematic Affect* (Winchester, UK: Zero Books, 2010).

development of theories surrounding motherhood, psychoanalysis, labour rights, and feminism of the time.

Mulvey reflects, "this cinematic strategy not only opposed the more linear space of conventional narrative but also seemed to represent the dilemmas faced by both mother and child trapped in a dyadic relationship." [65] Here, the physical process of using the technology is seen as embodying conceptual understandings explored in the film. It emphasises the relationship between the phenomenology of domestic space and the conceptual dichotomy of prison and nest that this space represents in psychoanalytic or psychogeographic terms. This methodology highlights how technological processes in filmmaking can embody and challenge existing conceptual frameworks, resonating with the potential for computational technologies to intervene in established power structures and viewpoints. While this strategy is specific to the context of *The Riddle of the Sphinx*, the conceptual structure it embodies is important to consider in relation to the museum. What becomes particularly interesting in linking and unpacking Mulvey and Wollen's film is how the museum space serves as a conceptual foil, grounding debates within the narrative.

In the film's final scene, Louise and her daughter visit the British Museum's Egyptian galleries, where they encounter sarcophagi contained with glass vitrines. This setting is laden with symbolism, Mulvey states, as the British Museum epitomizes the archetypal patriarchal and imperialist institution. She further notes that the choice of the Egyptian room was deliberate, aiming to evoke the enigmatic nature of hieroglyphs. These forms of communication are significant because they are inscribed on ancient bodies, blending iconic and symbolic meanings. [66] Moreover, the depiction of the mother and child holding hands in this space is crafted to represent the relationship between past and present through psychoanalytic lenses. The scene thus intertwines the museum's spatial and symbolic elements with broader conceptual themes, highlighting how the museum setting can both embody and be challenged as embodying prevailing narratives around history, identity, and representation.

[65] Laura Mulvey and Griselda Pollock, "Laura Mulvey in Conversation with Griselda Pollock," *Studies in the Maternal* 2, no. 1 (2010), 8.
[66] Mulvey and Pollock, "Conversation," 2010, 5.

The exhibition space grounds ideas surrounding motherhood and individuation through the technicalities of the film's process. The camera's pan creates a fractured, layered aesthetic where images within images are reflected in the glass cabinets of museum artefacts, complicating the viewer's perspectival gaze. Accompanied by the narrator's voice, attributed to Louise's daughter as an adult, the reflection on the past embodies the museum's temporal and spatial complexity. The narrator observes, "through these texts entombed now in glass, whose enigmatic script reminds her of a forgotten history and the power of a different language."[67] This use of the museum setting serves not only to stage the film's broader themes but also to critique the medium of film itself.

The material process inherent in the camera's function attempts to embody new ways of considering the gaze. Mulvey emphasises the strategy's importance as being "to strip cinema down to its own specificity and materiality"[68] to question and undermine the hegemonic patriarchy perpetuated by mainstream cinema of the time. In this context, the museum becomes a critical site for exploring and challenging dominant narratives, demonstrating how the interplay between film technique and museum space can expose and disrupt conventional perspectives, particularly regarding femininity.

However, the extent to which the apparatus itself is considered agential and the ways in which even this gesture can be subjugated must be carefully considered when applying this strategy to current forms of apparatus and imaging technology. The cinematic experience, particularly when mediated through the internet, operates differently from the experience of the black box of cinema. The conditions of 16 mm analogue film, which were designed for a specific type of viewing and embodied experience, are altered in the context of modern spectatorship through screens such as those on mobile phones. This shift raises questions about which elements of Mulvey and Wollen's experiments—successfully challenging perspectives of class, gender, motherhood, and the cinematic gaze in 1970s filmmaking—can be retained and adapted to the current context of computational image making. Specifically, how can these elements be applied to the modern museum space, computational imaging technology, and the imperial perspectives of universalisation? The

[67] Laura Mulvey and Peter Wollen, *Riddles of the Sphinx*, film (London: BFI, 1977).
[68] Mulvey and Pollock, "Conversation," 2010, 5.

challenge lies in translating the critical insights of Mulvey and Wollen's strategy into effective critiques of current technologies and its roles in perpetuating or contesting hegemonic narratives.

The 360-degree pan in *The Riddle of the Sphinx* represents a deliberate attempt to disrupt the singularity of vision in cinema and challenge its focus on consuming the subject. In contrast, the creation of digital 3D images introduces a more complex process. Specifically, there are two main methods for capturing electromagnetic sense data through physical rotation of the apparatus, which are valuable to consider in relation to the disruption of hegemonic perspective established in Mulvey and Wollen's film.

The first method mirrors the concept of 360-degree cinema by capturing multiple inputs of sense data in a circular or spherical motion to achieve comprehensive coverage of the area being focused on. This approach is exemplified by technologies such as *Google Street View*, which uses a multi-camera rig, or the use of LiDAR scanning in architecture, gaming, and cinema. This process can involve physically moving the camera to gather 360 degrees worth of information or utilising multiple discrete sensors or cameras.

The second method, in contrast, involves capturing discrete singular moments from different points and then stitching these together to create a comprehensive point cloud scan. This technique conceptually replicates the gaze criticised by Mulvey in that it involves multiple iterations of capturing singular moments simultaneously. However, it also creates an interrelated assembly of points that are interconnected, which adds layers of complexity to the visual representation as it represents multiple viewpoints directed at a specific subject.

In both processes, the centrality of the apparatus and the object of focus play crucial roles. The first method emphasises the apparatus's role in capturing a holistic view, while the second method focuses on the object and its detailed representation from multiple perspectives. This dual approach complicates the subject's capture and representation, reflecting the need to consider how current digital 3D technologies intersect with and potentially challenge traditional cinematic and monocular perspectives.

This contrasts with a method where an operator, drone, or automated rig captures the subject from various angles, making the object the centre of the computational gaze. This can be achieved by placing the object on a carousel, rotating it for a single camera to capture multiple points, or using a multi-camera/sensor setup to capture all points simultaneously. The cinematic technique known as bullet time, popularised in films like *The Matrix* (1999), is an example of how process operates. Alternatively, the sensor can physically move to capture different points. In all cases, the captured data is used to create a cohesive 3D form through black-boxed software interfaces. This software employs algorithmic processes to interpolate and align multiple source inputs, merging them into a unified 3D image.

The final process referenced is most relevant to this text. It is utilised in mobile technology and involves direct physical interaction and relationality with the object of focus. The operator moves around the subject, capturing data from multiple angles. These processes parallel the experience of navigating display systems in museum spaces, with elements of this performance being captured as part of the resulting 3D image. The wider argument of the text explores the limitations of this process, the different temporalities embedded in the computationally rendered 3D image, and the parallels with the intentions of expanded cinema. The initial focus of this research is: in what ways does the gesture of creating 3D digital images through this method replicate problematic systems of the gaze, as considered by Mulvey, and relate to other systems of domination and power, particularly in Foucauldian terms?

Computational images, generated through algorithmic processes that integrate data from sensors, are interconnected with spectatorship in ways similar to other types of imagery used to contextualise collections in museums. However, computational images mediate the viewer's relationship with the depicted object through technological interfaces, shaping perception in distinct ways. While comparisons can be made with exhibits that use illustrations or explanatory text, the narrativity embedded in computational images requires specific unpacking. In recent years, museums have used technologies such as volumetric Computerised Tomography (CT) scans, photogrammetry, and other 3D imaging processes

to present new scientific discoveries, in the restitution of digital artefacts to invested source communities and engage audiences with the details of conservation activities. However, these technologies are often viewed as utilitarian transmitters of scientific information or seamless evolutions of previous imaging apparatuses, typically interpreted through the theoretical lens of photography. This perspective overlooks their role as an operational assemblage with specific agency in the enactment of knowledge claims established by the institution.

By examining the universal claims made by museums through the positionality of the gaze, computational imagery can be seen as entangled with other forms of power and technological infrastructure that shape understanding of the museum and its contents, often in ways that reflect imperial practices. Taxonomy, as an academic discipline, shapes the design of display systems to guide how they are viewed and understood. This influences both the gaze of the visitor and the application of imaging technology by the institution and individual visitors within the space. Considering the museum through Foucault's concepts of heterotopia[69] and the medicalised gaze[70] allows for an exploration of the systems of control exercised through exhibition displays that utilise computational image technology. This perspective extends beyond the technicity of the apparatus to highlight how digital imaging technology is used or experienced, making specific claims to knowledge through defined academic readings.

The field of enquiry, initiated through discussion of the positionality of the gaze in Mulvey and Wollen's usage of 360 pans is also integral to much of the post-modern institutional critique of the museum, particularly Johnathan Crary's notions of "attention"[71] and "the observer,"[72] and Tony Bennett's characterisation of the museum as an exhibitionary complex.[73] Additionally, it is useful to consider Beth Lord's argument in her text *Foucault's*

[69] Michel Foucault, "Of Other Spaces: Utopias and Heterotopias," *Architecture /Mouvement/ Continuité* (1984), trans. Jay Miskowiec.
[70] Michel Foucault, *The Birth of the Clinic*, trans. A. M. Sheridan Smith (London: Routledge, 2003), 145 – 150.
[71] Jonathan Crary, *Suspensions of Perception: Attention, Spectacle, and Modern Culture* (Cambridge, MA: MIT Press, 1999).
[72] Jonathan Crary, *Techniques of the Observer: On Vision and Modernity in the Nineteenth Century* (Cambridge, MA: MIT Press, 1990).
[73] Bennett, *The Birth of the Museum*, 1995, 75.

Museum: Difference, Representation, and Genealogy,[74] in this context which interlinks the museum space with Foucauldian understandings of power, as explored by both Crary and Bennett. Lord posits that post-modern institutional critique of the museum often misinterprets Foucault's position.

Foucault does not provide a specific and substantial analysis of the museum in his writing, unlike his detailed attention to the clinic,[75] the asylum,[76] or the penal system.[77] However, in his concept of heterotopia, he mentions the museum and the library as examples of spaces that "indefinitely accumulate time," [78] characteristic of 19th-century Western culture. In this context, the museum is defined as a space of difference and representation, initially emerging as expressions of individual taste in the 17th-century cabinets of curiosities. Over time, this private and personal space of wealth and privilege evolved into institutions associated with broader structures and ideologies. These institutions, like other disciplinary systems, were designed to exert control over the wider populace in the 19th century, granting public access to collections and embodying an imperial society's notion of being the pinnacle of civilised—or rather, civilising—culture.

"(T)he idea of accumulating everything, of establishing a sort of general archive, the will to enclose in one place all times, all epochs, all forms, all tastes, the idea of constituting a place of all times that is itself outside of time and inaccessible to its ravages, the project of organizing in this way a sort of perpetual and indefinite accumulation of time in an immobile place, this whole idea belongs to our modernity."[79]

From this perspective the structure of *heterotopia* or *hetrochronies*[80] can be interpreted as being spatially isolated from the rest of society in which incongruous objects and things from discontinuous times are placed in relation to each other in perpetuity. The role of the

[74] Beth Lord, "Foucault's Museum: Difference, Representation, and Genealogy," *Museum and Society* 4, no. 1 (2006): 1–14.
[75] See Foucault, *Birth of the Clinic*, 2003.
[76] See Michel Foucault, *Madness and Civilization: A History of Insanity in the Age of Reason*, trans. Richard Howard (London: Routledge Classics, 2005).
[77] See Michel Foucault, *Discipline and Punish: The Birth of the Prison*, trans. Alan Sheridan (New York: Vintage Books, 1991).
[78] Foucault, "Of Other Spaces," 1984, 7.
[79] Foucault, "Of Other Spaces," 1984, 7.
[80] Foucault, "Of Other Spaces," 1984, 6.

space through this definition is to create a microcosm or illusion of coherence that is relational to the so called "real space of society."[81]

Beth Lord, in her analysis of critical perspectives on the museum, addresses the view that the museum solely embodies the negative aspects of an Enlightenment institution—one that represents state authority and seeks to impose order on the world through universal principles and the concept of a totalising history. In her analysis of Foucault, and in contrast to interpretations that view the museum as a collection of different objects from various sites and temporalities in one place, she argues that to "define the museum as a heterotopia because it is a space of different objects is either banal (a supermarket is also a space of different objects) or overly reliant on the notion, associated with the nineteenth-century museum, of a "timeless" storehouse of temporally discontinuous objects."[82]

I would argue that a detailed analysis of the supermarket in relation to temporality, power, heterotopia, and the extractive ecology of practices within this space, perpetuated through computational imaging, would be far from a banal study. The parallels between the supermarket as a 'museum' and the museum of extracted objects resonate interestingly with the condition of the Internet of Things. However, Lord's argument here also overlooks the inherent problem of positioning objects from different lifeworld under this relational framework, as it underplays the violence of the practices that enabled these objects to be placed within the museum's system, which in turn supports its claim to universality.

In museums like the British Museum the goal of creating a "collection representative of world cultures" [83] often translates into the seemingly endless task of categorising all human conditions, reflecting a specific historiographical view of world progress towards the present western view of society through academic discourse. However, even in this context, there is a disparity between the objects, artefacts, and bodies on display and the schematisation in which these things are placed. Using the language of the encyclopaedic and the structure of coherent and interlinked histories, practices of interpretation are considered pivotal for how the items on display best fit the narrative being conceptually

[81] Foucault, "Of Other Spaces," 1984, 3.
[82] Lord, "Foucault's Museum," 2006, 4- 5.
[83] British Museum, "About Us," n.d.

schematised for the visitor to consume. This system of knowledge is often presented through an authoritative voice. However, as Beth Lord maintains, even "if this scheme is presented as incontestable, and even if this scheme is used as a tool for the oppression or occlusion of other conceptual schemes, the difference between the objects and the scheme remains."[84]

Lord argues that while critical theory has often focused on the museum as an extension of Enlightenment values, a shift in understanding is required to include the possibility that the museum space may offer multiple and contesting relationships of things within its walls. She further contends that it is Foucault's intention, through his reference to these types of spaces, "to perform an archaeology of institutions that moves from the "document" to the "monument," examining particular institutions and their practices and discovering how they fit into discontinuous historical series."[85] Moreover, because the museum represents a system that applies concepts through discourse and their establishment within exhibition contexts, it can provoke critical acts of engagement that challenge the relationship between concepts and objects. Specifically, Lord states that Foucault conceptualises the museum as a space of distinction and representation, for example where the gap between words and objects is embodied in the display system, the debates articulated, and presented for public debate. In this sense the space embodies the enlightenment condition of permanent critique in that it allows for "a reflection upon its own conceptual conditions of possibility."[86]

However, while Lord argues that "museums are best placed to critique, contest, and transgress those problematic notions, precisely on the basis of their Enlightenment lineage,"[87] positioning the institution as a space of representation that holds potentially emancipatory power, with the dialogues within the space allowing for critical perspectives on its governance, Azoulay's concept of unlearning more effectively addresses how the scope of debate is shaped by the institutional context. Although museums often present themselves as neutral spaces for discussion, these discussions may operate beyond

[84] Lord, "Foucault's Museum," 2006, 9.
[85] Lord, "Foucault's Museum," 2006, 2.
[86] Lord, "Foucault's Museum," 2006, 11.
[87] Lord, "Foucault's Museum," 2006, 11.

institutional ratification and control. Lord's argument suggests that the relationship between objects and display systems is more about how meaning is created for the visitor and the rhetoric used, rather than questioning whether the framework itself needs undoing in Azoulay's terms.

Azoulay's argument about the violence of the shutter, suggests that museums often attempt to forcefully differentiate cultures, taxonomize material culture, and impose control systems that describe the world according to Western knowledge claims. Such narrativity or representational space positions the institution as interpreting the past in terms of an assumed continuity between ancient civilizations and the present, presenting a coherent historical era. Lord defines this argument as a conceptualisation of total history that "moves from the assumed 'monument' to the 'document'—in this case, from 'the Enlightenment' to the museum as an institution exemplary of it." [88] However, the condition of Enlightenment critique is problematic, not least because of the languages, positionalities, and conditions it allows to be made present in the space. Defining the museum as a philosophical problem, rather than focusing on the objects, collecting practices, or methods of display, diminishes the importance of these conditions in favour of what is perceived by Lord as a more fundamental task—the philosophising of the institution and its essence.

The condition of the museum space, especially regarding the use of new imaging technologies, is far more complex and intertwined. While these display systems act to disconnect objects from their originating communities, they simultaneously establish the framework within which spectatorship is possible. This dual role underscores the museum as a space that not only enforces control and separation but also enables critical engagement and interpretation by visitors within prescribed limits. The museum, as a site of representation that delineates similarities and differences, has the potential to reflect on the historically determined positionality of display systems and computational forms of imaging, enabling institutional critique to function as such. However, critical distance from the space is necessary for this to be operative. As demonstrated in the film work of Azoulay, there is potential to challenge the historically imposed constraints on visitors through the lens of

[88] Lord, "Foucault's Museum," 2006, 2.

representation, including considerations on how to transcend the act of looking within these boundaries.

Even if the idea of the museum as a space where total histories can be challenged holds promise for revealing the problematic political and historical orders it upholds, this potential relies on recognising that the aims of universality and encyclopaedic completeness must be abandoned. The intention of practice-research in this project thus focuses on exploring what Lord determines as "the contingency of orders of classification,"[89] which "encourages us to consider different orders, different ways of thinking." [90] However, this is not an essentialist task of determining the philosophical condition of the museum, but rather an onto-epistemological task of unlearning the knowledge claims made in and through the museum using imaging technologies and systems of display and accounting for the violence enacted in the space. It involves considering these claims in relation to broader societal understandings of these imaging technologies, rather than viewing the space as separate from the conditions in which it is situated—particularly within the wider infrastructure of knowledge claims made with and through systems and infrastructures of computation, which are now ever more agential in how the museum space is consumed by visitors.

By establishing connections between differing theoretical positions and intentions, it is possible not only to highlight the importance of moving discussions of digital forms of imaging technology away from the languages historically associated with the analysis of photography but also, in the specific context of the museum, to consider where the technology resides outside of Enlightenment conditions of critique in Lord's terms. Different types of language are needed to think about current forms of digital process as part of a wider assemblage of agential forces implicit in using and experiencing new imaging technologies themselves. This need is particularly highlighted when the historiography of ancient civilisations is substantiated through data visualisations produced by forensic anthropology and forensic pathology. This can be examined by looking at the signage

[89] Lord, "Foucault's Museum," 2006, 11.
[90] Lord, "Foucault's Museum," 2006, 11.

within the museum space and how new imaging technologies are positioned in relation to exhibits.

Enlightening Signage in Displays: Forensic Anthropology, Computational Imaging, and the Medicalised Gaze

Signage in the Egyptian galleries of the British Museum use illustrations of various digital imaging technologies to convey new research on the artifacts displayed to visitors. Images created through Computed Tomography (CT) scans of human remains, for instance, are presented as cutting-edge representations of scientific data visualisation. This positioning is established in relation to other types of historical and contemporary academic research. Tests conducted through observation facilitated by computational imaging technology derived from sensor inputs within specific academic fields are enabled through data analysis, and conclusions are reported to the public in relation to defined hypotheses and previously established research positions. The displays integrate historic records and texts, both ancient and modern, to establish information and knowledge claims about specific periods.

This form of narrativity is further developed by reconsidering the relationship between traditional methods in the disciplines of classics and the new methods and technologies available to contemporary archaeological practices. Current knowledge claims presented in the gallery are thus established using different forms of rhetoric. Computational forms of visualisation, which allow observers to see inside artefacts and bodies, are employed to reveal what is initially unseen to the naked eye. Traditional autopsies of ancient remains, categorised as having been established in the mid-19th century, are described as "highly informative"[91] but limited for current scientific discourse.

This is because source materials gleaned from different epistemes have varied concerns for current research processes, which seek information pertaining to "life expectancy, diet, and nutrition, state of health and ancient disease, and the relationship between population

[91] British Museum, "Egyptian Death and Afterlife: Mummies," information text, The Roxie Walker Galleries, Rooms 62–63, British Museum, London, 2022.

groups."[92] Therefore, new technology is necessarily applied to artefacts, particularly the remains of ancient peoples, as these processes are believed to "hold the potential to transform our understanding of ancient societies."[93] By integrating traditional scholarly research with modern technological advancements, the museum positions itself at the intersection of historical analysis and contemporary scientific inquiry. This approach is considered not only to enhance the narrative of the exhibits but also allows for a more comprehensive understanding of ancient societies, informed by both historical records and cutting-edge scientific data.

Herodotus's description of the mummification process in Book Two of his *Histories* is authenticated and verified by modern scientific analysis. Signage thus establishes a direct line of continuity, connecting Western thought from classical scientific processes and descriptions to the present context of the museum. The lineage of display is further associated with exhibition history in the wall text of the British Museum's Egyptian galleries, which references the cabinet of curiosities as the forerunner of the current museum space. It also highlights the public unwrapping of mummies in the 19th century as an invasive precursor to the non-invasive techniques enabled by advances in computed medical imaging technologies

This juxtaposition marks the link between the perceived barbarity of the past and the concern and care of the present. The methods currently employed towards ancient remains through scientific research are classified as non-violent, emphasising the care of the artefacts and their perpetuity within the museum system as custodian, ensuring public access. This approach contrasts sharply with the sensationalist and unethical autopsies of ancient people for entertainment purposes that were prevalent in the 19th century. The museum's use of digital imaging technologies is portrayed as a progression from invasive to non-invasive techniques, aligning with contemporary ethical standards and scientific rigor. By presenting these advancements, the museum not only enhances the narrative of its exhibits but also reinforces its role as a responsible guardian of cultural heritage, committed to preserving and interpreting the past with respect and care.

[92] British Museum, "Egyptian Death and Afterlife," 2022.
[93] British Museum, "Egyptian Death and Afterlife," 2022.

While some historic public dissections conducted for public spectacle are described as "morbid,"[94] the inquiries of Agostino Granville and Thomas Pettigrew are framed as contributing to "the recovery of scientific data."[95] Their importance in the genealogy of current scientific practices lies in their foundational embrace of a "multidisciplinary approach,"[96] which continues to be a hallmark of current academic research. However, these approaches are presented within a prescribed focus and in an unequivocally positive light, omitting any mention or acknowledgment of the potential violence inherent in the colonial processes of acquisition that these collections are part of.

Instead, the emphasis is on the technological advances since the 1960s that have revolutionised the study of Egyptian human remains. These advances are highlighted for their potential to enhance understanding of relationships between individuals in the past, as well as links between larger population groups "in antiquity and across time."[97] These narrative foregrounds the benefits of modern techniques, such as CT scans and other non-invasive imaging technologies, in contributing to a more ethical and scientifically rigorous examination of ancient remains. By focusing on these technological advancements, the museum presents a progressive view of scientific inquiry that distances itself from the more problematic aspects of its colonial past. This framing seeks to position contemporary practices as more respectful and considerate of the cultural and historical significance of the artefacts, while still capitalising on the rich data they provide for understanding human history.

The absence of references to the ethics of displaying the remains in this current museum process, ideas of repatriation or restitution, the meanings created using technological apparatus, or the intersection between Western perceptions of knowledge and understandings of ancient rituals is telling. Knowledge appears to be developed by specific academic fields deemed appropriate and is part of the institution's overall branding and defined societal purpose. Through this methodology, visitors are informed of the value and

[94] British Museum, "Egyptian Death and Afterlife," 2022.
[95] British Museum, "Egyptian Death and Afterlife," 2022.
[96] British Museum, "Egyptian Death and Afterlife," 2022.
[97] British Museum, "Egyptian Death and Afterlife," 2022.

meaning foregrounded through their engagement with the display, visualised and reinforced by specific types of digital visualisation.

The use of computational imaging technology, such as medical pathological techniques transferred to the museum context, is presented as facilitating knowledge. However, these technologies are not neutral tools; they bring with them specific ways of seeing. The application of these technologies in the museum setting inherently frames the objects and remains within a particular scientific and cultural narrative that prioritises certain interpretations and understandings over others. This selective framing can obscure the complex ethical and cultural issues surrounding the acquisition and display of artefacts – and particularly human remains. It also hides the potential for these technologies to transgress cultural boundaries, which is obscured under the guise of offering new insights into ancient rituals and practices. The argument of this text is that the museum's signage promotes a specific positionality that reflects the institution's perspective through the system of display and incorporation of new imaging processes. It suggests that considering how different forms of understanding could be positioned more equitably might shift the focus and context of display and the knowledge being communicated to the visitor.

In *The Birth of the Clinic*, Michel Foucault defines the medicalised gaze as rooted in an understanding of pathology derived from the dissection and anatomisation practices of the 18th century. For Foucault, these constitute acts of seeing that separate the body of the patient from the individual being examined. He contends that while medical practices concentrate on what is visible of the disease in the patient, they are also predicated on previous knowledge that substantiates what is recognised as visible. This perspective is entangled between acts of seeing and knowing: "as it moves forward, this gaze is really retreating, since it reaches the truth of the disease only by allowing it to win the struggle and to fulfil, in all its phenomena, its true nature."[98]

The visual apparatus of the gaze embodies a set of non-discursive behaviours within the social field, containing sayable or discursive parts that are also constitutive of power

[98] Michel Foucault, *The Birth of the Clinic: An Archaeology of Medical Perception*, trans. A. M. Sheridan Smith (London: Routledge, 2003), 9.

structures. The medicalised gaze not only observes and records but also actively participates in constructing the reality it examines. It is a tool of both perception and interpretation, deeply embedded in the power dynamics that shape knowledge and understanding within the medical field. This dual role of the gaze highlights how power and knowledge are intertwined, with the act of seeing being both an instrument of scientific inquiry and a mechanism of control and definition within society.

Foucault's reading of the medicalised gaze is crucial for considering knowledge claims established through the language of forensic pathology in the museum because it highlights how digital imaging technology is used to make certain historiography visible by focusing on bodies within the collection. The role that new forms of imaging technology plays is urgent to unpack, as there is an equation being made between the enactment of the medical gaze and the expected gaze of the museum visitor. The visitor is positioned to be observational, detached, and analytic. This position is catalysed by the lens of museum commentary, signage, and display systems, which often emphasise the exposition of previously unseen evidence unearthed through sense data input interpolated through computational technology. Analysis is framed in such a way that the usage and positionality of digital imaging processes make the invisible visible.

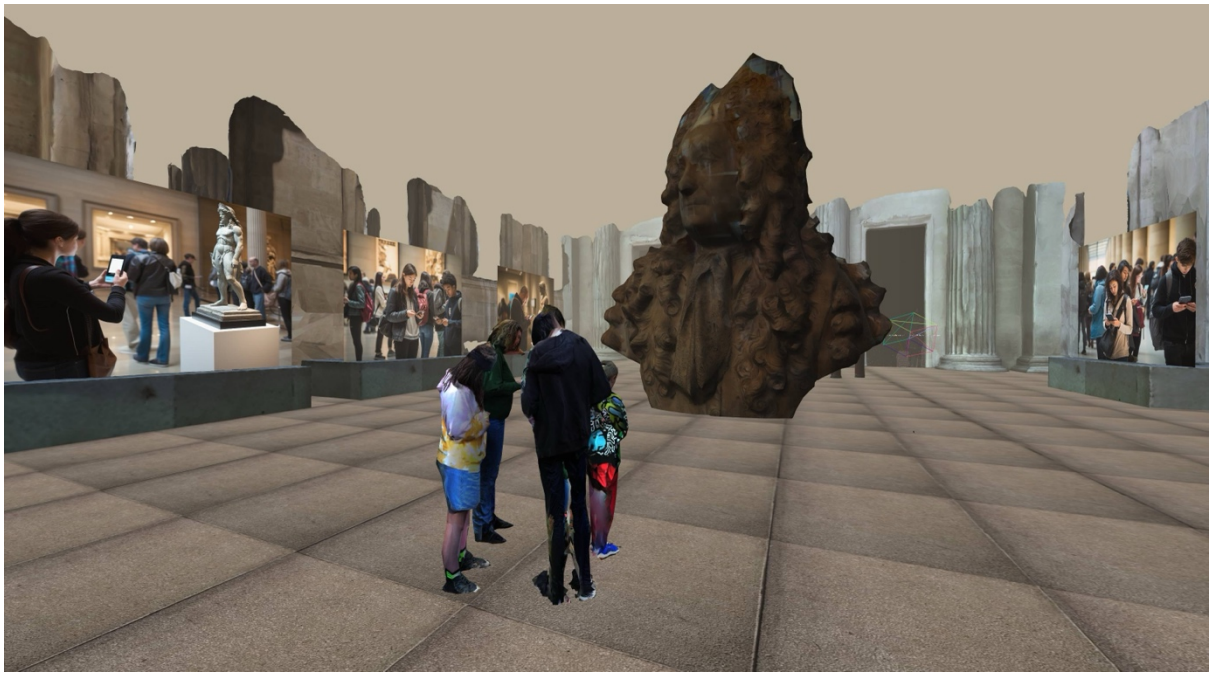
If there is indeed an equivalence between the museum and the clinic through the positionality of the gaze, a central concern becomes examining what the display reveals about the visitor's positionality. By analysing the relationships established through the act of visitation within the architecture of the museum, experiential phenomenology becomes a significant method to employ. Key to this approach is considering what is made visible through the technological apparatus and by whom. This involves examining not just the appearance of artifacts through computational forms of imaging, but also how knowledge is made visible through the mediation. It requires examining how the image is presented to be seen and how the image is positioned in relation to systems of interpretation and the academic disciplines privileged in the museum space. The act of making visible is not neutral; not least because it is influenced by the technological, cultural, and institutional contexts in which it occurs.

Computational imaging technologies, while revealing new dimensions of artefacts, also bring specific onto-epistemological frameworks that shape how these artefacts are understood. The way these images are curated, displayed, and contextualised within the museum influences the visitor's perception and interpretation. This process reflects broader power dynamics and knowledge production mechanisms, which need to be critically examined to understand the implications of the technological mediation of museum displays. The limits of what can be experienced through interaction with new forms of digital imaging apparatus depend not only on the subject of focus but also on the potential of what can be seen and made visible. Analysis thus becomes a question of how the schema of visualisation situates the body within the knowledge and power structures of a particular discourse, time, and place. What new understandings can be revealed, and through which languages are these presented within the museum's display system?

For instance, while CT scans can reveal new knowledge about ancient diets, bone conditions, or diseases, the evidentiary visualisation of these discoveries is framed within the discipline of forensic anatomy. However, it often overlooks the conditions of imperial power at the time of the body's exhumation, the legality of removing the remains from their point of discovery, or the debates surrounding calls for the return of bodies or objects by invested parties, nation-states, or institutions. By employing computational imaging processes interpreted through forensic anthropology and presented within the museum's display systems, previously hidden or obscured information becomes visible. However, understanding the exhibit requires acknowledging what remains invisible or out of sight, as well as recognising what is made visible, explicitly pointed out, or directly referenced. It also involves considering the languages through which these bodies are positioned in contrast to other perspectives that view the process as extractive.

If the museum conditions require visitors to interpret the affective registers of displays through a reflective, analytical, and medicalised gaze framed by specific academic languages, this gaze can be disrupted by challenging these conditions. By refusing the positionality imposed on the museum visitors might reveal different perspectives and understandings. This requires reactivating and reconditioning through different forms of approach to highlight forms of understanding that are tacitly present but overlooked or

unacknowledged, especially under the automatic and procedural computational processes dictated by mobile phone imaging technologies. Engaging with imaging technologies through the interface obscures what is conceptually visible and highlights the detachment experienced in the museum space, while presenting this detachment as active engagement through embodied positionality of interactions.



Museum of Computational Image Artefacts (MoCIA)

Link to the *Entrance Hall* in New Art City.

https://newart.city/show/museum-of-computational-image-artefacts-entrance

Link to walkthrough video *Museum of Computational Image Artefacts (MoCIA). Entrance Hall* on YouTube

https://youtu.be/ztToGapfDfk

Chapter 02:
Enactment of Alternative Archives and Tactics for Critical Positioning in the Museum Space

The Violence of a Civilization Without Secrets.

From the outset of Khalil and Polys' 2017 film, *The Violence of a Civilization Without Secrets*, a layered narrative approach is evident. The film incorporates archive footage surrounding the discovery of the ancient remains of the so-called *Kennewick Man* in 1996, gleaned from TV documentaries and news sources, open-source computational images, and, at various points, the artists' authoritative voice reciting sections of text; specifically, from Jean Baudrillard, Jacques Derrida, Thomas Keenan and Eyal Weizman, and Ina Blom. The film aims to complexify relations between references made through the multimodality structuring the narrative. Textual sources and archive material are juxtaposed with documentary and performative footage created by the artists in a national institutional museum space, overdubbed with atonal music. Informational videos of DNA appropriated from a MIT YouTube post and references to facial reconstructions based on forensic anthropology are intertwined, forming a narrative that links the scientific processes in these contexts with other forms of knowledge, particularly those of indigenous American belief.

In the first scene of the film, the viewer is placed in the position of navigating the corridors of the *American Museum of Natural History* in New York. The camera's embodied movement creates an equivalence between the film and the phenomenological experience of the space, situating the viewer in the role of museum visitor and, in this act, relationally to the artefacts exhibited behind glass. The camera's focus during the walk-through highlight objects in dioramas, maps, informational signage, taxonomically collected artifacts, and waxwork figures in the *Northwest Coast Hall*. In the voiceover of the video, the ethnographic museum is equated with the perpetuation of Thomas Jefferson's curiosity about Indigenous people, enacted through the violence of unearthing human remains from burial mounds. Through this reference, the artists establish connections between the museum and broader issues surrounding genetics, forensics, and archaeology, developed later in the film's narrative. The voiceover states that boxes of human remains have

historically been sent to museums by "archaeologists, sociologists, amateur explorers, and hobbyists"[99] in the hope that, through scientific study, a theory of Native American racial inferiority will be posited, or an alternate historical account of indigeneity will be found, proving the first peoples of America were of European descent.

Following these establishing concepts, the artists then point to the situation of *Kennewick Man's* 9000-year-old remains and the problematics surrounding the account of the discovery and subsequent initial findings, focused upon in the context of the media. In the film, multiple and dissonant references not only point to forensic anthropology as a discipline within the categorisation of the museum but also to the discovery as a media event. Archive footage covering the discovery of the body quickly becomes politically charged with contentions surrounding ownership, identity, and race through the language of genetics. This is particularly foregrounded by the artists through reference to the 1998 CBS documentary, *Kennewick Man: An Ambassador from the Past*,[100] and to the initial TV reports on the case that stated that this skeleton, one of the most complete of its age found in North America, was a "scientific treasure."[101]

The initial examination of the skull in 1996 by forensic anthropologist, archaeologist, and palaeontologist Jim Chatters, we are told, found that the shape of the skull was more reminiscent of Caucasoid than of Native Americans. Chatters states, "You could put this one in a crowd of Native American skulls. I mean, you could put him with a hundred of them, and you'd still pick him right out of the crowd (sic)."[102] As a result, the debate in the CBS documentary and claims of ownership began to be described in terms of race, a contention that media outlets picked up as casting doubt on whether Native Tribal Communities can indeed make claims to indigeneity. At the time of the discovery, this rhetoric was exacerbated by the misinterpretation of scientific terminology referring to the

[99] Adam Khalil, Zack Khalil, and Jackson Polys, *The Violence of a Civilization Without Secrets* (Vimeo video, 2017).
[100] 60 Minutes, "Kennewick Man: An Ambassador from the Past," *CBS News*, October 29, 1998.
[101] Khalil, Khalil, and Polys, *The Violence of a Civilization*, 2017.
[102] Khalil, Khalil, and Polys, *The Violence of a Civilization*, 2017.

skull as being of the Caucasoid skull type, with the normative understanding of Caucasian as meaning white-skinned and of European origin. [103]

The dispute regarding what to do with the material remains of *Kennewick Man*, particularly regarding his ancestry, played out in court as various scientists, state officials, museums, and indigenous tribal communities became involved in a case under the 1990 Native American Graves Protection and Repatriation Act (NAGPRA). The U.S. Army Corps of Engineers, on whose land the body had been discovered, had agreed in 1996 to return the remains to the Colville Tribes, the Umatilla Tribes, the Nez Perce Tribe, the Yakama Nation, and the Wanapum Tribe under the terms of NAGPRA until the court case intervened. The purpose was to determine how *Kennewick Man's* remains should be treated and under whose custodianship. In the video, the artists point out that, in addition to the previously listed advocates in the case, a white Pagan identity movement called the *Asatru Assembly* also claimed lineage to the remains. This was based on the perceived assumption of racial kinship, which they believed was supported by the initial forensic findings and fringe scientific theories, including the now-disproved *Solutrean hypothesis* that suggested a European origin for the makers of the Clovis tools, the first recognised stone tool tradition in the Americas.[104] In 1998, the *Asatru Assembly* joined the case against the claim of the Native Tribes, who were seeking to return the remains to the earth, in suing the U.S. Army Corps of Engineers to bury *Kennewick Man* in accordance with what they termed pre-Christian Norse ritual.

What is foregrounded by the artists in the video is the potential link between scientific institutional knowledge and the far-right beliefs of the *Asatru Assembly*, in opposition to Native American understandings, knowledge, and lifeway. The film acts as a reflective microcosm of the media narrative surrounding the body, as well as the contestations encompassing other objects for which calls of repatriation and restitution are being made in a global context. The urgency highlighted pertains not only to where material bodies and objects reside, but also to the languages and mediums through which they are understood. This formation resonates with Cynthia-Lou Coleman's position in *The Extermination of*

[103] Carl Zimmer, "New DNA Results Show Kennewick Man Was Native American," *The New York Times*, June 18, 2015.
[104] Jennifer Raff, "Rejecting the Solutrean Hypothesis," *The Guardian*, February 21, 2018.

*Kennewick Man's Authenticity through Discours*e, where she states that when the scientists sued to study the bones, news coverage positioned indigenous Americans against scientists in a reductive web of narratives.

'(1) war and battle contests, highlighting conflicts between Indians and scientists; (2) science versus religion, with science elevated to a superior status; (3) the rights and legitimacy of key stakeholders (Indians, scientists, the courts, and the federal government) as legal and moral; and (4) "progress" as a description of stakeholder platforms.'[105]

This insight is posited in *The Violence of a Civilization Without Secrets* as a dissonance between the law, forensic anthropology, and museum space on one hand, and indigenous knowledge, belief, and belonging on the other. In the video, multiple positions and the agency of the remains themselves appear to the viewer as entangled with the film as a medium. The artwork becomes a site through which to visually interrelate ideas which are equated with the ability of lens-based practices to entwine multiple forms of understanding. This methodology is echoed by overlaying text, voice, and appropriated image.

What is particularly important for this practice-based project is that forensic knowledge, often produced using imaging technologies such as CT, LiDAR, or photogrammetry, is equated with notions of facticity, even though the claims made, especially regarding ancient bodies, remain speculative. The film expands on the validity of these relationships, particularly with reference to the trope of recreation or simulacrum. Relationships between the message of the institutional curatorial display, as expressed through the taxonomy of objects, and the rhetoric of the forensic as a claim to truth are classified as being problematically intertwined.

Extracts from documentaries surrounding the discovery of the remains, appropriated news, documentary footage of facial reconstruction processes, and video lectures from the *Asatru Folk Assembly* are interspersed with computer-generated images (CGI) of skulls and skeletons. The only direct image of the actual remains of *Kennewick Man* that we see in the

[105] Cynthia-Lou Coleman, "The Extermination of Kennewick Man's Authenticity through Discourse," *Wicazo Sa Review* 28, no. 1 (2013), 67.

video is contained within a fragmented and dissected wipe transition. Appearance of a digitalised skeletal form is placed over DNA data appropriated from the 2014 MIT research video, *Genome Editing with CRISPR-Cas9*.[106] This footage then fades into the face of Armand Minthorn, an Umatilla trustee and religious leader, as he presents evidence in court. Minthorn states that it is through the Elders' intergenerational teachings that there is living evidence for the claims of kinship with the *Ancient One*, even though their births are separated by a long period of time. He argues that "the scientists can't accept the fact that just because it's not written down in a book, it's not a fact." He posits that despite the lack of evidence in forms acceptable as evidence in this context, the truth of kinship is a fact to him because he "lives it every day."[107]

The artist's inhabitation of Thomas Keenan and Eyal Weizman's conception, outlined in *Mengele's Skull: The Advent of a Forensic Aesthetics* (2012), further highlights that, in the context of law, particular knowledge claims are preferred. The human remains' "appearance and presentation in the courts of law and public opinion has in fact blurred something of the distinction between objects and subjects, evidence and testimony."[108] Forms of knowledge that reside outside accepted boundaries of evidence, in this instance, the oral history and religious belief system of the Umatilla Tribes, are placed in stark contrast to scientific methodologies, a portion of which have since been shown to be disproved by later research.

In the US, for the body to be repatriated to the Indigenous Tribes under NAGPRA, certain cultural affiliation requirements must be met. Specifically establishing affinity through kinship, geography, or language with a current Native tribe. While proving affiliation through genetic means may seem less political and technically complex, this is not the case. These forms of understanding preclude knowledge outside what is recognised by law. Kim Tallbear states that while "new research might promise to validate Native American

[106] McGovern Institute, "Genome Editing with CRISPR-Cas9," YouTube video, 2014.
[107] Khalil, Khalil, and Polys, *Violence of a Civilization*, 2017.
[108] Thomas Keenan and Eyal Weizman, *Mengele's Skull* (Berlin: Sternberg Press, 2012).

ancestry by using science to legitimise our claims, we also risk ceding our control of tribal identity to research institutions and their interests."[109]

In the initial 2004 ruling in favour of the forensic anthropologists, oral histories were overridden by the preliminary work of archaeologist and palaeontologist Jim Chatters (and others) in both the court of media and law. The artists signal those ideas of worth, value, and meaning were placed in a mutually exclusive relation to Indigenous religious and cultural understandings. This category mistake lies in the definition and conditions of appropriate knowledge and how these must be materialised to determine cultural affiliation. NAGPRA states that cultural affiliation is "a relationship of shared group identity which can be reasonably traced historically or prehistorically between a present-day Indian Tribe or Native Hawaiian organisation and an identifiable earlier group." [110] Disciplines and arguments through which historical tracing occurred in the 2004 court case were based on academic understanding within a prescribed domain.

The mediation of *Kennewick Man's* remains through forensic knowledge is entangled with scientific claims derived from data-oriented research, which contrasts with the Indigenous lifeways depicted in *The Violence of a Civilization Without Secrets.* Rather than linking forensics with truth, the artists suggest that this method represents an act of worlding. This is illustrated through appropriated footage depicting the facial reconstruction of *Kennewick Man,* where the creation of a face from ancient bones involves empirical modelling and interpretive art, reminiscent of other forms of figurative sculpture.

In a 1998 press conference surrounding the initial discovery, Jim Chatters stated that, to his surprise, the reconstructed head determined from *Kennewick Man's* skull was unexpectedly reminiscent of the actor Patrick Stewart.[111] The reconstruction by Chatters was also considerably different from the later 2014 attempt by Doug Owsley, a physical anthropologist at the *Smithsonian Institution's National Museum of Natural History*, based

[109] Intellectual Property Issues in Cultural Heritage, "Kim Tallbear: Science and Whiteness," YouTube video, 2016.
[110] *Native American Graves Protection and Repatriation Act*, Public Law 101-601 (1990).
[111] Associated Press, "Sculptor's Model Fleshes Out Ancient Face," *Los Angeles Times Archives*, February 15, 1998.

on the assumption that the Ainu people of Japan were among *Kennewick Man's* closest living relatives.[112] The hypotheses surrounding race seem to have influenced the outcomes of these processes and techniques even after the empirical process of fleshing out the foundational ligature.[113] However, in 2016, after a successful DNA test of the remains, this assumption was proved inaccurate as the sequencing confirmed *Kennewick Man's* closest living relatives to be Native Americans, based on DNA donated by members of the Colville Tribe. However, before the 2016 DNA test results were published, Kim Tallbear stated that from an Indigenous perspective:

"With or without genetic evidence, we know that Kennewick man walked North America – what is today Washington state – 8,500 years before European Colonialization…verifiable links to non-Americans anywhere in the world would also be interesting, but they could not be interpreted as conclusive of the lack of a cultural or biological relationship between Kennewick Man and the ancestors of living Native Americans"[114]

Having established the specific narrative and context through the presentation of appropriated CBS documentary footage depicting a re-enactment of the handling and extraction of *Kennewick Man's* skull from the banks of the Columbia River, the film cuts to a computer-generated rendering of a skeleton. The skeleton, which rotates in virtual space, appears to be in mourning, holding its head (the skull) in its hands. This visual is coupled with a voice reciting the dictionary definition of prosopopoeia, referenced by Eyal Weizman and Thomas Keenan in their analysis of debates surrounding the forensic process determining the identity of Joseph Mengele's remains through photographic source data, among other means.[115] In this context, reference is made to forensic anthropologist Clyde Snow's approach towards bones: "in the manner of a rhetorician employing the trope of prosopopoeia—the figure that artificially endows inanimate objects with a voice—he refers to skeletons as if they were both alive and speaking and gifted with a special capacity for truthfulness."[116] The

[112] Douglas Preston, "The Kennewick Man Finally Freed to Share His Secrets," *Smithsonian Magazine*, September 2014.
[113] Caroline Wilkinson, "Facial Reconstruction – Anatomical Art or Artistic Anatomy?" *Journal of Anatomy* 216, no. 2 (2010): 235–50.
[114] Kimberly TallBear, *Native American DNA: Tribal Belonging and the False Promise of Genetic Science* (Minneapolis: University of Minnesota Press, 2013), 157.
[115] Thomas Keenan and Eyal Weizman, "Mengele's Skull: From Witness to Object," *Cabinet* 43 (2011): 10–15.
[116] Keenan and Weizman, "Mengele's Skull," 2011.

materiality of the remains is presented as an agential force—an idea often negated in data analysis—which underscores the necessity of expanding our understanding of how scientific processes function through computational image-making, a key focus of Chapter 03 of this text.

Through engagement with narratives created from a collage of materials and academic references, the artists invite us to view the knowledge claims surrounding *Kennewick Man* as equivalent to what Baudrillard references as a "precession of simulacra." [117] The bones in this context seen as constructed representatives of linguistic meaning. This interpretation of the remains negates the material agency of the bones, according to Snow's understanding. Positing this idea of *forensis*, the artists contend that despite the dominance of institutional knowledge in rendering a particular onto-epistemological position within disciplinary boundaries, something essential remains specific to the materiality of this human's remains. This vestige or residue is present despite positionality within an overarching ideological construct, defining the bones as subjects within a particular conceptualisation. As Keenan and Weizman state, "Human remains are the kinds of things from which the trace of the subject cannot be fully removed." [118]

Building on this, Khalils and Polys highlight an oppositional relation through which human remains may be subjected in the context of the law. The speaking subject, as posited by the testimony, is relational in autonomy and agency to inanimate objects, which may be classified as evidentiary artefacts. Returning to Keenan and Weizman, the artists quote that the usage of forensics is not confined to science as a theoretical discipline but necessitates consideration of the materiality of the object as part of an evidentiary system of knowledge. The emphasis on *prosopopoeia* becomes the act of giving voice to the remains, where "a person or a technology must mediate between the object and the forum, to present it and tell its story."[119]

[117] Jean Baudrillard, *Simulacra and Simulation*, trans. Sheila Faria Glaser (Ann Arbor: University of Michigan Press, 1994), 10.
[118] Baudrillard, *Simulacra and Simulation*, 1994, 10.
[119] Keenan and Weizman, "Mengele's Skull," 2011.

These human remains may fall into what Susan Schuppli references as the operational concept of *material witness*. Through this positionality, they constitute an assemblage of "non-human entities and machinic ecologies that archive their complex interactions with the world, producing ontological transformations and informatic dispositions that can be forensically decoded and reassembled back into a history." [120] The complexity of the bones lies not only in their constitution but also in how their materiality interacts with knowledge systems, including understandings posited through scientific processes.

Khalils and Polys argue that, although these objects have material, cultural, and social potency in their historic or normative usages and experiences, the museum's presentation seeks to unify artefacts through an enlightenment or colonialist framing. They state that the museum determines the positionality of the artefact to the extent that "everything is turned into an object – no matter if it is a piece of the earth, an ivory tusk, the shell of a tortoise, or human remains."[121] The problem lies in how display systems inhabit imperial power within the museum, violently flattening cultural specificities without considering other forms of agency. However, as contended in *Un-Documented: Unlearning Imperial Plunde*r (2021) this does not imply a lack of potential agency in the items on display, but rather highlights the agency inherent in the forms of mediation themselves.

The impact of flattening objects from the specificities of their lifeworld into other determined settings, particularly within a schema dictated by the museum in *The Violence of Civilization*, directs us to the apparent supremacy of one system of knowledge over another. Jean Baudrillard analyses this act as being at the heart of the destructive nature of scientific and anthropological processes, where the subject is destroyed through systems of academic study and public display.

In Baudrillard's argument, the artefact (in his example, the mummy of Rameses II) resides outside the symbolic order and is preserved eternally. However, the processes of exhibition display represent an act of "extermination by museumification,"[122] as the body's symbolic potency within the Ancient Egyptian lifeworld is negated and transgressed through

[120] Susan Schuppli, *Material Witness* (Cambridge, MA: MIT Press, 2020).
[121] The Center for the Humanities, "Culture Capture," Vimeo video, 2016.
[122] Baudrillard, *Simulacra and Simulation*, 1994, 10.

inclusion into the museum's specific taxonomic system, as well as forensic anthropology, history, and archaeology as academic frames of interpretation. This is not a comment on the differences between modern conservation techniques and those used in the mid-1970s but rather a reference to the violence of effacement. Baudrillard emphasises the hierarchical understandings of knowledge in museum preservation processes, contrasting claims of the object based on their own cosmology (in this case, ancient Egyptian beliefs) with the current, overriding narrative of history based on contemporary scientific methodologies. He further posits that lifeways other than those quantifiable and understandable by current academic discourse are excluded in the pursuit of transparency and universal forms of knowledge and interpretation.

"For mummies do not decay because of worms: they die from being transplanted from, a prolonged symbolic order, which is master over death and putrescence, on to an order of history, science and museums - our own, which is no longer master over anything, since it only knows how to condemn its predecessors to death and putrescence and their subsequent resuscitation by science. An irreparable violence towards all secrets, the violence of a civilisation without secrets. The hatred by an entire civilisation for its own foundations"[123]

In *The Violence of a Civilization Without Secrets,* concerns about the effacement of symbolic orders belonging to non-Western societies are depicted as being perpetuated within the universal claims of the museum space. While the first chapter of this text argues that objects in museums possess an active form of potency—replacing the notion of the thing as 'dead' with the view of objects as having agency while awaiting their return to their people—the current condition of these objects, in terms of their relational and symbolic effacement, remains a significant factor as a narrative of subjection. The visual narrative of the film highlighting how mass media outlets, sensationalist documentaries, and museum displays construct meaning through a specific lens. The film compares the dramatic reconstructions of events surrounding *Kennewick Man's* discovery, forensic reconstructions of his face, and sculptural dioramas portraying Native American life at the *American Museum of Natural History* to acts of desecration. This is especially relevant in how the

[123] Baudrillard, *Simulacra and Simulation*, 1994, 10.

material remains of Indigenous Americans, in both historical and contemporary contexts, are treated as symbolic of a broader erasure of Indigenous cultures.

Through this comparison, the video posits that this attempted erasure is also enacted through recreation, replication, or simulacra, whether via forensic anthropology, news channels, or the systems of display in museum spaces. The accumulation of material through these forms facilitates a wider condition of imperial society, where "the museum functions as a trophy case to exhibit the settler colonial power's most prized possessions."[124] It is primarily through lens-based media that this is experienced. Despite claims to universality, it is still an experience where invested parties, such as members of Indigenous American communities, may be excluded from discussions and interactions regarding the ancestral significance and religious importance of material culture and human remains.

The artists in the film state, referencing Baudrillard, that these processes of collection are the lynchpin of contemporary Western existence, as our "entire linear and accumulative culture collapses if we cannot stockpile the past in plain view." [125] The necessity of displaying objects is posited as an inherent function of Western society itself. The work asserts that translating knowledge and ideas into visual form is central to how meaning is created for visitors through museum displays. However, it also signals that the issue is not only the taxonomised, collected, and displayed objects, artefacts, and remains, but the structure of how meaning is created in a wider societal media context, with the museum serving as a microcosm. In this instance, human remains, according to forensic science, are more real to the museum than Indigenous American accounts of oral history. This represents a type of worldbuilding that prefers dominant forms of academic debate to the exclusion of others, as in the context of the law, "only forensic anthropologists have the right and authority to speak for them." [126]

At the end of the film, we are again directed towards the specificity of acts of spectatorship enacted in the museum space, first posited at the start through the camera's first-person

[124] Khalil, Khalil, and Polys, *Violence of a Civilization*, 2017.
[125] Baudrillard, *Simulacra and Simulation*, 1994, 10.
[126] Khalil, Khalil, and Polys, *Violence of a Civilization*, 2017.

perspective navigating the *Northwest Coast Hall* of the *New York Museum of Natural History*. However, in this latter instance, the viewer is placed in a reflective position, observing an exaggerated performance. Our focus is on two people investigating the *Spitzer Hall of Human Origins*, wearing grotesque balaclava-like masks that veil their identities. Within the performance, there is a sense that visitors in this space are complicit in the continuation of the hierarchies of the museum through ghoulish forms of attentive viewing. The visitor is not simply a benign and unwitting participant in cultural exchange but is a culpable agent in the power imbalance highlighted throughout the film. The requirement for knowledge claims made in the museum to be consumed through visitor interaction is viewed as part of the effacement systems of categorisation and display enact on the objects within its walls. Furthermore, it is implied that without this type of consumption, the museum would be unable to fulfil one of its primary functions: transferring the meaning gained through academic study, research, and curatorial aim to a public audience.

The two human performers, whose faces are covered in fleshy latex, performatively inhabit the role of the museum visitor. The performers viscerally appear to want to consume the objects on display, at times seeming to sniff at them in their act of intensive but quizzical looking. In this role, there is an echo in the relationship between the objects exhibited and the performance, between artefact and human body. When the performers' attention shifts to a series of models showing the forensic process of fleshing out a reconstruction of a Neanderthal skull—from bone to the inclusion of muscle ligature, to a fully formed face, to the inclusion of hair—we hear the whisper, "Memory is not a container for information, but a perpetually emergent process." This reference, taken from Ina Blom's 2016 text *The Autobiography of Video*, [127] is important to unpack as it implies a further conceptual reference that accounts for the becoming of experience in a Bergsonian sense.

The quote, taken from a section of text in which Blom aligns with Henri Bergson's position in *Matter and Memory*,[128] is part of her analysis of video practice, arguing that memory is a

[127] Ina Blom, *The Autobiography of Video: The Life and Times of a Memory Technology* (Berlin: Sternberg Press, 2016), 76.
[128] Henri Bergson, *Matter and Memory*, originally published as *Matière et Mémoire* in 1896, trans. Nancy Margaret Paul and W. Scott Palmer (New York: Zone Books, 1991).

process where the past is continuously conserved. The experience of memory at any given moment is an experience of difference because the present is ongoing, continuous, and unrepeatable. Moments accumulate over time; thus, recognition of the past is an emergent process. In this argument, the idea of a singular, fixed memory is impossible, as each memory is experienced in the ongoing present. This process, in Blom's conceptualisation is seemingly made tangible in works of art that utilise moving image technologies.

If we inhabit Blom's argument further in reference to Khalil and Polys' film, there is an understanding whereby Bergson's idea of the accumulation of moments may be applied. In Blom's interest in the concept of *feedback*[129] in early video works, she interlinks the idea of memory with *constant generation*[130] in moving image. As a result, rather than viewing the experience of video works as being in a constant, stable state, Blom proposes that "memory is quite simply a force of retention at work in all perception and sensation, carrying past materials across the temporal divide that installs itself even in the articulation of the syllables of a single word."[131]

If this lens is applied to the contextualised subject of Khalil and Polys' film, the moment of encounter, both within the museum space and in the context of new media, is considered a continually changing experience. Any notion of fixed, indelible meaning or knowledge necessitates further negotiation due to the changing conditions of the present. While there is acceptance in the institutional museum space that forensic anthropology may reveal new discoveries and further research within a particular field will illuminate current understanding of texts, artefacts, and bodies, this moment of encounter is perhaps negated in importance. Just as the enactment and re-enactment of different positions towards the material remains of *Kennewick Man* proved problematic over time through various expertise, contexts, institutional positions, and knowledge claims, so too will visitation and reassessment of the material condition on display in the museum posit new meanings, particularly regarding the questions being asked and by what means.

[129] Blom, *The Autobiography of Video*, 2016, 15.
[130] Blom, *The Autobiography of Video*, 2016, 15.
[131] Blom, *The Autobiography of Video*, 2016, 15.

The conceptualisation of digital imaging processes in this text resonates with the way the artists highlight the complex relationship between the film's formal construction and editing, and issues of restitution, knowledge, language, and positionalities shaped by notions of cultural heritage. Different agential forces, both within and beyond the museum space, as highlighted by Khalil and Polys in their discussion of Kennewick Man's treatment, underscore the urgency of addressing debates surrounding the use of computational imaging technology in this context. This is particularly relevant in considering how new forms of 3D images, often considered equivalent or relational to artefacts of other materials, people, and things, are conceptualised in cultural heritage projects involving *digital repatriation*. [132]

Key to these debates is the establishment of relations and ideas of ownership between bodies, objects, and sites with living people and lifeways. In the context of ancient societies, this becomes a particularly contested set of issues, often predicated on ideas of ownership and legal rights. Furthermore, how these operate in relation to new forms of technical images, frequently produced within the museum context, complicates these discourses. The inclusion of CGI stock footage of a rotating skull in the film is particularly important in this context, as it alludes to the indeterminate state of the human remains. Though not explicitly a digital image derived from a capture process—the dominant focus of this thesis, where images are created through the import of electromagnetic sensor data and transformed through computation—it bears a striking visual resemblance to computational image forms such as photogrammetry. However, in the film, the use of these forms acts analogously to the application of scientific forensic data to form a narrative of *Kennewick Man's* remains.

The video echoes this text's broader argument that certain types of computational image, when positioned in the context of museum display systems, are embedded in problematic claims to knowledge with broader implications than the institutional intentions of circulating research. The artwork tacitly signals the need for a more comprehensive understanding of

[132] Kimberly Christen, "Opening Archives: Respectful Repatriation," *The American Archivist* 74, no. 1 (2011), 187.

how new forms of technology are utilised in the museum space, the complicated position visitors are placed in, and the circumstances that highlight these issues.

This line of research raises several important questions. Do new forms of digital image mediation similarly transform culturally significant artefacts, with their own lifeworld, into objects through a singular computational language? If so, how might alternative forms of understanding be integrated? Is the act of creating a digital image through computational processes inherently an act of oppression or violence? Additionally, does the computationally created image, by producing equivalency between subject and mediated object, negate other forms of agency within the museum space? The visitor's role in reinforcing the museum's claims is also significant. How might practices employing new imaging technologies be directed towards purposes beyond extraction? These questions are particularly relevant to broader debates on the function of imaging technologies in museums and the intersection of computational processes with the institution's agency, as well as the integration of alternative knowledge systems within this space.

The composite and entangled assemblage of source material used in *The Violence of a Civilization* engages in forms of defamiliarization and bricolage, reminiscent of the experience of the internet. In this experience, strange and complex equivalences are made through processes of browsing. While this contextual form of mediation is not explicitly referenced in the film, viewing the work outside of a film festival or gallery space tacitly invites this comparison. Indeed, the research completed in creating this text has involved similar dissection and recreation. The video itself, as well as all the source material constituting the film, is available on video sharing platforms, and the segments of texts quoted, though not explicitly cited in the film, are accessible through search engine queries.

Analysing the film reverses the process undertaken by the artists during its creation, rendering this text an act of reconstruction. Writing becomes intertwined with a computational search process, further developed through phenomenological practice with documentary forms of digital image-making that enact and perform the role of a visitor within the museum space. Practice-based research within the museum space requires

sensitivity to how the context of display can be reinterpreted. As shown in the construction of Khalil and Polys' film, this work necessitates engaging with the entangled relationship between institutional knowledge claims, the gaze situated through display systems, and being attentive to the positionality inhabited in this space. These concerns are contrasted with the relationality used to establish the apparent natural, complete, and authoritative positioning of the universal museum, in terms of the languages and academic knowledge claims made with and about the artefacts within the building.

What is highlighted in the film is that visitors are not only implicated in the relations established with the institution but also in relation to the role that external agents play in perpetuating messages and claims made using certain types of academic research consumed through mass media. This is particularly important in understanding how display systems are designed to operate within specific parameters, as well as how intervention through practice-based research can form a position in this space. What has thus been foregrounded are the ways in which wider infrastructures and histories that exist outside of the narratives perpetuated in the museum space are either explicitly acknowledged or tacitly accepted as having agency in the creation of knowledge. However, as practice-based research engages with the embodied experience of the museum, a negotiation takes place between ideas and positions that may be unconsciously overlooked in the institution's display of research. In this site of contestation, as explored in Chapter 01 of this text, it is important to highlight the ideological claims made through the systems of display.

Practice-based research can be used to broaden understanding of the museum, particularly in the use and experience of imaging technologies co-opted from a variety of other functions and contexts to present knowledge claims made through the construction of the space. However, less research has been done in understanding how different forms of lens based and computational image making act in the communication of these forms of message. So, to determine the agential role of digital images in this context and how they act in relation to the entangled relations established both through the positionality of the researcher and the methodology employed is necessary. This is in combination with understanding how the museum may be viewed through new forms of computational lens and to what extent imaging technologies encase people and things within the particularities

of their framing. How can practice determine the agential role of computational images in this space and their interaction with the entangled relations established through the researcher's positionality and methods? And under what conditions?

Universal Museum Space as a Nacropolitical Institution Entangled with Technology

Achille Mbembe's concept of *necropolitics* is useful for understanding both how the conditions of the museum are established and the power structures within which digital imaging technologies operate. His analysis reshapes the frames of reference and develops an understanding of how technologies function within contested spaces, particularly by extending beyond the limitations he identifies in the questions and conditions established by Martin Heidegger's work.

Mbembe introduces his concept of the museum through discussion of the necropolitical, specifically referencing the imperial practice of creating human zoos, such as the 'Congo Village' at the 1958 Brussels World's Fair. Mbembe compares these practices, which closely resemble conditions of the transatlantic slave trade,[133] to the power structures of managing wild animals. Firstly, he draws a parallel between human zoos and animal zoos, noting that people were abducted, captured, and confined, their existence controlled by "assigning them to a vast subdivided enclosure, if required, into several mini-ecosystems."[134]

Secondly, both human and non-human animals in these zoos were subject to implicit prohibitions against being killed; they were preserved for other purposes, particularly that of visitation. Mbembe highlights that, while the exhibit's body retains its flesh, it is no longer seen as mere meat for the purpose of consumption. Instead, it is reduced to a specimen for extraction or display to be viewed in comparison with other exhibits. Thirdly, within the zoo, entities are not considered tamed or cohabiting with humans in domestic spaces. They remain separate from human conditions of domesticity but are subjected to the aesthetics and governance of the space. Although perceived as existing in an artificially created pristine state, they are more closely related to notions of otherness or the exotic

[133] Achille Mbembe, *Necropolitics*, trans. Steven Corcoran (Durham, NC: Duke University Press, 2019), 161 – 166.
[134] Mbembe, *Necropolitics*, 2019a, 167.

than to the conditions of those who view them. The affective relationship established by the zoo's structure creates a distance between the exhibit and the visitor, which is essential for the act of exhibition. Mbembe argues that "exhibition is permitted by this distance, as exhibition makes no sense except in the separation between the spectator and the exhibited object." [135] Thus, Mbembe contends that those displayed in colonial human zoos of the 19th and 20th centuries existed in a state neither fully human nor mere objects but living in a condition whereby their humanity was suspended.[136]

This state of being in-between parallels Azoulay's concept of the shutter and the idea that the evolution of advanced technologies depends on the extraction, suppression, and segregation of bodies, places, and things deemed 'other.' The rights of subjugation are granted to institutions as well as to individuals considered citizens, in the exercise of power and sovereignty. This positionality is reinforced through technological advancement, which, as Ramon Amora comments, "enables the spatiotemporal repositioning of the Other into new sets of social, economic, and political relations."[137]

In his interpretation of Mbembe, Amora further asserts that structural inequalities are created, allowing those deemed dominant within prescribed norms to control the conditions of life for those outside these structures.[138] The consequences of such domination are important to examine, as Amora argues that violence and subjection "are articulations of the colonial imaginary, and are furthermore predicated on the blueprints of fragmentation, identity, and death as necropolitical consequences of imperialist ideas." [139] These forces influence how technology is used to perpetuate and regularise forms of subjection under the "colonial fantasy of sovereignty." [140] However, there remains potential in technology to address individuated lived experiences and to reconstruct conditions of socialised space.

[135] Mbembe, *Necropolitics*, 2019a, 167.
[136] Mbembe, *Necropolitics*, 2019a, 167.
[137] Ramon Amaro, *The Black Technical Object: On Machine Learning and the Aspiration of Black Being* (Berlin: Sternberg Press, 2022), 31.
[138] Amaro, *The Black Technical Object*, 2022, 31.
[139] Amaro, *The Black Technical Object*, 2022, 31.
[140] Amaro, *The Black Technical Object*, 2022, 32.

Returning to the concept of the human zoo, Mbembe draws a comparison between this and the museum, as well as the figure of the enslaved, describing them all as a "theatre of appearing."[141] He argues that a critical focus on the museum requires an examination of the relationships established between bodies, positionality, and historical reference. Mbembe further posits that the museum itself is a producer of artefacts. Its violence is situated in a regime of taking life, where displays exhibit "objects deprived of their breath and returned to the inertia of matter."[142] Expanding on Foucauldian notions of biopolitics and the "right to be alive,"[143] Mbembe describes the museum as a necropolitical institution, where systems of "(m)ummification, statuefication, and fetishization"[144] all correspond to logics of separation. This argument contests Azoulay's articulation that objects in the museum retain poised to re-enter their lifeworld, but it is crucial to this research, particularly in the context of debates regarding restitution. It extends the sovereignty of the museum space into other power structures, linking it intrinsically to the use and development of new imaging technologies for the perpetuation of rhetorical positions.

Mbembe argues that while museums ostensibly invite engagement with the idea of universality, historically, they have not presented humanity as a unified whole. Instead, the museum's framework has perpetuated concepts of separation that have been strongly entrenched since the institutions' inception. He attributes this to the ways in which knowledge and power have been conceived, particularly regarding the humanities' role in shaping discourse. Northern European and American perspectives have been naturalised and privileged, while those of subjugated peoples have been subjected to different and more oppressive frameworks. As Mbembe notes, subjugated knowledge and peoples have "always adhered to certain elementary rules of injury and violation."[145] The oppression embedded in the processes of taxonomy and classification dictates how cultural artifacts, often obtained through violence, are presented and displayed. Mbembe further explains that this is rooted in the belief that "because different forms of humanities have produced different objects and different forms of culture, these objects and forms of culture should

[141] Mbembe, *Necropolitics*, 2019a, 171.
[142] Mbembe, *Necropolitics*, 2019a, 171.
[143] Michel Foucault, *Society Must Be Defended: Lectures at the Collège de France, 1975–76*, ed. Alessandro Fontana and Mauro Bertani, trans. David Macey (London: Penguin Books, 2004), 240.
[144] Mbembe, *Necropolitics*, 2019a, 171.
[145] Mbembe, *Necropolitics*, 2019a, 171.

be placed and exhibited in distinct places and assigned different and unequal symbolic statuses.'[146]

Dan Hicks, the current curator of World Archaeology at the Pitt Rivers Museum, applies this perspective to his own institution. His critique of what he terms the *Brutish Museum* highlights how modern ethnographic institutions, established through colonial violence, employ dominant categorisation methods that reinforce repressive practices. Hicks underscores that these methods must not only be unlearned but also re-examined and re-positioned. In his conceptualisation of the museum, and in relation to the idea of "necrography," [147] Hicks argues that the ways in which museums understand and present their collections are deeply problematic. He identifies two main issues that have emerged in museum studies since the 1990s, where engagement with the imperial legacies of these institutions has been hindered.

One form of discussion is rooted in the concept of object biographies, while the other concerns relational entanglements. Hicks argues that both approaches have hindered museums from addressing colonial violence and pursuing cultural restitution. He contends that viewing artifacts through biographical accounts means each new historical event adds to the object's narrative. This method calls for unpacking and the reinterpreting artifacts through re-contextualisation in academic research and curatorial practice. Instead of merely seeing digital image use as an extension of the historiographical biography of artifacts, it is thus important to challenge the linearity of this approach.

Although significant progress has been made in understanding material culture within anthropology through concepts like *the Social Life of Things*,[148] Hicks contends that this approach has been co-opted by the rhetoric of universal museum collections, while their policies and practices have remained largely unchanged. New curatorial projects and methodologies continue to narrate the coherence of objects as they transition through various historical contexts, yet they fail to acknowledge that this coherence relies on the

[146] Mbembe, *Necropolitics*, 2019a, 171.
[147] Dan Hicks, *The Brutish Museums* (London: Pluto Press, 2020), 33.
[148] Arjun Appadurai, ed., *The Social Life of Things: Commodities in Cultural Perspective* (Cambridge: Cambridge University Press, 1986).

museum's fixed structure. Consequently, this perspective perpetuates imperial systems of inequality. The emphasis on collection, display, and juxtaposition of global cultural heritage often results in objects being severed from their original contexts, locations, and communities, creating new, constructed forms of categorisation.

In the case of the Pitt Rivers Museum, which he feels epitomises the imperial ethnographic display, Hicks argues that the enduring processes from the museum's inception necessitate a reduction of form, creating "a kind of social evolutionary bricolage."[149] This approach separates the culture that originally contained the collection—in the Pitt Rivers' case, the ideologies of Victorian Britain—to allow for a narrative of imperialism that showcases "the progress of gradual material form and Western technological superiority."[150]

Despite the problematic nature of this narrativization, it is still widely accepted and defended within museum management, especially in debates surrounding restitution for colonial violence or the repatriation of looted cultural artefacts. For instance, in a 2019 interview with the Greek newspaper *Ta Nea* about the Elysium Marbles, Hartwig Fisher, then director of the British Museum, claimed, "When you move cultural heritage into a museum, you move it out of context. However, this is also a creative act."[151] Arguing that the museum context allows for a creative act does not mitigate the violence of acquisition, nor does it address how power is distributed to enable this creativity, or who benefits from it. Instead, it underscores the necessity of addressing and recounting the loss and death caused by these collections as a primary concern.

In Hicks's argument, the second issue impeding the effective restitution process in anthropology museums concerns notions of relationality. This is exemplified in the museum context through the reinterpretation of Latourian *Actor Network Theory* by theorists such as Alfred Gell[152] and Nick Thomas.[153] Building on earlier anthropological work, this concept critiques the dichotomy between Western academic thought and non-Western ideas,

[149] Hicks, *The Brutish Museums*, 2020, 168.
[150] Hicks, *The Brutish Museums*, 2020, 168.
[151] Mark Brown, "British Museum Chief: Taking the Parthenon Marbles Was 'Creative'," *The Guardian*, January 28, 2019.
[152] Alfred Gell, *Art and Agency: An Anthropological Theory* (Oxford: Clarendon Press, 1998).
[153] Nicholas Thomas, *Entangled Objects* (Cambridge, MA: Harvard University Press, 1991).

advocating for cultural hybridity and a reciprocal relationship between indigenous and Western knowledge. Hicks argues that this narrative is problematic if it ignores the moments where relationships are defined by separations rather than entanglements. He asserts that it is crucial to unpack and acknowledge the institution's role in ongoing imperial violence. According to Hicks, "museums bear witness when worlds fragment, networks are cut, paths are blocked, movements are forced, when instability is not just in words and ideas but in physical form."[154] Thus, the processes of museumification—including acquisition, storage, and display—must be critically examined to address these separations and their implications for restitution.

To this end, Hicks posits the concept of *necrography* as a useful framework for unpacking the complex conditions of things contained within museums. Hicks sees Mbembe's necropolitics expanding the concerns of the biopolitical from a focus on the living body to an account of neocolonialist oppression that includes the agency of infrastructure and nonhuman materiality. As Hicks interprets Mbembe, "necropolitical conditions can be made through attacks upon the nonhuman environment as well as just the human body." [155] This argument and positionality built upon the specificity of the bulldozer and Apache helicopter gunship in Palestine, used by Mbembe as descriptors of the necropolitical,[156] can be applied to encompass late-modern colonial occupation as "a concatenation of multiple powers: disciplinary, biopolitical, and necropolitical." [157] Hicks asserts that these conditions can be considered within the specific context of the museum, where the infrastructure of containment is also equated with extractive processes of separation.

The concept of engaging with a *necography* of the museum offers a way to account for and foreground the conditions that have allowed for systems of display to be established. In this method, it is necessary that the colonial museum be accounted for through forms of "forensic death-writing."[158] These may become exercises in contemporary archaeology in that they require an excavation of the museum in the present and necessitate a degree of

[154] Hicks, *Brutish Museums*, 2020, 29.
[155] Hicks, *Brutish Museums*, 2020, 29.
[156] Achille Mbembe, "Necropolitics," trans. Libby Meintjes, *Public Culture* 15, no. 1 (2003), 39-40.
[157] Mbembe, "Necropolitics," 2003. 29.
[158] Hicks, *Brutish Museums*, 2020, 33.

forensics to understand "the truth at the scene of a crime."[159] Through this way of thinking about objects, and particularly those looted and entangled with histories of enslavement and oppression, need further understanding than that of narrativization and a contemplative stance regarding the universality of human creativity.

The violence of naming, the acquisition of status within institutional hierarchies, and the concept of fixed, biographical understandings of objects and people all serve to perpetuate the current conditions of institutional knowledge and systems of display. These dynamics are also reinforced by new forms of imaging technology. Therefore, the aim of practice-based research in this project is to explore ways to act in the present and to question under what conditions interventions in the museum space are effective. However, it may not be the concept of forensics, as posited by Hicks with its focus on the crime scene, that is most relevant here. Instead, it may be more useful to consider the idea of *forensis,* as discussed in relation to *The Violence of Civilization Without Secrets.* In this framework, materiality becomes an operative agent capable of speaking. This materiality, potentially altered by the conditions of experience, is equally applicable to images generated through computational systems of data interpretation from sense-capture input.

Mbembe suggests that decolonial projects within academic institutions can be effectively conceived through the concept of *pluraversity*. This approach addresses conditions involving diverse forms of agency without extending Western models, which are often proliferated through global commerce. Instead, it advocates for a framework where knowledge claims are open and robust enough to accommodate various epistemic traditions. In this process, the human experience is neither abandoned nor downgraded but embraced through a "horizontal strategy of openness to dialogue among different epistemic traditions."[160] Developing new perspectives in this way helps place the human in relation to the universe, potentially incorporating a range of forces into our understanding of relationality.

[159] Hicks, *Brutish Museums*, 2020, 33.
[160] Achille Mbembe, "Decolonizing Knowledge and the Question of the Archive," in *Decolonizing the Curriculum*, ed. Shirley Anne Tate and Deborah Gabriel (London: Zed Books, 2020), 71.

He further argues that addressing the issue requires more than merely applying multiplicity to objects and artefacts in the museum, which he frames as a dialectic of difference and singularity. In this view, singularity should not be seen as a division between cultural or historical entities.[161] However, recognising singularity, especially in relation to trauma or the need for restitution, does not imply that such recognition is merely a matter of contingent difference or separation. Mbembe thus complicates the notion of restitution by emphasising the importance of the lifeworld of objects and their continued vitality when returned from Western museums and other institutions. If museums in other parts of the world merely replicate the conditions of Western imperial museum spaces, then the restitution may simply amount to a change in geographic location rather than a meaningful shift in the conditions affecting these artefacts.

The issue of restitution is intertwined with a priori ontological positions embedded in Western epistemic traditions, particularly where there is an assumed detachment between the "known from the knower."[162] This category mistake reflects broader issues concerning knowledge, which delineate the realm of human agency from the nature of the world as such. These traditions, originating from a separation between the human subject and the world of objects, are entangled with knowledge claims that privilege certain perspectives. In this relational framework, the knowing subject can "know the world without being part of that world"[163] and is believed to produce knowledge that is considered universal and independent of context.

Mbembe's argument about sovereignty can be applied to the context of the museum space, particularly when considering an artefact's lifeworld as existing both within and beyond human agency. In this framework, the implicit structures of the museum become exercises of sovereignty that control the mortality of artefacts, thereby defining "life as the deployment and manifestation of power."[164] This is further exemplified by the museum's claims to universality and encyclopaedic completeness. Echoing Edward Said, Mbembe

[161] Achille Mbembe, *Out of the Dark Night*, trans. Laurent Dubois (New York: Columbia University Press, 2021), 89.
[162] Mbembe, *Out of the Dark Night*, 2021, 56.
[163] Mbembe, "Decolonizing Knowledge," 2020a, 56.
[164] Achille Mbembe. *2003. Necropolitics. Public Culture, Volume 15, Number 1, Winter 2003. 12.*

contends that the notion of the universal is grounded in systematic processes of separation and categorisation based on specific academic logics. However, this process is often unacknowledged and naturalised through the languages used and the positions adopted regarding certain subjects.[165] Within this schema, the 'other' is effectively displaced from the narratives and histories of modernity.

For Mbembe, history becomes a means through which Western perceptions are imposed on those who are outside of empowered positions. This results in the displacement of actions and perpetuates "the idea that modernity grew and originated in the West and therefore removed the very question of the 'other' in History."[166] The implications of this perspective are that universalism is equated with Western academic frameworks that categorise alternative ways of knowing, thereby shaping how the world is viewed. Hicks further argues that this positionality must be critically examined in relation to the histories of violence embedded in museum collections. The focus should be on understanding the narratives of objects in both their current and historical contexts, rather than merely adding new biographical layers. Hicks asserts that we "need to understand these unhistories, these processes of taking life rather than adding new biographical layers, in order to make visible how much is unfinished."[167]

Mbembe argues that humans, as a species, have always been entangled with processes and histories extending deep into the past. From this perspective, the human species can be seen as having an agential role that is shared and entangled with various forms of material and living entities. Dualistic partitions between human thinking and that which exists outside of it, as well as the bifurcation between human and non-human, can no longer be defended. This is because existence involves populations of entities that "are unleashed in the world as autonomous actors in their own right, irreducible to representations, and freed from any constant reference to the human."[168]

[165] Mbembe, "Decolonizing Knowledge," 2020a, 90.
[166] Mbembe, "Decolonizing Knowledge," 2020a, 90.
[167] Hicks, *Brutish Museums*, 2020, 154.
[168] Mbembe, "Decolonizing Knowledge," 2020a, 79 – 80.

It is therefore necessary and urgent to develop new forms of knowledge that account for diverse approaches. Practices that utilise new forms of imaging technology have the potential to raise questions that highlight these conditions, but their effectiveness will be limited if they rely solely on dominant Western academic traditions, ignoring or minimising other methodologies, traditions, or archives. This is necessary because what constitutes knowledge and how it is determined are in a state of flux as new forms of imaging technology evolve, particularly with the development of computation that mediate how the world is seen, categorised, and understood. This process also reflects the broader epistemic condition that academic disciplinary boundaries are becoming increasingly blurred and may soon become obsolete. However, Mbembe notes that this current state is not necessarily a negative existential crisis.

"New bodies of thought are involving the rethinking the nature of knowledge itself, the nature of being, of matter, how degrees of agency are distributed across human and nonhuman agents. Contrary to various discourses on the crisis of humanities, the age is characterised by heightened curiosity and accompanying experimentation. "[169]

Mbembe's positionality challenges colonial knowledge processes that reinforce structures of dominance and domination. Projects of restitution and the imperial control of artefacts in the museum space are tied to the sovereignty of power. The capacity for control ultimately relates to the biopolitical imperative of deciding who (or what) can live and who must die. As Mbembe comments on the Foucauldian biopolitical in relation to racism, "in the economy of biopower, the function of racism is to regulate the distribution of death and to make possible the state's murderous functions."[170] Critique of certain claims often privileges instrumentalist views related to the Foucauldian nexus of power/knowledge. From this perspective, decolonial practices have been approached as disconnections or separations from dominant strands of knowledge consumption and dissemination. However, the problem lies in understanding "difference as a particular fold or twist in the undulating fabric of the universe—or a set of continuous, entangled folds of the whole."[171]

[169] Achille Mbembe, "Future Knowledges and Their Implications for the Decolonisation Project," in *Decolonisation in Universities*, ed. Jonathan Jansen (Johannesburg: Wits University Press, 2019), 244.
[170] Mbembe, *Necropolitics*, 2019a, 71.
[171] Mbembe, "Future Knowledges," 2019b, 242.

Understanding how these objects functioned within a defined lifeworld, what energies they served as repositories for and were able to release, the circumstances in which they did so, and their effects on matter and living beings, is complexified, as Mbembe concludes, because when "it comes down to it, all this knowledge is lost."[172]

With this problematic, Mbembe considers that the crucial question resides not solely in the return of cultural artefacts and restitution of material, which he defines as "an obligation whenever a conscious, malicious, and deliberate act of destruction has been undertaken against another's life."[173] Rather, it lies in a wider project regarding the restitution of meaning. This is particularly urgent as the knowledge associated with these material things may have been erased. In this likely situation, the question of who can compensate for the eternal loss of knowledge and how it could possibly be compensated becomes central. Therefore, what is necessary is a rethinking related to rectifying asymmetrical relations through the introduction of reciprocity and care, which Mbembe identifies as the condition of the anti-museum. According to Mbembe, the "anti-museum is not an institution but rather the figure of another place, one of radical hospitality."[174] This condition parallels Azoulay's invitation for undocumented peoples to become present in the museum space, "not to attend the opening of exhibitions of objects extracted from their communities, but to stay for a period of several years to help the museum make sense of its collections of objects from their cultures."[175] However, what becomes vital in this discussion is the correlation between the loss of knowledge and lifeways and the repositioning of knowledge through the context and understanding of technology.

Planetary Entanglement, the Condition of Computational Images, and Mbembe's Reading of Heidegger

Mbembe sees technology as intrinsically linked to the construction of power, enacted through processes of categorisation, separation, and naming perpetuated by the imperial

[172] Mbembe, "Future Knowledges," 2019b, 168.
[173] Mbembe, *Out of the Dark Night*, 2021, 171.
[174] Mbembe, *Necropolitics*, 2019a, 172.
[175] Ariella Aïsha Azoulay, "Imagine Going on Strike: Museum Workers and Historians," *e-flux Journal*, no. 104 (2019).

authority of the humanities. The conditions of the museum and its objects are similarly subjugated through these processes. Thus, the agential role of computational image-making in current forms of discussion becomes crucial to consider, highlighting the interconnectedness of display contexts and the onto-epistemology of technology. Mbembe argues that understanding how processes of vision operate is essential, as they are instrumental in determining not only what is seen but whether something can be envisaged at all. Technology, therefore, becomes entangled with the determination of what can be known: "just as they recalibrate the relationship between visual imaging and truth, or the role of automated machines in the production of human knowledge." [176]

Starting with an analysis of technology through Martin Heidegger, Mbembe proposes that modern life is marked by technological escalation, which he describes as "planetary entanglement."[177] This process, while initially appearing to enhance global connectivity, is also entangled with acts of separation and systems of power. He states that worldwide, "the combination of 'fast capitalism', soft-power warfare, and the saturation of the everyday by digital and computational technologies has led to the acceleration of speed and the intensification of connections."[178]

To understand this condition requires rethinking how technology is implicated in our lives. This is particularly evident in the ways Heidegger's philosophy, as articulated in his essay *The Question Concerning Technology* (1954), needs reconsideration. Mbembe interprets Heidegger's view of technology as having a "double essence." [179] First, as i*nstrumentum*: a means to a defined end and, secondly anthropologically, as an activity performed by humans. [180] Heidegger's interest in technology is as a way of thinking or "a mode of revealing."[181] In Heidegger's text, this mode is where "revealing and unconcealment take place, where *aletheia*, truth, happens."[182] Heidegger sees technology as revealing the conditions necessary for freedom and truth, which depend on specific, attentive contexts.

[176] Mbembe, *Out of the Dark Night*, 2021, 23.
[177] Mbembe, *Necropolitics*, 2019a, 93.
[178] Mbembe, *Necropolitics*, 2019a, 93.
[179] Mbembe, *Necropolitics*, 2019a, 93.
[180] Martin Heidegger, The Question Concerning Technology and Other Essays, trans. William Lovitt (New York: Harper Perennial Modern Thought, 2013), 5.
[181] Heidegger, *Question Concerning Technology*, 2013, 12.
[182] Heidegger, *Question Concerning Technology*, 2013, 13.

But Mbembe questions what is proposed to be at stake, particularly the nature of these conditions in Heidegger's framework, and whether technology itself is the event through which they.[183]

For Heidegger, technology involves an intervention into presence where bringing-forth "brings out of concealment into unconcealment." [184] This mode of "revealing"[185] is where "truth"[186] or "correctness of representation"[187] occurs. The human relationship with technology is thus tied to a concept of "freedom"[188] and, in Heidegger's terms, to "truth"[189] which are considered intrinsically and inextricably linked. Heidegger's question of technology hinges on freedom as the foundational position from which it must be posed. In this context, freedom governs "the free space in the sense of the cleared, that is, the revealed."[190] To fully engage with technology as a site of "unconcealment,"[191] Heidegger emphasises that to determine how we can respond to its essence in its current state is by experiencing it "within its own bounds."[192]

Heidegger contends that technology's essence is not equivalent to its manifestations or technical apparatus. For instance, the underlying essence that pervades all digital images derived from sensor data input is not the same as the experience of engaging with those images themselves. Heidegger argues, the essence of technology "is by no means anything technological."[193] This assertion, which distinguishes between a universalised concept of things and their specific sensual qualities and conditions, establishes, for Heidegger, how we should engage with technology. According to Heidegger, the essential experience of technology occurs in the "open" [194] synonymous with his understanding of freedom and truth. In this space technology is neither confined as a compulsive pursuit in itself, nor pushed forward merely as an *instrumentum*.

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[183] Mbembe, *Necropolitics*, 2019a, 94.
[184] Heidegger, *Question Concerning Technology*, 2013, 13.
[185] Heidegger, *Question Concerning Technology*, 2013, 13.
[186] Heidegger, *Question Concerning Technology*, 2013, 13.
[187] Heidegger, *Question Concerning Technology*, 2013, 12.
[188] Heidegger, *Question Concerning Technology*, 2013, 25.
[189] Heidegger, *Question Concerning Technology*, 2013, 13.
[190] Heidegger, *Question Concerning Technology*, 2013, 13.
[191] Heidegger, *Question Concerning Technology*, 2013, 4.
[192] Heidegger, *Question Concerning Technology*, 2013, 4.
[193] Heidegger, *Question Concerning Technology*, 2013, 4.
[194] Heidegger, *Question Concerning Technology*, 2013, 25.

In this space Heidegger argues that "everywhere we remain unfree chained to technology"[195] it should neither be negated nor feared; rather, the most pressing concern is that it remains thoughtfully attended to in terms of its essence. The essence of technology relates to an understanding of "enframing,"[196] which demands neither blind development of apparatus nor a reactionary stance as if technology were "the work of the devil."[197] He asserts that while human experience is intrinsically linked to technology, considering technology as neutral makes us "utterly blind to the essence of technology."[198] However, according to Mbembe, Heidegger's thinking about technology is too narrowly defined and limited in scope relative to our global, fragmented present—a context Mbembe describes as a "time of planetary entanglement and technological escalation." [199] Heidegger's framework is deeply embedded in the traditional dichotomy between human and non-human, a perspective that Mbembe critiques. He notes that there is "no deep rupture between him and the tradition he inherits…that assumes there is a division between the technical world of humans and the world of non-human 'animals.'"[200]

These assumptions often overlook the prevalence of tool use among non-human beings and privilege a hierarchy of cognition associated with tool usage. This distinction, which separates the human world from the natural world, reinforces concepts of primitiveness, where the 'original human' is seen as living under the rule of animism.[201] Mbembe argues that this tradition is also entangled with the myth that the earthly *technosphere* was brought to life solely through human engagement, thus centring (some) human experience as free from a purely instinctual relation with the world.

Instead, Mbembe identifies two core anxieties at the heart of the tradition he sees Heidegger's understating of technology to operate and its impact on human existence in our increasingly technologically dependent world. The first anxiety concerns the role of

[195] Heidegger, *Question Concerning Technology*, 2013, 4.
[196] Heidegger, *Question Concerning Technology*, 2013, 4.
[197] Heidegger, *Question Concerning Technology*, 2013, 25.
[198] Heidegger, *Question Concerning Technology*, 2013, 4.
[199] The New School, "Borders in the Age of Networks," YouTube video, May 17, 2019.
[200] New School, "Borders," 2019.
[201] New School, "Borders," 2019.

apparatus created through human intervention—tools, machines, technological artefacts, and devices—that perform functions which either "replace human action or respond to human expression or sensation."[202] In our computationally mediated present, the boundary between apparatus and human operator is becoming increasingly porous, blurring the traditionally defined relationships between humans and objects. As Mbembe notes, this reflects the belief that "people invent things but that people are not things."[203] The anxiety being that in time the relationship between thing and human will be merged such that "things will take the place of people and people are treated like things"[204]

This problematic relationship is central to understanding how computational imaging technologies, derived from sensor-based data inputs and operating as extensions of knowledge, are reproduced within the universal or encyclopaedic claims of the museum space. Despite the interconnectedness of various forms of agency and infrastructure, a distinction remains between objects as images and objects in themselves. This distinction reflects a central anxiety: technological advancements, such as computational processes, may invert traditional roles between users of technology and that which is consumed by it. Guidelines for the display and treatment of human remains, which emphasise the need to regard them with care and as human rather than mere objects, are complicated by the context of computational images derived from sensory data of bodies created through medical imaging technologies such as Computed Tomography (CT) scans. This issue is particularly explored in relation to the condition of computational images made of human remains in the museum space in next chapter of this text, and through practice-based research in the *Docile Bodies Room* of the *Museum of Computational Image Artefacts (MoCIA).*[205]

The second anxiety, according to Mbembe centres around a nostalgic recollection of a fictitious time when humans could manipulate their environment at will. This form of relationality is considered to have been supplanted by engagement with computational

[202] New School, "Borders," 2019.
[203] Mbembe, *Necropolitics*, 2019a, 94-95.
[204] Mbembe, *Necropolitics*, 2019a, 95.
[205] Peter Ainsworth, "Museum of Computational Image Artefacts (MoCIA): Docile bodies Room," Available at: https://newart.city/show/museum-of-computational-image-artefacts-docile-bodies-room.

technology, which threatens to subjugate humans as they become "mere extensions of the tools originally intended to serve us."[206] Under previous conditions, agency was solely attributed to human action, but it is now increasingly supplanted by advanced, black-boxed technologies that require minimal human intervention. In this context, machines take on an agential role in knowledge creation, with human input becoming a minor component in complex, autonomous processes. This shift reflects a state where humanity feels dehumanised, as tools designed to serve human thought evolve into autonomous entities. Mbembe notes that this second type of anxiety "speaks to the loss of self-sufficiency and to the fear that industrial-technical objects are no mere tools, and furthermore, that they are now capable of inventing themselves independently of our intentions."[207]

Mbembe contends that the agency of images, particularly through the concept of *image capitalism*, can be regarded as a *techno-phenomenological institution*.[208] This concept highlights the profound effects of algorithmically produced computational images are having on the collective psyche and understanding of experience. For Mbembe, this is accounted for in the relationship between the image and the world outside of the image space, meaning that the "uneasy status as a double of the real and its power to excise time have their origins in a deep anxiety about what constitutes the real – an anxiety that has become a cornerstone of contemporary life."[209] This disparity between experience and its images reveals category mistakes and affects our understanding of the world, particularly through recent forms of imaging process.

Digital practices and computational images related to photography presented in museums can affectively engage new audiences by transforming how information is created, consumed, and digested by visitors. This transformation is linked to the prevalent use of mobile and computational technology in everyday life. Examining knowledge structures through computational technology in the museum space requires acknowledgement of the black-boxed functionality of this technology and the processes of engagement it involves. The mobile phone, a ubiquitous artefact of modern life, exemplifies this shift. Mbembe

[206] Mbembe, *Necropolitics*, 2019a, 95.
[207] Mbembe, *Necropolitics*, 2019a, 95.
[208] Mbembe, *Necropolitics*, 2019a, 23.
[209] Mbembe, *Necropolitics*, 2019a, 24.

notes that the "mobile phone is not simply an object of use. It has become a portable storage (grenier) of all kinds of knowledge and a crucial device that has changed the way people speak, act, write, communicate, remember, and imagine who they are and how they relate to themselves, to others, and to the world at large." [210] To support this claim, Mbembe references a 2014 interview where N. Katherine Hayles discusses the impact of new technologies on cognition, citing the widespread use of iPads in nursery schools in the US and Europe.

In her interview, Hayles argues that engagement with new technologies might alter cognitive processes, enhancing certain attributes while potentially diminishing others. Specifically, she suggests that the use of computational tools could "contribute to a technologically enhanced rewiring of children's brains towards hyperattention at an age characterised by high degrees of neural plasticity."[211] This rewiring might help children adapt to "the socio-technical systems we are currently shaping,"[212] but the full implications are not yet understood. Mbembe uses this to suggest that technologies might be reshaping our perception. Thus, how computational forms of images are employed and perceived becomes intertwined with forms of cognition. Given that these technologies are still developing, their impact on perception and experience is not fully known, making research and engagement in various contexts crucial. Understanding how imaging processes shape knowledge claims in institutions, such as through practice-based research in museums, helps frame the issues these technologies raise. However, this necessitates a clear understanding of how the technology is situated and defined from a historic perspective.

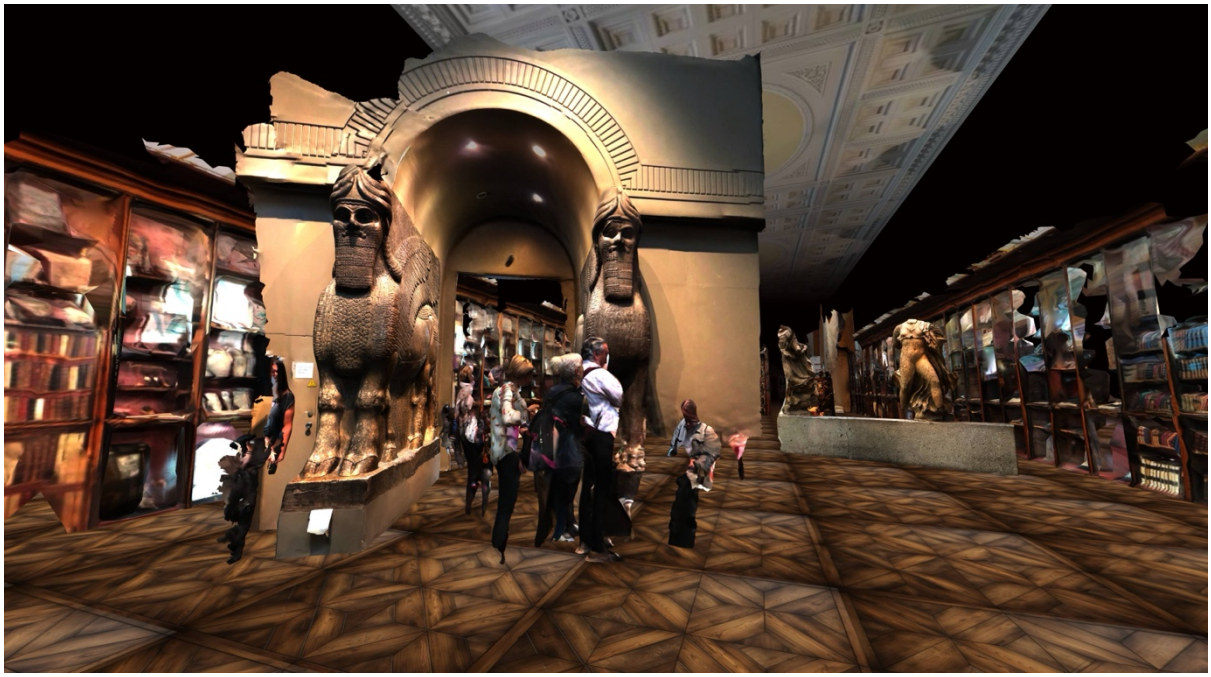
Humans are now more embedded in complex technological infrastructures than ever before. Current experiences are deeply intertwined with our embodied interaction with technical objects, especially mobile phones, which serve as a constant lens through which we perceive the world. Addressing this condition is urgent and necessary. If the museum is seen as a system of control, this text argues that the attentive use of mobile imaging technology may have an even greater impact on the conditions of embodied experience

[210] Mbembe, "Future Knowledges," 2019b, 249.
[211] Holger Pötzsch, "Posthumanism, Technogenesis, and Digital Technologies: A Conversation with N. Katherine Hayles," *Fibreculture Journal* 24 (2014), 172.
[212] Pötzsch, "Conversation with Hayles," 2014, 172.

than traditional display systems within this space. By examining the positionality established through, with, and by digital forms of image in the museum—particularly by analysing power relations through the lens of computation—overlaps and potential areas where conditions might be revised or reversed may be uncovered.

This approach may provide a more nuanced understanding of the infrastructures enabling computational forms of imaging technology to function. Rethinking how we sense and interact with these technologies can broaden our conceptualisation of how museums are understood, moving beyond universal, encyclopaedic, and imperial notions the museum operates through. The project's development thus focuses on reframing technology—especially computational image-making—to align with more pluralistic accounts of knowledge and the diverse languages and conditions used to present it. More urgently, the project considers how the activation of digital imaging processes relates to what Mbembe terms "planetary entanglement."[213]

[213] Mbembe, *Necropolitics*, 2019a, 93.



Museum of Computational Image Artefacts (MoCIA)

Link to the *Enlightenment Room* in New Art City.

https://newart.city/show/museum-of-computational-image-artefacts-enlightenment-room

Link to walkthrough video *Museum of Computational Image Artefacts (MoCIA) Enlightenment Room* on YouTube

https://youtu.be/brshTcn5UEw

Chapter 03:
Computational imaging, digital repatriation, and display of volumetric computational images in the Universal Museum.

Computational Images as Display Artefacts

The human remains known as *Gebelein Man A* were discovered at a site on the Nile 40 km from Thebes and acquired by the British Museum during an aggressive collection campaign of ancient artefacts at the turn of the 20th century, led by E.A. Wallis Budge, the then keeper of Egyptian and Assyrian antiquities. Budge's brief and non-specific account of the acquisition lacks photographs of the excavation. The image of *Gebelein Man A* in his publication depicts the remains as housed in the museum sometime after 1901 rather than as they were found at the site in Egypt.[214] In this image, *Gebelein Man A* is placed in a reconstruction of the grave-pit described in Budge's excavation account. However, this reconstruction is a shallow hole made of plaster painted to look like rock, with the body laid on a layer of sand. The current display in 2024 is not the original; the 1920s exhibit was more oval and deeper than the one now in Room 64 of the British Museum. However, in both historical and contemporary displays, the funerary objects described by Budge as "flint knives, earthenware pots, etc."[215] are positioned around the body.

The explanatory text within the rectangular glass display cabinet states that the items around *Gebelein Man A* are "typical of the Middle Predynastic period, about 3500 BCE, the time we think he lived."[216] All objects on display come from Gebelein, and some "might have come from his grave."[217] The visitor sees a scene resembling an archaeological site, where the body is presented in a state of equivalence. A connection is made between Gebelein, the burial period, and the British Museum context to frame the experience, emphasising conservation, care, and the body's perpetual preservation in this state.

[214] E. A. Wallis Budge, *By Nile and Tigris* (London: J. Murray, 1920), 361.
[215] Budge, *By Nile and Tigris*, 1920, 361.
[216] British Museum, "Gebelein Man: A Natural Mummy of the Predynastic Period, 3500 BCE," object label, Room 64: Early Egypt, British Museum, London.
[217] British Museum, "Gebelein Man," n.d.

These ideas, which imply the exhibit and display context as embodying protection and custodianship, align with many concepts associated with the public function of museums. The rhetoric of preservation often justifies their societal and cultural role, particularly in Western institutions and in debates on the restitution and repatriation of artefacts. This was important in Budge's time, as he states, "it is impossible for any mummy to be wrecked or mutilated in the British Museum."[218] In his account of the transportation process, Budge noted the care given to the human remains as they were shipped from Egypt to London, where they were laid out in the museum. However, almost as a side note, he mentions that following a weekend when the body had been left in the museum upon arrival in London, it was discovered that the top joint of one of the forefingers was missing, and to his knowledge, "it has never been seen since."[219]

The display of human remains in museums often places these bodies under a governance framework that differs significantly from the lifeworld of the individuals they once were. This discrepancy is starkly highlighted in the ethical debates on whether human remains should be displayed in museums at all. While there is no attention to the ethical considerations of exhibiting human remains in the display of *Gebelein Man A*, museum policies are uniformly applied under current governmental or individual institutional legislation within the museum space. Policies, such as the UK's Human Tissue Act of 2004[220] and the US's Native American Graves Protection and Repatriation Act of 1990, [221] provide a framework for discussing the display of human remains. However, the interpretation and enforcement of these laws remain contentious. While a comprehensive analysis of the legal debates surrounding these policies is beyond the scope of this thesis, it is important to acknowledge their influence on discussions about the perception of computational images derived from human remains, as this forms a central aspect of the chapter's broader argument.

In the UK, much of the language surrounding potential repatriation revolves around the concept of "appropriate consent," which is linked to the age of the remains and the opinions of living relatives. This becomes speculative for ancient peoples, especially where beliefs intersect with current forms of legislative framework and academic disciplines such

[218] Budge, *By Nile and Tigris*, 1920. 395.
[219] Budge, *By Nile and Tigris*, 1920. 395.
[220] *Human Tissue Act* 2004, c. 30, https://www.legislation.gov.uk/ukpga/2004/30/contents.
[221] NAGPRA, 1990.

as legal systems, museum governance, religious arguments, and political stances on cultural heritage. These debates also intersect with anthropology, archaeology, and museum curation practices.

However, there is currently a general shift towards questioning the validity of displaying human remains at all. For example, in 2020, the Pitt Rivers Museum removed 120 human remains from display;[222] in 2023, the Smithsonian created a dedicated team to develop a policy addressing the future of the institution's human remains collection;[223] and laws in France, which previously prohibited the repatriation of human remains from institutional collections, have been simplified to allow the return of remains up to 500 years old.[224] Additionally, institutions like the Surgeons' Hall Museum in Edinburgh prohibit visitors from producing images of human remains,[225] although the institution itself or those with specific requests are not subject to this restriction. This disparity seemingly arises from the institution's inability to control the context in which visitors might use the material—particularly on social media.

When considering the case of *Gebelein Man A*, the temporal gap between the present and pre-dynastic Egypt makes it evident that the museum's conditions likely do not reflect the cultural values and burial practices of the man or his community. In fact, it could further be asserted that the display of the remains in the British Museum positions the body in a state of exhumation, creating a simulacrum of its archaeological condition from 130 years ago. The visitor is placed in a position like that of a 19th-century archaeologist rather than the inhabitants of Gebelein from c.3500 BCE. The exhibit implies a comparison between different systems of knowledge, drawing parallels between various material conditions and historical circumstances.

This condition is extended and reconditioned within the context of computational image technologies, which are utilised to enliven the display and present new knowledge discovered about the body through the discipline of forensic pathology. The *Virtual*

[222] BBC News, "Shrunken Heads Removed from Pitt Rivers Museum Display," September 11, 2020.
[223] Smithsonian Institution, "Smithsonian Brings Historic Specimens to Life," January 13, 2015.
[224] Carol Vogel, "France Simplifies Law on Restitution of Human Remains," *The Art Newspaper*, December 20, 2023.
[225] Surgeons' Hall Museums, "Filming and Photography," n.d. Available at: https://museum.rcsed.ac.uk/plan-your-visit/facilities.

Autopsy of *Gebelein Man A* comprises three screens mounted on grey panels adjacent to the vitrine containing his body. Two information panels are placed in relation to the screens: 'Gebelein Man. A Natural Mummy of the Predynastic Period' provides details about the body's composition, historical background, and the interactive touch screen. The second, 'Autopsy Table: Key Discoveries,' summarises findings from the *Virtual Autopsy*, including *Gebelein Man A's* age, manner of death, and the approximate period he lived.

The parameters of engaging with the *Virtual Autopsy*, through the positioning of the screens, encourage multiple acts of spectatorship in the gallery space, making the experience of the exhibit both a public and private performance. This construction is designed to allow visitors to engage with the exhibit individually, while their interactions are simultaneously observed by others, embodying a function of the museum space as enabling individual acts of discovery within a communal educational experience. Users access the digitally rendered Computed Tomography (CT) scan through the horizontal 'touch table,' and descriptive labels reveal forensic anthropological details of the body. In this way, navigating the computational image allows users to uncover narratives through new research conducted by the museum. Additionally, a smaller screen plays a looped video instructing the visitor on how to use the apparatus, while a larger screen to the side of the *Virtual Autopsy Table* replicates the touchscreen on the vertical plane of the wall, broadcasting interactions into the wider gallery space.

The *Virtual Autopsy* uses "volume rendering," [226] which consists of stacks of thousands of 2D images generated by X-ray scanners, interpolated into digital image data to produce a 3D volumetric digital form. The rendered digital body, designed for non-experts, allows anatomical details to be navigated via the interactive touch screen. Interaction is initiated through gestures on the glass, enabling real-time transformation of the 3D image. The exhibit allows visitors to control the perspective and order of information discovery, resonating with *International Council of Museums* (ICOM) definition of museums[227] and adhering to codes of practice for the care of human remains by using new technologies for research dissemination and interactive engagement.

[226] Anders Ynnerman et al., "Interactive Visualization of 3D Scanned Mummies at Public Venues," *Communications of the ACM* 59, no. 12 (2016), 72.
[227] ICOM, "Museum Definition," 2022.

Aligning with codes of practice established in the UK under the *Guidance for the Care of Human Remains in Museums,*[228] published by the Department for Culture Media and Sport in October 2004 the 2014 publication *Regarding the Dead: Human Remains in the British Museum* expands upon issues surrounding the treatment, ethics, and research potential of differing academic methodologies within this field of research. In this context, it is stated that both researchers and museum employees should avoid the description of human remains as "scientific objects or data," and that "human remains should never be treated or referred to as objects."[229] However, in the promotional video, *Interactive Visualization of 3D Scanned Mummies at Public Venues*, the *Virtual Autopsy* is described to be a self-guided tour of "large volumetric image data."[230]

This description presents the relationship between *Gebelein Man A's* body and the *Virtual Autopsy* as relational, distinguishing between the agency of the human remains and the interactive digital image created by computation. The *digital surrogate*[231] is not the same as the body of the man. However, the *Virtual Autopsy* is both indexically linked to the body through x-ray images and conceptually linked to photography, as described by Rosalind Krauss, as "the result of a physical imprint transferred by light reflections onto a sensitive surface."[232] This linkage complicates the direct relationship between the human remains and the computational image of them. It influences the classification and ethical viewing in the museum space, affecting how viewers interact with volumetric data sets and shaping the conceptualisation of the gaze by both the institution and visitors. The relationship between different forms of materiality—digital and flesh—shifts attention from the immediate museum context to the knowledge claims entangled with data visualised in a software space.

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[228] Department for Digital, Culture, Media & Sport, *Guidance for the Care of Human Remains in Museums* (2004).
[229] Daniel Antoine, "Curating Human Remains in Museum Collections: Broader Considerations and a British Museum Perspective," in *Regarding the Dead: Human Remains in the British Museum*, ed. Alexandra Fletcher, Daniel Antoine, and J.D. Hill (London: British Museum Press, 2014), 3.
[230] Association for Computing Machinery, "Interactive Visualization of 3D Scanned Mummies at Public Venues," YouTube video, December 2016.
[231] Haidy Geismar, "Post-Photographic Presences," *Photographies* 8, no. 3 (2015), 309.
[232] Krauss, "Notes on the Index," 1977, 75.

The display's integration with familiar mobile phone touch screen interactions complicates visitor engagement, merging museum experience with everyday technology use. This influences visitor positioning and attention, creating unintended relational dynamics. Gwyneira Isaac describes this as seduction through "reproductive and technological fascination,"[233] where engagement extends beyond content to the display context. The exhibit's intuitive design, mirroring daily mobile interactions, implies implicit control over user actions. The computationally rendered corpse is viewed through the lens of everyday technology, yet it is contained within museum-controlled display systems. Despite this control, attempts at institutional knowledge dissemination are often subverted by visitor play and personal documentation of their experience through mobile technology.

The interactive display equates the visitor's engagement with the CT scan to the museum's research process, suggesting equitable access to information through advanced visualisation techniques, offering valuable insights into the collection. For example, analysis of the scan revealed penetrating trauma resulting in broken ribs, suggesting *Gebelein Man A* was possibly murdered – a subject that garnered press attention at the time of the exhibit's opening.[234] This information is presented alongside details like dental condition (age), hip shape (sex), and the discovery of the oldest known tattoos. Interaction with the *Virtual Autopsy*, through this narrative, creates coherence between data visualisation, scientific research, the museum, and the visitor. This indicates that computational forms of image technology are not merely about the transference of electromagnetic information from one form to another but are active forms of informational transition. Interaction with the display equates the methodology for engaging with the CT scan to that used by the museum to analyse the data. The narrative created in this context suggests that we are given access to the same information as the experts, presented in a form equivalent to what they used to make the discoveries being shared.

The CT scan data, presented as an artifact with explanatory context, complicates the relationship between the display and the human remains. This interaction is further complexified by visitors documenting their experiences with phone cameras. The attentiveness of the visitor becomes a feedback loop mediated through various imaging

[233] Gwyneira Isaac, "Technology Becomes the Object," *Journal of Material Culture* 13, no. 3 (2008), 288.
[234] BBC News, "British Museum Exhibit Gebelein Man Died 'Violent Death'," November 16, 2012.

apparatuses: between screen and mobile device, spectator and interactive display, and computational imaging technology and the corpse as an exhibit within a simulacrum of archaeological discovery. The instructional video sets expected interaction parameters, depicting an ideal scenario of attentiveness and functionality. However, broader discourses on imperialism, repatriation, technological interaction, and the ethics of displaying human remains, as with the signage in other parts of the institution, remain absent from the display.

Though we do not touch the virtual body in a haptic sense, determining texture, weight, and feel, the image form, experienced through the screen, remains tactile because of the bodily engagement with the glass surface of the touch screen. This interaction places the visitor in a specific position, with skeuomorphic icons guiding actions. Scan data is revealed through linear sequences and cross-dissolve transitions, from surface to bone, resembling a filmic edit. Gestural movements like pressing, swiping, dragging, and rotating fingers manipulate the image in the black construct space of the software interface. Cinematic cross dissolves transition between skin, soft tissue, and skeleton, gradually revealing the underlying structures of the computational interface, drawing attention to the materiality of the screen. As the skeleton is reached and passed through, minimal remnants like ghostly sinews of pixelated data clouds linger, hinting at the ground from which the body will (re)appear like an apparition.

The digital visualisation of *Gebelein Man A's* body in the *Virtual Autopsy* floats in the software's black void. The digital scan appears more vivid and detailed compared to the body on display in the gallery. Lit by an unknown source, the graphically rendered texture of the bones looks like powder-coated carbon fibre, allowing the maximum amount of detail and visibility in the navigation. But the digital texture becomes abstract at close examination, and the body seems lost at a distance. Rich, vivid colours enhance the micro-scale viewing experience, making the body feel like an abstract data landscape.

During the COVID pandemic, the interactive touch display, posed a threat for virus transmission. Consequently, the exhibit was switched off, making the display's physicality more apparent. The absence of the interactive body highlighted the infrastructure behind the computational image, reflecting the wider assemblage and computational apparatus.

The software interface's ground acts relationally to gallery display conditions as a black mirror or Claude glass resonating with Vilém Flusser's concept of the technical image. The technical image as mediation highlights the estrangement inherent in the process where images create a barrier between human experience and the world:

"Images are mediations between the world and human beings. Human beings 'ex-ist', i.e., the world is not immediately accessible to them, and therefore images are needed to make it comprehensible. However, as soon as this happens, images come between the world and human beings. They are supposed to be maps but they turn into screens: Instead of representing the world, they obscure it until human beings' lives finally become a function of the images they create. Human beings cease to decode the images and instead project them, still encoded, into the world 'out there,' which meanwhile itself becomes like an image - a context of scenes, of states of things." [235]

In Flusser's conceptualisation, the relationship between image and world is central to human experience. The world, as it appears to humans, is inaccessible to consciousness except as a series of images through which we comprehend. However, this process of imaging also distances what is seen as the world from what is seen as the human, shaping our comprehension of the world as an image. The process of imaging becomes one of estrangement, creating an unacknowledged barrier between human experience and the world outside this narrow frame. Although the process of imaging is not apparent to us, it is through images that the world becomes comprehensible.

The *Virtual Autopsy* intersects with debates on historical medical imaging, institutional critique, display ethics, imperialism, and collection access. However, its role as a curatorial exhibit is part of the broader narrative of the encyclopaedic museum, serving as custodian of artefacts and embracing computational forms of imaging technology to disseminate research practices. This raises urgent questions about the interface's interpretation, blending new technology spectatorship with the museum's curatorial and historical roles in knowledge creation and dissemination. The physical distance between the ancient body in the vitrine and the viewer is mirrored in the relationship between the glass screen of the

[235] Vilém Flusser, *Towards a Philosophy of Photography*, trans. Anthony Mathews (London: Reaktion Books, 2000), 9-10.

imaging apparatus and the phenomenological interaction. In both cases, the body may be an unwilling participant in the imperial museum, viewed through systems of display and computational surveillance. In the *Virtual Autopsy, Gebelein Man A's* remains are less an agent and more an element within the construction of computational imagery, data, and the museum exhibitionary complex.

The gaze from above in the *Virtual Autopsy* contrasts with the gallery navigation, reflecting Donna Haraway's criticism of detached scientific knowledge production as "the false vision" promising "transcendence of all constraints and responsibilities." [236] The display enacts a duality between the body's placement in the museum space and the computational space within the infrastructure of computation. This deliberate positionality is part of the aesthetic of software processes as blank workspaces and the screen as an information mapping plane. The positionality forms an "active perceptual system"[237] building and developing specific ways of seeing in the production of technoscientific knowledge claims, in Haraway's terms.

The examination of *Gebelein Man A* using computational imaging technology aligns with other scientific methods, including more invasive techniques, to extract physiological information from ancient remains. [238] The non-invasive interaction with the 3D image performs the museum's position of care whilst engaging visitors through new technological interfaces and storytelling methods. Specifically, what is foregrounded in importance are the anatomical features through which informed guesses about his life and evidence of his death are made by mapping his interior and exterior body through medical pathology. The interaction with the CT scan of this human body is designed as an entry point for the visitor into a particular position of academic research and manner of seeing the museum. The *Virtual Autopsy* invites visitors to acquire knowledge but within institutionally defined conditions. The visitor's embodied position outside the glass cabinet looking in is mirrored by the experience of horizontal touchscreen, maintaining a distance despite the detailed mediation and interactive process of engagement offered by the museum.

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[236] Donna J. Haraway, "Situated Knowledges," *Feminist Studies* 14, no. 3 (1988), 583.
[237] Haraway, "Situated Knowledges," 1988, 583.
[238] Daniel Antoine and Janet Ambers, "The Scientific Analysis of Human Remains from the British Museum Collection: Research Potential and Examples from the Nile Valley," in *Regarding the Dead: Human Remains in the British Museum*, ed. Alexandra Fletcher, Daniel Antoine, and J.D. Hill (London: British Museum Press, 2014), 20-30.

Data analysis in the context of forensic anthropology goes beyond determining the age at death or biological sex, as its stated focus within the context of information panels in the British Museum encompasses wider aspects of human biology, "such as the growth and development of children, genetics, diet, and the occurrence of diseases in the past."[239] Through the process of layering TIFF images in the computationally rendered 3D CT scan, it is desired that the opacity of the human form be rendered transparent through the inhabitation of the medicalisation of the gaze. In the context of *Gebelein Man A*, physical anthropologists using CT analysis are able to "look inside his body in order to examine carefully his muscles, bones, teeth, and internal organs."[240] The expert act of analysing computational image data yields "a wealth of valuable biological information"[241] that, without the latest generation of scanning technology focusing on micron-level details, would be missed in other forms of examination.

These concepts, while purporting to enhance public understanding of Predynastic Egypt, may instead foreground the role of computational forms of imaging and interactive technologies in storytelling processes that serve the institutional goals of the museum. They re-orient knowledge claims through new technological interfaces in a quest to compete within the attention economy. This positionality reinforces the hierarchy of museums as holding the keys to knowledge and their ability to unlock understanding of their collection through the designated engagement of academic debate within the institution and with commercial partnerships considered appropriate interlocutors. Less considered in terms of technology engagement is how the museum may be affected by the agency of digital imaging processes themselves.

The display is perceived to embody a form of transference from the computational amalgamation of X-ray data for the purpose of forensic pathology into interactive digital image data presented for the enlivenment of the museum collection and the dissemination of new knowledge to the public. This is a curatorial choice that emphasises a specific intent toward a defined set of working relationships with technological apparatus. *Gebelein Man*

[239] John H. Taylor and Daniel Antoine, *Ancient Lives, New Discoveries* (London: British Museum Press, 2014), 11.
[240] Taylor and Antoine, *Ancient Lives*, 2014, 31.
[241] Taylor and Antoine, *Ancient Lives*, 2014, 32.

A's body is presented as a world which the positionality of the museum is entitled to explore. The computationally visualised sense data is associated with the hidden and secretive, awaiting discovery—an approach that, while potentially viewed as extractive, may provide insights without physically damaging the body.

In this potential category mistake, Joachim Classen and David Howes see analysis of technology as perpetuating "the possibility of experiencing a safe but nonetheless potent contact with the 'other worlds' from which they sprang."[242] While there is an effort to understand the use and meanings of practices, ceremonies, and material conditions of belief, this is becoming ever more intertwined with ways in which technological imaging processes reveal new knowledge that potentially confirm Western representations of non-Western cultures, and thus "serve as a springboard for the Western imagination." [243] While Classen and Howes' argument specifically focuses on current understandings of Indigenous knowledge through new forms of technology, the relation between the lifeworld of *Gebelein Man A's* remains and the condition of the museum is stark nonetheless.

The museum space is implicitly bound to imperial processes in which artefacts, often acquired through acts of force, are presented decontextualised from their site of origin, functionality, or use through inclusion within particularly codified and controlled display systems. The extent to which the positioning and usage of digital forms of image are being used to extend certain positionalities within taxonomic forms of categorisation is crucial, as they situate the expanded research process being completed in the museum space. This creation of data necessitates debates surrounding repatriation, especially as the equation between exhibition spaces, artefacts, and forms of display creates a deliberate correlation between cultures, times, beliefs, and conditions of acquisition. The homogenisation of how information is delivered in museum processes and forms of viewing is now becoming more entangled with the agency of data and computational infrastructure.

The kinds of scan data, both in the context of conservation and in the replication of artefacts for other purposes, that utilise 3D digital technologies are considered, according

[242] Constance Classen and David Howes, "The Museum as Sensescape: Western Sensibilities and Indigenous Artifacts," in *Sensible Objects*, ed. Elizabeth Edwards et al. (Oxford: Berg Publishers, 2006), 202.
[243] Classen and Howes, "Museum as Sensescape," 2006, 202.

to Haidy Geismar, as "digital surrogates."[244] These *digital surrogates* not only duplicate the dimensions of museum artefacts but also replicate other qualities recognised through languages of visuality. She states that these new forms of computational images foreground the visuality of the objects they focus on through the digital interpolation of sense data inputs, which often capture the surface of things through photographic of Light Detection and Ranging (LiDAR) input.

The implication of this terminology, and particularly the transformation from one type of material to a computationally determined data form, is picked up and expanded upon in Mathilde Pavis and Andrea Wallace's Response to the 2018 Sarr-Savoy Report, which posits the agency of digital material in the context of projects of restitution. In this context, Geismar's categorisation of the concept of the digital surrogate aligns with Pavis and Wallace's assertion that data held within collections "range in quality depending on the purpose of digitisation or the reproduction technologies at hand but can include digital photographs or scans of two-dimensional and three-dimensional objects and associated archival materials."[245]

The concept of the *digital surrogate*, defined in this way and applied to the case of the *Virtual Autopsy*, holds resonance as it indicates that these computational forms of imagery possess agency as artefacts in their own right. However, what if, instead of being a site of contestation and imperialist visioning through languages of guardianship, digital processes conceived as surrogates have the potential to be embodiments of care in other terms? Is it possible, that digital images can be used in ways that do not perpetuate strategies that embed images as operational cogs within this machine of knowledge and meet the demands of (re)producing specific types of extractive representational systems? Elizabeth Edward states of the re-enactment present in other forms of photographic technology presented in anthropological terms, "the photographic image is able to perform in two registers"[246] and "through projection, heightening, and concentration, the scientific and the poetic come together."[247] The same could also be said of new forms of computational

[244] Haidy Geismar, "Post-Photographic Presences," *Photographies* 8, no. 3 (2015), 309.
[245] Mathilde Pavis and Andrea Wallace, "Response to the 2018 Sarr-Savoy Report," *JIPITEC* 10, no. 2 (2019): 115–29.
[246] Edwards, *Raw Histories*, 2001, 177.
[247] Edwards, *Raw Histories*, 2001, 177.

images created through sensor inputs, but presenting one kind of knowledge without the other limits the potential for how the visualisation can be understood

This notion is particularly relevant in relation to the re-positioning of digital forms of imaging created through practice in this space, as it suggests that other forms of narrative may be combined with those of forensic data analysis by incorporating relationality that museum taxonomic structures may not immediately be seen to include. Despite the language and positionality of the museum within the rhetoric of the *Virtual Autopsy,* the connections between new forms of computational image creation, display systems, institutional messaging, and broader concepts of how computational forms of imagery are understood create dynamic assemblages of relations that remain in flux

In the experience of the visitor, relations are conditioned by multiple forms of interaction and attention because of the way displays interrelate systems of meaning, infrastructure, and intentionality. The museum has stage-managed these relations by foregrounding certain forms of knowledge claims over others in the interactions experienced by the visitor. Can other ways of processing and presenting image data lead to wider conversations about the agency of technology and its usage within different realms or archives of knowledge?

The Problem of Wearing a Digital Cloak

Haidy Geismar's documentation of a collaborative project between UCL's anthropology department and interlocutors at Massey University in New Zealand offers a way to conceptualise what she terms 'post-photographic' processes beyond the traditional concepts of image and copy. This project focuses on a Māori cloak in UCL's ethnography collection, highlighting broader implications for digital imaging technologies through cross-cultural exchange. It emphasises how 3D images, created from electromagnetic input data, can be understood outside the tradition of photographic theorisation. The project also offers ways to consider the onto-epistemological foundations of new forms of computational imaging processes. The intentions seek to align forms of knowledge often not represented within the context of the Western universal museum space in significant ways through how artefacts are enlivened, experienced, and accounted for.

Geismar states that the research process was determined from the outset by the concerns of Māori artist Kura Puke, who responded to certain objects in the collection as lacking contexts or histories, perceiving them as disconnected from narratives of time, place, and meaning within their own lifeworld. In this context, *Tukatuku Roimata*, a Māori cloak made of flax, dog hair, and wool that entered UCL from the Welcome collection in the mid-20th century, was chosen as a focus of attention. This object was important to engage with because in Māori culture fine cloaks "with dog hair tassels are generally known as *korowai* and are considered to be great cultural treasures *(taonga)* imbued with ancestral power, *mana* (spiritual authority) and *wairua* (spiritual efficacy and energy)."[248] The project explored how to reactivate the cloak using digital technologies through the application of Māori cosmologies. It questions whether what Geismar terms 'post-photographic' imaging processes, like photogrammetry used in the museum for purposes such as conservation, can be reconditioned through new languages and purposes.

While the project was initiated before Mathilde Pavis and Andrea Wallace's response to the 2018 Sarr-Savoy Report,[249] its urgency resonates with calls for the release of digital data held by Western institutions and the ethical considerations surrounding these concerns. The UCL Māori cloak project examines the agency of *digital surrogates* created by 'post-photographic' technologies. Pavis and Wallace's paper advocates for the return or release of digital data by Western institutions, paralleling the broader discussions in the Sarr-Savoy Report[250] on the restitution of African cultural artifacts from French ethnographic and private collections.

Geismar's project offers a possible solution or way forward considering these calls for digital repatriation from the archives of Western institutions through the creative co-creation of practices and methodologies in the handling, engagement, and distribution of 'post-photographic' data. Geismar situates the project within the work of Māori scholars such as Paul Tapsell and Dierdre Brown, focusing on 3D scan data of the cloak by foregrounding indigenous lifeways whilst positing these in relation to other forms of western academic frameworks. These concerns echo discussions on imperialist strategies of extraction

[248] Geismar, "Post-Photographic Presences," 2015a, 308.
[249] Pavis and Wallace, "Response to Sarr-Savoy," 2019, 115.
[250] Felwine Sarr and Bénédicte Savoy, "The Restitution of African Cultural Heritage," trans. Drew S. Burk (2018).

inherent in both the verdict of the photographic shutter[251] and Museum as repository of universal knowledge claim.

My reading of Geismar's project is through reference to research pertaining to academic source material and wider reading around the project. Consequently, my argument does not pertain to the extent to which the UCL project is successful in its aims computational image data to inhabit Māori understandings, not least because of my intersectional positionality as a white male academic based in London with no Māori ancestry. I emphasize the negotiation of digital processes through multiple voices, questioning self-evident ideas of mediation that digital technologies garner. My primary focus in this discussion is how Geismar's project highlights that understanding 'post-photographic' mediation of the cloak involves a different engagement with digitalisation, emphasising copresence and metonymy. This may be important to understand in the development of practice-based research directed at the museum from the positionality of being a visitor in this space.

The digitalisation of *Tukutuku Roimata*, contained in UCL's anthropology collection through photogrammetric 3D technology, draws attention to further problems pertaining to how and under what conditions digital artefacts are created and shared. In Geismar's argument, understanding the 'post-photographic' cloak resides "not in the positivism of 3D digitalisation as a technology of perfect visual replication, but a different kind of engagement with digitalisation."[252] It is important to consider the limits of the technology for the intended purpose in this context. From a technical perspective, creating 3D scan data necessitates attention to specific material conditions of artefacts and comparisons with others. For example, 3D images created through photogrammetry alone have a range of technical limitations which make them work effectively with objects such as granite sculptures, but less well with glass, shiny metal, or delicately feathered materials when judged through the conditions of visual reproduction in terms of exactitude and likeness.

Creative practice-based strategies may reframe 'post-photographic' mediation's onto-epistemology. In this context, artist Kara Puke foregrounds the necessity that processes

[251] Azoulay, *Potential History*, 2019, xv – xvi.
[252] Haidy Geismar, *Museum Object Lessons for the Digital Age* (London: UCL Press, 2018), 101.

"materialize the energy of recognition and connection"[253] in the discourse of co-presence that transcends "the medium of the digital" because, in this capacity, they are "encompassed by Māori cosmology."[254] This shift in dialogue is important to the project's affectivity, from Puke's perspective, and distinct from technical concerns about visuality.

Geismar's account of the digitalisation of the Māori cloak[255] questions the extent to which the 'post-photographic' image may be 'like' the cloak made of dog hair. The idea of *Te Ara Wairua*, "a Māori term meaning 'pathway of spiritual or intangible energy,' which drew around and through our Māori cloak,"[256] is used to foreground the project's intention for the *digital surrogate* to inhabit ideas of closeness in affective and experiential terms. Her stated intention is to build on the contemporary rise of digital practice, inclusive of understanding communication through social media, but also on "Māori worldviews that understand people and things (including images) as interconnected, perpetually drawn into webs of relationships filled with cosmic, spiritual, political, and social energy."[257] The discussion of the *digital surrogate* aims to consider how technology may inhabit Māori ideas of closeness, affectively and experientially, rather than mimicking the cloak visually. Geismar's approach questions assumptions of digital imaging technologies, proposing new ways to understand 'post-photographic' practices.

Technologies like photogrammetry, CT scans, and LiDAR are used in cultural heritage projects for various purposes: from creating conceptualisations of visualised historic environments, disseminating artefacts to the public as a curatorial tool, to non-invasive conservation and research processes pertaining to the material condition of the artefact, and assessing historic or potential interventions to preserve the object. However, what unifies these projects is the emphasis on the detail and accuracy of the digital computational images created the electromagnetic sense data input. Hito Steyerl critiques the objectivity claims of these technologies, comparing them to documentary representation. Steyerl argues that while these processes stake claims to objectivity about

[253] Geismar, *Museum Object Lessons*, 2018, 95.
[254] Geismar, *Museum Object Lessons*, 2018, 95.
[255] Geismar, "Post-Photographic Presences," 2015, 308–312.
[256] Geismar, *Museum Object Lessons*, 2018, 88.
[257] Geismar, "Post-Photographic Presences," 2015, 305.

half of the surfaces are "pure estimation, deliberate abstractions" [258] effectively "leaps of faith through the void between measurements and the aesthetic interpretations of data."[259] Steyerl further highlights that the rhetoric of companies that produce scanning systems, whose technologies are often used in contexts such as forensic police work, is invested in this type of relationship. This is because they enable their products to function within prescribed domains and in unassailable languages regarding relationality.

"In this terminology, we immediately recognize many tropes that are common in more traditional discussions of documentary evidence. The new technology promises all the things that documentary representation promised objectivity, full and truthful representation of events only this augmented by an additional dimension."[260]

Steyerl's position raises further concerns about the implications of assigning the status of accuracy, truth, and objectivity, historically associated with the medium of photography, to these new forms of imaging technology in similar contexts. Steyerl's concerns differs with Geismar's determination of 'post-photographic' processes applied in the context of digital anthropology. However, where they align, the argument is for a re-evaluation of the conceptual frameworks and methodologies employed in the use of digital imaging technologies. How can the relationship between technology and cultural artefacts or bodies be disrupted to avoid replicating extractive processes under the guise of restitution and care?

In the use of computational forms of imaging, particularly in the context of forensic analysis and conservation, technologies embody the narrative that the more detailed a digital form becomes, the better it represents the likenesses of artefacts. This assumption values visual coherence, structural, and technical correlation. However, from an institutional perspective, the potential of emergent digital technologies also lies in the consideration of how 3D objects can initiate wider cultural exchange, particularly from a defined professional community of institutions to more diverse groups. Digital forms of imaging technologies

[258] Hito Steyerl, "Ripping Reality: Blind Spots and Wrecked Data in 3D," 2012.
[259] Steyerl, "Ripping Reality," 2012.
[260] Steyerl, "Ripping Reality," 2012.

may require broader contexts for understanding to be effective in different registers and to highlight or embody different kinds of ideas.

Debates on the relationship between artefacts and their *digital surrogates* in the context of humanities and visual culture, anthropology, and photographic theorisation focus narrowly on resemblance, authenticity, relationality, and reproduction. Mark Wilsher calls this "postmodern problematics 2.0,"[261] noting the ontological issue of virtual vs. 'real' objects "is like nothing so much as Jean Baudrillard's simulacrum given tediously prosaic form."[262] Wilsher questions the experiential quality of these digital imaging processes beyond concepts of visuality into ideas of embodiment. While referencing the experience of VR, this expanded set of conditions is important to attend to in this context. Lev Manovich contends that the affective register of these images is that of *photorealism*[263] rather than other experiential forms of seeing. He argues that certain types of 3D images are designed to emulate reality "as seen by the camera lens,"[264] not as seen through human eyes. In his consideration of what constitutes the real in computer-generated image production, particularly CGI in filmmaking, Manovich asserts that images produced through computer processes are not designed to emulate "our perceptual and bodily experience of reality"[265] but only that of the photographic image.

In the 2009 UCL project *Niabara – the Western Solomon Island War Canoe at the British Museum*,[266] researchers approached the scanning process as a technical problem. At the time, it was one of the largest museum objects they had attempted to scan in high resolution. The 3D image was created to standards of *photorealism*, aiming to represent the canoe accurately in digital space. Researchers believed that Solomon Islanders had an interest in new technologies and sought to link the research with the government's educational programs using digital tools.

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[261] Mark Wilsher, "Virtual and Other Bodies," *Art Monthly* 427 (2019), 12.
[262] Wilsher, "Virtual and Other Bodies," 2019.
[263] Lev Manovich, *The Language of New Media* (Cambridge, MA: MIT Press, 2001), 200.
[264] Manovich, *Language of New Media*, 2001, 200.
[265] Manovich, *Language of New Media*, 2001, 200.
[266] Mona Hess et al., "Niabara—The Western Solomon Islands War Canoe at the British Museum," in *Proceedings of the 15th International Conference on Virtual Systems and Multimedia* (2009), 41-46.

However, while researchers contended that "digital 3D objects are indeed desirable and suitable for the repatriation of the war canoe,"[267] problems emerged when matching these parameters with expectations of usage and readability. During the ceremonial handover of the completed scan data to the Indigenous Islanders of Vella Lavella, the 3D canoe received a mixed reception. Michael Rowlands and Graeme Were noted that without certain attributes, the image was essentially unreadable for understanding the genealogy of the craft. "Cato Berg, the anthropologist working in Vella Lavella…reported that some of the people were unable to identify the canoe as 'one of their own' … they claimed the digital image was dead, lifeless, and even broken."[268]

The project aimed to address the erosion of indigenous knowledge and the ability of source communities to make these canoes traditionally. Issues of recognition were partly resolved through colour rendering and the inclusion of associated artefacts, like bird feathers and shells, in the 3D object. However, the question of whether the British Museum is the best place for the last remaining Western Solomon Islands War Canoe remains unaddressed by rhetoric of this act of digital repatriation. In this instance, the technological process aimed at achieving narratives of detail and likeness may not have captured the qualities and appearance that cohered with the lifeways of the identified recipients. These expectations also highlight the problem of equating 3D technologies used to create digital objects of study, which in this capacity can stand in for other types of materiality.

Geismar reiterates these concerns in reference to the Māori cloak, observing that the problem in the museum context is how relationality is established through technology. Specifically, the computational image, derived from various forms of sensor inputs, acts as a repository of information about formal qualities captured through data, resulting in a visualisation that represents a form of knowledge conceived through the photographic. Geismar highlights that museum imaging projects are dominated by a photographically oriented understanding of digital image files, relying heavily on "the language used to describe them was fundamentally drawn from the photographic lexicon, even as the

[267] Hess et al., "Niabara—War Canoe," 2009, 42.
[268] Graeme Were and Michael Rowlands, "Digital Heritage Technologies and Issues of Community Engagement and Cultural Restitution in 'New Style' Ethnographic Museums," in *Beyond Modernity*, ed. Sandra Ferracuti et al. (Rome: Espera Libreria Archeologica, 2014), 277.

process used to construct the images went far beyond that of photography."[269] The relationality of digital imaging practices to the Māori cloak includes a re-conceptualisation from debates surrounding photography. This is defined explicitly in Geismar's work as "shifting the lexicon of how we understand digital images from terms such as index and presence towards a discourse of co-presence."[270]

To think about different ways of conceptualising the digital cloak, Geismar explores the ideas of *copresence* and *metonymy* with reference to the work of Eelco Runia. Where Runia posits metaphor as being of central importance to the "transfer of meaning,"[271] he contends that metonymy enables the "transfer of presence."[272] Through this reasoning, he further states that metonymy acts as "a 'presence in absence' not just in the sense that it presents something that isn't there, but also in the sense that in the absence (or at least the radical inconspicuousness) that is there, the thing that isn't there is still present."[273]

This definition and usage are mobilised by Geismar through her discussion of whether the digital cloak may start to embody or be understood through *taonga* as an idea of transference, informed by Dierdre Brown's discussion of *virtual taonga*.[274] In Geismar's argument, relationality is established between *taonga*, as a Māori lifeway, and the *digital surrogates* created in the institutional research project. This relationship, she states, complicates issues surrounding the storage, display, and ownership of digital artefacts when viewed through the lens of Māori cosmology. Referring to Runia, presence is considered "'being in touch"—either literally or figuratively—with people, things, events, and feelings."[275] Where the process of scanning puts operative agents in touch with the thing scanned even if tele-present, Geismar expands the idea of presence to constitute making something proximate in a tactile sense or co-present in that "the recognition that

[269] Geismar, "Post-Photographic Presences," 2015, 309.
[270] Geismar, "Post-Photographic Presences," 2015, 309.
[271] Eelco Runia, "Presence," *History and Theory* 45, no. 1 (2006): 1–29.
[272] Runia, "Presence," 2006, 1.
[273] Runia, "Presence," 2006, 1.
[274] Deidre Brown, "'Ko to Ringa Ki Nga Rākau a Te Pākehā'—Virtual Taonga Māori and Museums," *Visual Resources* 24, no. 1 (2008): 59–75.
[275] Runia, "Presence," 2006, 5.

image making and viewing are also intensely social activities, and that the image draws and holds together the subject and viewer across both time and space."[276]

However, in the context of the *digital surrogate*, relationality is also considered to be metonymic. For Runia, metonymy acts as "a metaphor for the entwinement of continuity and discontinuity."[277] The experiential difference between the digital scan and the cloak made of dog hair is one that is disjointed, or, in terms synonymous with Viktor Shklovsky, *defamiliarized*.[278] If applied to the 'post-photographic' mediation of the cloak, the *digital surrogate* can be thought of as "a jumble of things that are genetically, ontologically, and existentially separate," [279] but also, Geismar contends, in terms of Māori ideas of ancestry, these relations need to be considered as a tightly knit whole.

Under the correct conditions and circumstances, Geismar contends, digital technology may become a form of embodied understanding that has *mana* in Māori terms, due to the potential transference of life energy between humans, nonhumans, and other agents. What thus becomes important in approaching the cloak as a *virtual taonga* is the recognition and acknowledgment of the digital imaging process as constituting multiple and conflicting forces, including the imperial context of the museum. To understand the digital mediation of the Māori cloak as encompassing a metonymic process, where the transposition of agency from one context to another occurs, "requires first of all decontextualization."[280] Connecting and juxtaposing contexts and material forms initiated through the project, particularly in placing the institutional museum space in relation to other varied contexts of use, enables the imaging technology to redefine the digital cloak.

Geismar's project aims to explore the capacities of digital technologies to encode Māori values, extend community to the cloak, and reimagine it within new representational and relational frameworks. The title 'wearing a digital cloak' connotes both physical proximity to the body and the idea of gradual damage over time. Material can wear down, effectiveness can wear off, and the cloak may suffer wear from use. The present participle 'wearing'

[276] Geismar, "Post-Photographic Presences," 2015, 306.
[277] Runia, "Presence," 2006, 9.
[278] Viktor Shklovsky, "Art as Device," in *Viktor Shklovsky: A Reader*, ed. and trans. Alexandra Berlina (London: Bloomsbury, 2017), 73–96.
[279] Runia, "Presence," 2006, 9.
[280] Runia, "Presence," 2006, 19.

implies liveness and aliveness, but also potential distress in the engagement of the cloak with 'post-photographic' presences, introducing precarity and fragility to the conceptualisation. However, through the process of rethinking "the combined efficacy of digital technologies as communicative media, as visual aesthetics, as simulations of indexicality, and as instigators of a co-presence,"[281] it may at least be possible to consider the *digital surrogate* as having agency beyond that of a museum artefact.

Paul Tapsell states that the performance of *taonga* in the right context keeps them alive.[282] Western and settler colonial museums fall short of Tapsell's concept of the post-museum,[283] where the institution is a temporary custodian, not an owner, of the things in their care. The post-museum emphasises loaning objects for specific purposes, recognising *taonga's* life cycle and cultural activation. While objects in the post-museum space are preserved, this is not equivalent to a state of stasis. Physical deterioration, particularly by weather, may be part of a 'natural' state, as the concept retains the idea that *taonga* have a life cycle. Tapsell contends that ideas of co-authorship should dictate how Māori *taonga* are held in museum collections and presented through display. Loans and exhibitions thus entail important processes of negotiation, particularly in a settler colonial context, between source communities and those whose land the exhibition space occupies. There is a necessity to recognise those communities hosting the object as co-producers of the museum space, where boundaries of difference are negotiated and respected in the parameters of display.

Tapsell contends that technology is pivotal in negotiating intergenerational communication breakdowns caused by the global dispersion of community members. However, he remains concerned about how knowledge is transferred and the contexts in which it is experienced. Tapsell states, "It's one thing to democratize knowledge, but it is another thing to make knowledge common. If you want to maintain the power of knowledge, you need to retain the *tapu*. You've got to know where the boundaries are and how to negotiate them."[284]

The potential of computational forms of imaging technologies may reside in their capacity to facilitate knowledge exchange and connect globally distributed communities. However,

[281] Geismar, "Post-Photographic Presences," 2015a, 318.
[282] Paul Tapsell, "The Flight of Pareraututu: An Investigation of Taonga from a Tribal Perspective," *Journal of the Polynesian Society* 106, no. 4 (1997): 323–74.
[283] Paul Tapsell, "Lecture—(Post)musings from the Edge," YouTube video, 2015.
[284] Tapsell, "Lecture—(Post)musings," 2015.

this depends on the languages, archives, and borders established and used, and on considering for whom and by whom the conditions of exchange are shaped. This negotiation focuses on balancing past heritage and future opportunities in the sense of *whakapapa*. Tapsell describes *whakapapa* as a Māori understanding where memory, knowledge, and time are interlaced. It becomes a negotiation between multiple interlocutors when considering how institutional spaces and practices are activated.

In a similar way, contextualising forms of negotiation is central to Deidre Brown's discussion of *virtual taonga*.[285] The intersection of this concept and computational forms of image mediation can be seen as agential in larger conceptualisations of Māori cultural identity and its evolution through new technological apparatus. Brown asserts that reproducing and re-creating are ways in Māori culture to maintain a cohesive relationship with the past and a sense of identity imbued with genealogical and spiritual significance. Junctures between different cultures can be negotiated and cultural property built upon for specific needs and purposes, including the use of digital methods and tools. However, where discussions about cultural exchange take place, there is also serious concern about appropriation.

This is particularly problematic in contexts where Māori artefacts, patterns, or cultural practices are taken out of their spiritual context and placed in an unimagined setting. Brown sees this problematic use as especially evident in the use of Māori designs or object images in art and advertising. While there may be aesthetic similarities between depictions of *taonga* and their simulacra, this does not imply similarity within the frame of Māori cosmology or the conditions from which they have been appropriated. Thus, it is through reciprocity and dialogue that Māori cultural artefacts and expressions in the public domain become affective, especially concerning their commodification.

According to Geismar, these positionalities are important for evaluating the conditions of exchange established through the UCL project. The digitalisation of the cloak, initiated within a Western imperial infrastructure, aims to inhabit a space where dominant and contested perspectives can coexist within Māori understandings. Central to this is the creative activation of the cloak through practice-based processes. In Geismar's project,

[285] Deidre Brown, "Traditional Identity: The Commodification of New Zealand Māori Imagery," YouTube video, 2013.

multiple explorative outputs include the creation of interactive light installations, the usage of soundscapes, and video technologies to link communities separated by physical distance. The participants designed environments that used remote access video technologies like Skype to enable direct, real-time communication between participants and communities in New Zealand and the cloak in the context of the museum space.

These connections were explored further in Kura Puke's work, digitally translating sound captured from sites in New Zealand into light, which was then directed at the cloak in the context of its exhibition at UCL. These processes, intending to draw attention to communal understandings of knowledge and affectivity, use various forms of technological apparatus while also attempting to inhabit ways of thinking that are concurrent with Māori lifeways. Practice is used to distinguish how or whether incarnations of digital media create connections that relate to shared responsibilities toward the cloak across physical distances. Specifically, the conditions determined through the interactive design practice of Puke and research collaborator Stuart Foster are mindful of Māori practices connected to source communities and locations.

The cloak came to UCL from the Wellcome Collection with no data regarding its provenance other than that it was of Māori origin. An urgent concern thus became initiating the appropriate conditions under which the object could be (re)named. The name *Tukutuku Roimata*, meaning "the tears of the ancestors from the spiritual realm through *korowai*,"[286] was designated to the cloak by *Te Urutahi Waikerpuru* of *Te Matahiapo*. This was made possible by a ceremony held in the UCL museum space using video teleconference technologies. In the ceremonial act, the cloak was linked with lifeways and genealogy within Māori culture. The anonymised and generically accessioned cloak within the taxonomy of the UCL collection was given specificity in a current setting. However, the cloak could be activated "as a channel of communicative and spiritual energy" in the context of Māori lifeways, rather than being perceived solely as an artifact for consumption within the collection.

The success of these practices, Geismar contends, made her question her own suppositions regarding an effective register of the performance. The expected outcome, for Geismar,

[286] Geismar, "Post-Photographic Presences," 2015a, 314.

adhered to the use of technology as defined by their corporate creators, in the sense that clarity of video image and uninterrupted internet service seemed an intrinsic part of the process. However, she observed that this was not true for the Māori interlocutors, who placed the importance of enactment above the technicalities of the mediation in terms of perceived correct use.[287] The potential of the cloak is signified as being an active agent in co-present actions brought about through engaging new technologies. The project's approach to *Te Ara Wairua*, pathway of spiritual or intangible energy, while not an attempt at repatriation, becomes a space of activation and community building.

The project situates ideas of negotiated activation as essential to any digital project designed for the restitution or repatriation of items in Western Museum spaces. In this context, the scan data created from the cloak for conservation purposes was utilised differently than initially intended, specifically to map the cloak cartographically. This process created an exchange between the physical location of the cloak at UCL, researchers, and Māori communities in both the UK and New Zealand. As a methodology, this approach recognised the potential to shift the understanding of the *digital surrogate* from languages of photography—such as likeness, similitude, and reproduction—to the conditions of exchange aligned with Māori understandings of place. This involved transforming the interface from a specific technical software program for forensic analysis to an interactive platform synonymous with gaming.

In Geismar's project, 3D imaging processes are phenomenologically experienced, allowing computational methods of visualising data to recondition the limitations of an institutional setting by placing *digital surrogates* in new contexts of negotiation. Even if the material cloak remains confined to the museum's physical space, an affective register and meanings can emerge from other forms of engagement with the artifact. The digital imaging processes serve as a catalyst for a different kind of engagement, redefining artifacts that are typically positioned within the taxonomy of museum display. Through practice, the focus shifts from viewing the cloak as merely an object lesson in undergraduate anthropology classes at UCL or as an artifact contained within a box—too large and fragile to handle—to fostering new forms of dialogue, critical positioning, and engagement.

[287] Geismar, *Museum Object Lessons*, 2018, 89 – 93.

Paul Tapsell considers concerns of place through reference to interwoven understandings that reside both within and outside our perception. His description of *tui*, in this context, describes interwoven processes inherent in *taonga*, which include a sense of storytelling, genealogy, and ritual.

"Tracking the pathway of taonga through the Māori universe of time and space is like tracing a single aho, thread in a cloak. The thread, like the flight of the tui, appears and then disappears, time after time, in a repeating pattern that interlocks with other threads, or taonga, descending from one layer of whakapapa to the next"[288]

Tapsell's conceptualisation is used in Geismar's work to discuss how 3D modelling and photogrammetry software may function through this understanding. It also signals an urgent need for a conceptual shift in understanding *digital surrogates*, moving from viewing the scan as simply a 3D version of a photographic image to recognising the 'post-photographic' as being more complexly interwoven. Technically, photogrammetric and other forms of 3D images are made up of multiple computationally determined parts stitched together through algorithmic processes. Furthermore, making the *digital surrogate* look photographically like the cloak necessitates the participation of craft-based technical operators in extensive post-production using specialist software. Geismar thus highlights that the skills of the technical operator become intrinsic to creating 3D images, to the extent that we may potentially "recognize the idiosyncratic hand of the technologist in these perfectly fabricated images."[289]

The current technological processes in 2024 designed to create seamless 3D images from inputted source data are less reliant on manual stitching than those from 10 years ago. The active agent is not so much the human operator interacting with the scan, but rather the algorithmic process of computational form searching that completes the scan according to detailed coded specifications. There is still a necessity for removing or reconstructing perceived mistakes that occur through the algorithmic alignment of images in post-production software. This necessity arises only if the production model aims for the *digital*

[288] Tapsell, "Pareraututu," 1997, 324.
[289] Geismar, "Post-Photographic Presences," 2015a, 310.

surrogate to share photographic likeness or photorealism with the original object from which the sense data was captured.

However, to develop an element that Geismar has perhaps neglected in her reference to Tapsell's understanding of weaving is the agency of the algorithmic computational process itself, which in current forms of the technology performs most of the stitching. While she appears to be asserting the agency of the individual maker and the uniqueness of their hand in the creation of the digital artifact to align with Tapsell's ideas, it is important to note that even in 2015, these technologies relied heavily on automated processes dictated by software. Furthermore, in their cloud-based current form, the results are so esoteric that minimal differences in input data can create anomalies and incoherences in the final scan experienced in a raw state through the software. Understanding copresence through this concept necessitates the relationality between technological apparatus as agent, material object of concentration, and conscious human interlocutors as being an assemblage of active components.

While the digital object lesson of Geismar's focus is considered a challenge to the way technology functions and is negotiated, ideas of unique access to the collection that are not afforded to most museum communities remain undiscussed. This type of work and exchange necessitates specific conditions and very particular technical requirements for the creation of scans for conservation or the production of high-res CT or LiDAR images. These demands for space, time, and equipment are not available in the normative museum experience, making it problematic if they are to be more generally operative as ways to access new meanings of the museum through computational imaging technology.

The differences in geographic locality are thought to be addressed through digitalisation and the sharing of *networked images.*[290] However, projects of this kind also highlight disparate and unequal forms of separation and agency. It is often Euro-American custodians of artifacts who have unique physical closeness and proximity; they can handle, move, and touch items, albeit because they are experts designated with collection care. This positionality contrasts with those who reside outside this context, who interact vicariously

[290] Daniel Rubinstein and Katrina Sluis, "A Life More Photographic: Mapping the Networked Image," *Photographies* 1, no. 1 (2008): 9–28.

and remotely, participating in limited and controlled access through the creation, manipulation, and interface of embodied experiences mediated by technological apparatus. The assemblage of 3D photogrammetric imaging processes, particularly as experienced through the phenomenological engagement with the museum space—whether via a screen within the space adjacent to the object of focus, through tele-present media such as video conferencing or shared digital files, or in the context of the internet—raises complex issues of agency, ownership, and access in practice-based, museum-focused research projects.

Statements regarding how the epistemology of computational image practices is framed become important to negotiate in this context. However, these statements do not negate how interactions are continually (re)defined by the institution that facilitates them. Even if the gesture or model of exchange aims for a different or more equitable way of experiencing, whether encountered in the museum or online, Geismar's project highlights that *digital surrogates* are never simply transparent mediators, regardless of the language used to read them. Discussing them in these terms ignores the larger power structures in which imaging technologies are embedded.

In the context of working with Māori cultural artifacts, Geismar's project is specific in its intention and practice iterations. The research questions top-down uses of 'post-photographic' imaging for transmitting narratives of collective experience through the digital and broader ideas of visuality read through the photograph. It further highlights that while readings of *digital surrogates* may constitute, house, or consist of meanings defined in Western academic institutional terms, this positionality is not exhaustive. For invested peoples reading them through specific lifeway, these surrogates are potentially subsumed for specific and defined contexts and purposes. The value of 3D models as digital replicas may be synonymous with institutionally labelled notions of reproduction, but there is potential in renaming or un-naming processes that activate artifacts in new and significant ways, especially in determining how institutions are effectively used and for whom they serve.

The operationality of digitising the cloak as a 3D computational image experienced through gaming software starts to redirect the understanding of how computational imaging

technologies may align with other archives of knowledge. This shift involves changing the experience from the interface of photogrammetric post-production software to engagement with an interactive, navigable landscape enabled through the reproduction of the scan data in a gaming engine. Geismar proposes that rather than considering the 'post-photographic' solely as a form of visualisation, it should be seen as a concept that considers "digital data as cultural information that might be able to connect up to other methods of gathering, storing, and presenting information."[291] The 'post-photographic' experience is reconceptualised or rematerialised to alter the onto-epistemology of the digital artefact, employing technologies normally reserved for detecting minute changes in the material condition of artefacts targeted for conservation. The containment of the museum and the focus of museum professionals through a set of concerns established in the institution give way to an engagement with a specific lifeway, attempting to be closer to the positionality of the cloak's origins and current meaning for Māori communities.

In her account of the research process, Geismar indicates that game engine design is employed in new visualisations of the cloak to interlink different forms of using the data as an experience of copresence. Practice outputs are thus designed to metonymically associate the Māori understanding of *taonga* with a concept of land, time, and being, interlaced through the mediation of game space. This resonates with Alexander Galloway's concept of how computer interfaces operate as systems that model external forces. He argues that computational media convert sense data and, in doing so, define and model programmed behaviour using variables and functions. Galloway asserts that if there is a substance that emerges in this *mediatic form*,[292] it is one of complete simulation because "informatic machines do not participate in the worldly logic of essence and instances; they simulate it."[293]

Considered through this lens, the 'post-photographic' scan data of the cloak could be likened to the swooping virtual and weightless camera, perhaps emulating the view of drones, which are often used for creating source data. This navigable gaming space is frequently co-opted into the experience of cultural heritage, where experiential

[291] Geismar, "Post-Photographic Presences," 2015a, 316.
[292] Alexander R. Galloway, *The Interface Effect* (Cambridge, UK: Polity, 2012), 20.
[293] Galloway, *The Interface Effect*, 2012, 20.

photogrammetric images are compiled and presented for consumption through a specific, defined experience and view from above. This is a problematic conceptualisation due to the conditions established through frames of spectatorship. As Thomas Elsaesser writes, "the technologies of imaging today are not means of assisting sight, whether of real or imagined things, but technologies of probing and penetration."[294] They have more to do with "controlling territory, occupying space, monitoring a situation, and mining it for useful information or active intervention."[295]

Geismar contends that the new conceptualisation of 'post-photographic' practice in this project enabled "experiential domains that can be entered into in order to affect co-presence between people, and between people and things across time and space."[296] Within the institutional museum space, this expanded practice suggests the potential for catalysing, creating, or maintaining different relationships between diverse interlocutors through emerging technologies. However, much work is still needed to address how the conditions of exchange determine the parameters of engagement with computational forms of image creation technologies, particularly concerning agency and power relations. A starting point is to change how sense data inputs transformed into images through algorithmic process are used as grounding material for conversation and to redefine names and archives of understanding thought with. Viewing the image data of the cloak in relation to gaming technologies, for example, opens new dialogues and communities for this specific anthropological research project to be experienced in the imperial legacies of collections.

Nancy Marie Mithlo contends that what becomes important to negotiate and question in this context is the museum's "mandates to collect and preserve." [297] This conceptualisation is based on embedded social histories rather than "universal standards,"[298] through which knowledge is created. She also sees Indigenous partner collaborations in institutional research as potentially problematic because they pit different contested processes against

[294] Thomas Elsaesser, "The 'Return' of 3-D: On Some of the Logics and Genealogies of the Image in the Twenty-First Century," *Critical Inquiry* 39, no. 2 (2013), 242.
[295] Elsaesser, "Return of 3-D," 2013, 242.
[296] Elsaesser, "Return of 3-D," 2013, 316.
[297] Nancy Marie Mithlo, "'Red Man's Burden': The Politics of Inclusion in Museum Settings," *American Indian Quarterly* 28, no. 3/4 (2004), 746.
[298] Mithlo, "Red Man's Burden," 2004, 746.

one another, ignoring complexity and misrepresenting intentional goals. The danger lies in the relationality established between anthropologists and Indigenous partners, which enforces an oppositional credo while maintaining boundaries and differentiating values. Despite this, what becomes pivotal is how Indigenous knowledges may operate differently from those of disciplines acknowledged within the institutional context, which may neither incorporate nor acknowledge other forms of approach in significant ways, especially when it comes to changing institutional systems.

While Mithlo emphasises the importance of redressing inequality systems of knowledge perpetuated by the museum's universal claims, this cannot fall solely on the shoulders of indigenous museum professionals. If the aim of the project is positioned as a "responsibility to literally sort through the culmination of colonial legacies via museum collections"[299] the assumption that this represents equity or redemption for the institution is unfounded. This concept further highlights broader issues with the museum's usage and interaction with the questions research projects are designed to address. Despite efforts to "give Natives a voice"[300] museum projects run the risk of placing indigenous interlocutors in positions that enable "self-perpetuating institutions that generally maintain authority." [301] In her comparison of Mithlo's understanding of the *Red Man's Burden* and the state of contemporary art practices designed to re-frame ethnographic museums, Geismar contends that the position of 'outsiderness' is problematically used to enliven or frame collections, whilst isolating certain understandings and lifeways "without integrating them into the mainstream institutional culture."[302]

Through this position, it is not possible to redeem histories of extraction and violence, as the intervention only provides an outside frame that gestures towards restitution without enacting the necessary and fundamental shift in the institution, its languages, and the academic disciplines that lay claim to the collection. This leads Mithlo to conclude that what becomes important is how these research approaches come to fruition in the museum setting. She contends that this depends "on to what degree Indigenous knowledge is

[299] Mithlo, "Red Man's Burden," 2004, 748.
[300] Mithlo, "Red Man's Burden," 2004, 746.
[301] Mithlo, "Red Man's Burden," 2004, 746.
[302] Haidy Geismar, "The Art of Anthropology," in *The International Handbooks of Museum Studies*, ed. Sharon Macdonald and Helen Rees Leahy (Chichester, UK: Wiley-Blackwell, 2015), 204.

incorporated not only into the exhibit content but also in how research questions are chosen and implemented."[303]

Geismar's project differs in that it aims not only to activate the cloak but also to establish protocols and future display parameters, storage, and understanding, thereby (re)activating the artefact within Māori lifeworlds. These processes not only drive the project but are also interwoven with Western onto-epistemology to establish significant ways to rethink how the institution may operate. The research conducted, rather than being simply gestural in its proposed incorporation of alternate paradigms of knowledge, was intent on reevaluating the conditions of both the material cloak in the collection and how the *digital surrogate* acts.

The extent to which Geismar's project represents an act of exchange is not only in the negotiation between invested communities and the institutional space; it is also in questioning terminology, language, and forms of knowledge claim. More resonant, however, is Kura Puke's intention to conceptualise a response to the UCL collection by recreating "a provenance for the cloak and to reactivate the spiritual pathways, the *wairua*, that all Māori *taonga* instantiate."[304] The project involves questioning and redefining familiar spatial and temporal connotations, not only outside of normative usage but also through recognition of the extractive, imperial processes and methodologies from which current technological forms of photography as a medium have evolved since the 19th century.

With the growing use of computational 3D technologies at a consumer level, new propositions are urgently needed regarding both the understanding of collections through different types of engagement and the navigation of imaging technologies through forms of relationality. With the use of different kinds of digital 3D data outside of institutional rhetoric, there is the possibility of a negotiated reinterpretation of the universal claims of the museum through the inhabitation of this space. Consequently, the question arises: in what ways might visitors to institutional spaces become critical producers of new forms of knowledge through engagement with this technology at a consumer level?

[303] Mithlo, "Red Man's Burden," 2004, 760.
[304] Geismar, "Post-Photographic Presences," 2015a, 308.

Museum of Computational Image Artefacts (MoCIA)

Link to the *Docile Bodies Room* on New Art City.

https://newart.city/show/museum-of-computational-image-artefacts-docile-bodies-room

Link to walkthrough video *Museum of Computational Image Artefacts (MoCIA). Docile Bodies Room* on YouTube

https://youtu.be/-TZFbRfqopA

Chapter 04:
Resistant Visitor, Consumer Level Computational Imaging Apparatus, and Mobile Reality Capture Process.

The Other Nefertiti.

In November 2015, a 46 second clip was uploaded onto YouTube with the title, نفرتيتي الأخرى (The Other Nefertiti), [305] and whilst the low-res hand-held video has no description, it seemingly shows the discovery of an ancient artefact. The bust found, positioned in the shade of an undisclosed interior of a tomb like space, is partially buried in the sand. There is no voice heard in the video and little sound - other than footsteps, the laboured breathing of the person shooting the footage, and, in one instance, the swish of sand being brushed from the surface of the artefact to reveal hidden detail. The aesthetic of the work is reminiscent of looting videos that emerged from Egypt after the Arab Spring in 2011 – used to substantiate the authenticity and precedence of an artefact to be sold on the international e-commerce antiquities black-market.[306] Soon after the video was posted, the Egyptologist Dr Monica Hanna tweeted the question as to whether this video depicted the finding of another head of Nefertiti; the first being a painted stucco-coated limestone bust - believed to have been crafted in c.1345 BCE by the sculptor Thutmose - which is regarded as the jewel of Berlin's Neues Museum collection.

Following this post, in December 2015, artist collaborators Jan Nikolai Nelles and Nora Al-Badri uploaded a video[307] depicting Al-Badri entering room 210 of the Neues Museum in Berlin—the room where the Nefertiti Bust is displayed. The recording itself feels illicit. It is shot at waist height, with the hint of a jacket occasionally intersecting the frame. The video shows Al-Badri walking around the space—one hand in her pocket and the other on her jacket lapel—and shows that concealed underneath her clothes, strapped to her body by a belt, is an X-Box Kinect Sensor, which is covertly revealed during the circumnavigation of

[305] Mahmoud Ahmed, "نفرتيتي الأخرى" ["The Other Nefertiti"], YouTube video, 2016.
[306] Mark Altaweel and Tasoula Georgiou Hadjitofi, "The Sale of Heritage on eBay: Market Trends and Cultural Value," *Big Data & Society* 7, no. 1 (2020): 1–13.
[307] Nora Al-Badri and Jan Nikolai Nelles, "The Other Nefertiti," Vimeo video, 2015.

the sculpture. In the footage, we focus on the performative process of the intervention: the artist is apparently making a 3D scan with the technical apparatus.

The context of the object presented in Room 210. Nordkuppelsaal, Neune Museum, Berlin is described by Nelles and Al- Badri as "sacred staging,"[308] dramatically lit from above and displayed in a temple-like neoclassical environment. This display position is not historic but is a curatorial decision designed as part of the rehang and reopening of the Neues Museum in 2009.[309] The optics of the display feel designed for consumption through the camera, but no photographs of the artefact are allowed in the space. As the Berlin institution states,

"In order to allow every visitor to experience the extraordinary effect of the bust and the space, the North Dome Room is subject to special regulations that do not apply anywhere else in the museum. During guided tours the guides and visitors are requested to restrict their conversation to the spaces outside the room, and all forms of photography are also prohibited."[310]

Through this methodology, the museum space and the presence of the artefact become an attentive experience. Engagement with technology and other museum users breaks the "extraordinary effect" of the display and operates within the "special regulations" of the space. While different exhibits have varying parameters, it is the interplay between these conditions that computational imaging technology inhabits and seeks to disrupt in terms of agency, sovereignty, and power in *The Other Nefertiti.*

From the perspective of writing this text, the entirety of my personal experience of the exhibit is based on computational images gleaned from various internet sources. The most specific and detailed understanding of the display for me comes from navigation through Google Heritage—where a museum view of the artefact may be accessed through Google's

[308] Claire Voon, "Could the Nefertiti Scan Be a Hoax—And Does That Matter?" *Hyperallergic*, March 1, 2016.
[309] Staatliche Museen zu Berlin, "The Presentation Of The Bust Of Nefertiti", 2022.
[310] Staatliche Museen, "The Presentation Of The Bust Of Nefertiti", 2022.

Arts and Culture[311] site, under the heading, 'An Audience with Nefertiti'[312] emphasising the differing agencies present in the museum space.

While an increasing number of institutions not only tolerate visitors taking photographs in the museum but actively encourage exploration of displays through the computational lens, particularly on social media,[313] by building repositories of 3D material for users to access remotely[314] or offering bespoke 3D material services to museum users,[315] the acceptance of technology in certain exhibition contexts is not encouraged. This was highlighted in the British Museum in March 2022, when the Institute for Digital Archaeology (IDA) requested and was refused access to the gallery to capture the top of one of the Parthenon Marbles with Light Detection and Ranging (LiDAR) apparatus. The other elements of the sculpture had already been scanned by their technicians during normal visitor access to the space. Institutional anxiety in the museum sector in relation to whether agency of interpretation and experience may be subverted through engagement with outside content creation – particularly through platforms such as Instagram that utilise computational forms of image, and pressure to include access to 3D digital models in the context of institutional webspace to expand notions of access to the collection – has increased in recent years.

Debates about engaging with the universal collection through a computationally determined lens often focus on promoting the museum as an attractive and engaging experience for visitors. This approach prioritises the positive experience of the museum over the collection's positionality and its relation to unlearning the imperial, as described by Ariella Aïsha Azoulay.[316] While attempts to highlight some of the problematic aspects of collections have become more widespread in the context of museum signage,[317] these do not implicate the visitor as agential within the structures of power that operate in this

[311] Staatliche Museen zu Berlin, "Neues Museum," Google Arts & Culture, 2022.
[312] Google Arts & Culture, "An Audience with Nefertiti," 2022.
[313] Arielle Pardes, "Selfie Factories: The Rise of the Made-for-Instagram Museum," *Wired*, 2019.
[314] For example, Scan the World, "The Digital Cast Courts," 2019.
[315] British Museum, "Services," Available at: https://www.bmimages.com/services.asp.
[316] Azoulay, *Potential History*, 2019, 19.
[317] For example, the Rijksmuseum has added 77 labels to its gallery walls highlighting slavery and colonial violence implicit in some paintings and artefacts under the concept of "New Light on the Permanent Collection" see Rijksmuseum. 2023. "New Light on the Permanent Collection." Available at: https://www.rijksmuseum.nl/en/whats-on/exhibitions/rijksmuseum-and-slavery.

context. Namely, the gesture of imaging may be considered relationally to other acts of violence that, Azoulay contends, are inherent in the imperial museum space and its inhabitation. This is evident through historic acquisition processes, extractive accumulation methods, and the eradication of diverse voices and lifeways. These concerns are overshadowed by institutionally ratified knowledge claims and tasks, which may also influence the visitor's experience and perspective.

In the instance of Google and the Neuse Museum's creative collaboration, the project fits seamlessly with the messaging and positionality inherent in the power structures of culturally determined institutional spaces. Google's sovereign power allows it to create navigable computational image mediations facilitated by the institution, positioning the viewer in a specific rhetorical dialogue with the collection while restricting access to the raw data. Indeed, the images in Google's Museum View of the Nefertiti display are stamped with copyright notices from 2019. Visitors do not have this same access in their experience of the exhibit.

In activities completed in the gallery, the museum is actively collaborating with a significant institutional structure, which controls the way information is presented, used, and experienced online. This notwithstanding, there is an attempt to narrate a particular kind of history in the museum space, which is implicit in all aspects of the visitor's experience. From the architectural structure to the display parameters, the signage, café, shop, and object categorisation (often residing within specific enlightenment taxonomies), to the way visitors navigate showcases, there is a sense of control and coercion exerted.

Certainly, the advocacy of the museum as having universal public access is difficult to substantiate without considering the museum as an expanded and computationally mediated entity within the context of the screen. Museum buildings are in specific places, in particular countries, which require costs, visas, and knowledge of their existence in the first place. Even with the footfall of the Louvre, for example, at 10 million people per year, it is a very small proportion of the world's population. Furthermore, museums, facing the overwhelming problem of attempting to digitise vast collections of objects for usage, access, and consumption online, are again predicated on the idea of relatively exclusive

access. However, a wider and more important problem is that there is often little or no acknowledgment or signposting of the particularity or ideology of the space, which frequently incorporates the use of new media, interactive exhibits, and digital curatorial strategies. Thus, there may be little attempt to fundamentally unsettle the discourse of "discovery" and "preservation" that the museum represents from within the institution. Hence, the necessity for strategies of critical intervention, such as the provocation by Al-Badri and Nelles in *The Other Nefertiti*.

Haidy Geismar asserts that the "mimetic faculty of digital renderings,"[318] may necessitate a shift in understanding of both existing and emergent forms of museum collections where, it "is better to think about the interface between different material forms, and between objects and people, than to think about either the digital or the analogue in isolation from one another." [319] In Geismar's argument, the relationality between artefact and *digital surrogate* demands recognition of a complex understanding and concern with how forms of relationality are mediated through the process of computational images created from sense data inputs. Extending this reading, the way the computational forms of image capture are thought of within the context of the museum industrial exhibitionary complex means engaging with the technologies as being comprised of multiple agents and in a state of flux. This reading thus includes continued negotiation of relations between museum objects, people, institutional critique, and technical interface, which form part of a wider assemblage.

However, it remains to be investigated whether disseminating computationally determined image data outside the institution, while still using the museum space as a frame—as in Nelles and Al-Badri's project—creates more potent or significant coherences with computational forms of image mediation or relates to processes of unlearning in Azoulay's terms, compared to the museum's understanding of their collections. As Elizabeth Edwards points out in relation to the context of practice-research within the wider remit of artistic intervention, and in specific reference to Hal Foster's essay *The Artist as Ethnographer, (1996)* the problem inherent in considering insight or claims made through the inhabitation

[318] Geismar, *Museum Object Lessons*, 2018, 105.
[319] Geismar, *Museum Object Lessons*, 2018, 112.

of this role is in the assumption of unique positionality, which may re-appropriate knowledge claims from one set of Western philosophical discourses to another. [320]

Specifically, in this narrative, the artist not "perceived as culturally and/or socially 'other' has only limited access to the 'transformative alterity' of radical or politicised practice in a given context, while artists perceived as 'other' are assumed to have automatic access to it."[321] While acknowledging researchers' intersectional positionality is of urgent importance—particularly writing as a white male academic in a Western university context—the cultural politics of marginalisation, where modalities of knowledge become relational to essentialist claims and access towards these may be seen to replace one set of authorities (or what Achille Mbembe refers to as the archives of knowledge)[322] for other determined sets and conditions under the same rubric, is problematic. The archive in Mbembe's text is defined as a "matter of discrimination and of selection, which, in the end, results in the granting of a privilege status to certain written documents, and the refusal of that same status to others, thereby judged unarchivable." The archive is, therefore," not a piece of data but a status."[323] Therefore, practice-research in this context necessitates an understanding of the problems inherent in the process and requires questioning where attempts to establish positionality through intervention are situated.

In the instance of *The Other Nefertiti,* the relation between the scan and the bust contained within the sacred vitrine of the Berlin Museum is interesting not only in terms of mimetic likeness or equivalence judged in a conservation or technical sense for reproduction or for the data sets' inclusion into an adjusted realm of understanding the artefact within the institution's historical narrative. It is also significant to consider how these digital forms of imaging processes can be used to highlight phenomenological experiences, offering alternative ways of being and thinking in the museum through activities related to the exhibition space and the artefacts on display.

[320] Edwards, *Raw Histories*, 2001, 223.
[321] Edwards, *Raw Histories*, 2001, 224.
[322] Mbembe, "Power of the Archive," 2002.
[323] Mbembe, "Power of the Archive," 2002, 20.

In this context, the intervention points towards assumptions made in the rhetoric of survey museums that, as institutions, they take on the responsibility and care of artefacts on behalf of humanity, which could be extended to the care of digital data. The neutrality of this assumption is not questioned in the public museum space's signage or presentation of the collection. Anyone who interacts with the institution is made aware of their role—whether as curator, visitor, invigilator, security, custodian, or aboriginal shareholder —and this positionality is subordinate to the institution itself, particularly because of the museum's remit to fulfil the role of protector of collections in perpetuity.

This role also encompasses the framework by which understanding of material knowledge is defined and the conditions by which it is presented to the visitor. To redress this power imbalance, or at least to acknowledge that the museum is not a neutral space, James Clifford contends that the institutional museum space should make the history of its own collection and display "a visible aspect of any exhibition." [324] When this is not evident, interventions through practice-research using computational forms of image capture technology, such as in *The Other Nefertiti,* can highlight the problematic conditions of museum display systems and pose new positionalities.

The Neuse Gallery's website states they provide "a comprehensive insight into the continuities and changes that occurred over the course of four millennia in ancient Egyptian and Nubian cultures."[325] However, this rhetoric does not acknowledge the collection as a particular understanding of history and scholarly research within Egyptology, nor does it foreground the colonial history of the display. This highlights the problems inherent in current museum practices, particularly concerning who resides outside the institution and who the shareholders of objects may be. Framing the power relations created in reference to Clifford's conceptualisation of the museum as a *Contact Zone*[326] suggests museums are fundamentally unequal spaces. Clifford contends that an unavoidable imbalance of power exists between the institution and community representatives—both the public and specific invested groups—whose relationship to artefacts is profoundly affected by the re-contextualisation arising from the institutionalisation of the zone.

[324] James Clifford, *The Predicament of Culture* (Cambridge, MA: Harvard University Press, 1988), 229.
[325] Staatliche Museen, "Neues Museum Collection," 2022.
[326] Clifford, *Predicament of Culture*, 1988, 229.

While Clifford's specific focus in his essay is on developing Mary Louise Pratt's idea of the *Contact Zone* in colonial encounters to the context of Indigenous people's relations to the American museum space (specifically through his personal experience at the Portland Art Museum between staff and Native American elders and their relationality to artefacts in the context of collection display), much can be derived from this positionality in the context of *The Other Nefertiti*. The equivocal tangibility associated with the term 'contact,' particularly its implication of partiality, is fundamental to the interaction. This is especially relevant to the process of 3D scanning as a form of distant surveying, given that museum objects are often positioned far from touch—sometimes due to geographical distance, sometimes because of their value or the fragility of the object.[327]

Al-Badri and Nelles released the high-resolution scan data of *The Other Nefertiti* at the *Chaos Communication Congress*[328] in Berlin in 2016. Simultaneously, the scan was converted into a 3D print and brought to Egypt, where it was exhibited at the *Something Else OFF* Biennale in Cairo in an act of symbolic repatriation. The installation of the 3D model in Cairo echoed the design of the display at the Neues Museum, where the scan was installed on a black plinth that brought the sculpture to head height and contained within a metal cube structure. Nelles states of the act,

"We did not know if the public was interested in accessing, studying, printing, or remixing the dataset. The story went viral along with all the issues we were referring to, and there was coverage on every continent, which means there is a specific relevance for ancient artefacts if activated in a meaningful way beyond the museological order."[329]

The Other Nefertiti, created through this technical and conceptual method, embodies its own social power when placed in relation to national and institutional government ideas of ownership through its representation in different contexts and spaces. The new relations established through the display of the bust and the release of the scan data in *The Other*

[327] Geismar, "Post-Photographic Presences," 2015a, 309.
[328] Chaos Communication Congress, 2016, https://edri.org/our-work/33c3-2016/.
[329] Nora Al-Badri, "The Other Nefertiti," 2016, https://alloversky.com/puzzlepieces/the-other-nefertiti.

Nefertiti create meanings that are tangential but relational to the conditions and knowledge claims established in the Neues Museum.

The sculptural version of *The Other Nefertiti* is not a strict copy of the bust, as the 3D print was not a painted replica, but rather is physically similar in terms of its mass and surface detail. *The Other Nefertiti* is considered by the artists to be representative of 'cultural storage,' as there is no attempt to mislead the viewer into believing that the printed scan is an ancient sculpture. The gesture here is not an attempt "to conceal its origin as a technological reproduction but embraces the value of the inherent information... The copy is no slave to the original. A new discussion on the originality and truth of data as well as material objects of other cultures is necessary."[330]

The operativity of these mediations does not come from their acquired aura as simulacra, but from their new form as embodied in computational processes and intervention as a performative practice. The intention of *The Other Nefertiti* resonates with other artworks that utilise the form of the bust for specific critical intentions. Strategies employed by artists such as Fred Wilson in *Grey Area (Brown version)* (1993), which explores the significance of the bust in relation to black identity, and Isa Genzken's use of Nefertiti busts in works such as *Nofretete* (2014), which explore the conceptualisation of feminine ideals in art, become aligned with *The Other Nefertiti* (2016) in terms of the gesture of the performance towards a particular positionality and situating the work within the wider context of art production.

However, multiple adaptations of the data released to the public have been created—from printed versions used as educational tools, plant pots, or heads for Lego figures, to graphics for live music performances, printed T-shirts, and psychedelic gifs—each operating in a different functional system where the museum has minimal authoritative voice. By enabling interaction with the data in alternate contexts outside the confines of the institutional space, some of the agency residing with the museum as gatekeeper of meaning may, in some way, be released to the user.

[330] Al-Badri, "The Other Nefertiti," 2016.

Though these remixes and interventions reside outside of this specific power structure, they are not liberated from ideological constraints. The language of open-source data in the context of *The Other Nefertiti* echoes the tactics of 1970s conceptual art processes and understandings of entropy. The gesture of the work resembles Robert Barry's *Inert Gas Series/Helium, Neon, Argon, Krypton, Xenon/From a Measured Volume to Indefinite Expansion* (1969) but is contextualised in an era of the "Poor Image."[331] *The Other Nefertiti* highlights digital image data as being in a continual state of flux, widely disseminated in a global ecosystem like Barry's work, but also degraded and reconditioned as described by Hito Steyerl's conceptualisation.

Robert Barry's photographic series ostensibly depicts the release of unknown quantities of inert gases into different landscapes of the east coast of America. This conceptual gesture seems, in part, to initiate an entropic process of artistic creation "to indefinite expansion," highlighting the way that art, and indeed other agential forces, act within wider systems. However, this gesture also addresses the condition and means of documentation and the expectation of art in relation to ideas of truth and believability. The way photography functions as a mediation in Barry's project underscores both the conditions and expectations regarding the role artists play in the claims made through art, and the role photographic mediation fulfils in specific contexts.

The work features a deadpan photographic aesthetic synonymous with conceptual art practices of the 1970s, as exemplified by Ed Ruscha's *26 Gasoline Stations* (1963) and John Baldessari's *The Spectator is Compelled…* (1966–68). We see a canister of gas, with a visible measuring system, standing alone in a specific blank landscape—a desert, a mountain range, among palm trees, and on the beach. No people are depicted in the landscape, and the image does not document the artist in the act of releasing the gas, but there is evidently a human presence—which we assume to be the artist—in the act of making the image. In this way, the status of both the artwork and the photograph is in stasis but also flux—a Schrödinger's cat-like state—in that the gas is both potentially released and not released.

[331] See Steyerl, "In Defense of the Poor Image," 2009.

We are to believe that the gas has been discharged, but there is no 'proof' that the gas was let out of the cylinder. In any case, the inert gases are invisible and intangible to human senses and, as such, cannot be depicted through light-based photographic imaging. However, the poetry of the gesture remains. The condition of the piece is perhaps best described by Barry in his text piece, *It has order* (1969–70). In this work, written on otherwise blank pieces of paper, we read the fragmented sentences: '... it has order ... it is always changing ... it is affected by other things ... it affects other things ... it is not confined ... it is not in any specific place ... it can be presented, but go unnoticed ... to know of it is to be part of it ...' [332] In this way, the work's documentary truth function does not specify particularities and defined references, nor does it state what constitutes order, change, and affect.

In the case of *The Other Nefertiti*, 3D scanning process, once located within the museum, moves from this 'measured volume' into new realms of meaning, association, and use. While the context, reference, and intention of *The Other Nefertiti* and Barry's *Inert Gas Series* differ significantly, comparing them highlights how both use the apparent truth status of lens-based media to establish specific positionalities of visual practice. For both projects, there is an argument regarding the truth status of the act. The narrative of how the artists made the scan of the Nefertiti bust seems unlikely if the technical quality and resolution of the scan are considered.

However, Nelles and Al-Badri's intervention effectively foregrounds concerns surrounding access to certain types of data. The release of the scan at the *Chaos Communication Congress* parallels Barry's work in that, after its release, the artist relinquishes the ability to trace its effects. For Barry, the gas enters the atmosphere and the wider planetary ecosystem; for T*he Other Nefertiti*, the distribution is facilitated by engagement with assemblages that have different kinds of agency than the museum on the internet. Further, the materiality in *The Other Nefertiti* is found as much in the larger assemblage of cables, server farms, electron transfer, and electrical power production and infrastructure that characterise late capitalist industrial digital infrastructure as it is in the human interlocutors engaged in software-based manipulation of computational image data.

[332] Jörg Heiser, "Robert Barry," *Frieze*, no. 80 (2004).

Where technologies mediate the museum space, created through institutional strategy, the message of the artefacts, the curatorial conceptualisation of the display, and the experiences of other museum visitors may be obfuscated by the rubric of production and use. However, this does not necessarily equate the production and manipulation of 3D scanning practices created outside the institutional context to an act of repatriation, but rather a displacement from one contact zone to another. In the instance of *The Other Nefertiti*, the artists' positioning of the act of making the artwork addresses the specific problem of accessing original scan data of museum artefacts, which may be impeded by institutional permission processes.

There are several critical discussions surrounding the acquisition of the bust of Nefertiti and repeated requests from the Egyptian government for the artefact's repatriation—most recently to coincide with the opening of the *Grand Egyptian Museum* (GEM) project. [333] However, the return of museum artefacts to invested parties from Western imperial institutions built from colonial projects of extraction, and the critical commentary and comparison with the return of historic artefacts through new technology conceptualised under the rubric of *digital repatriation,*[334] only form part of the artist's intention.

The use of 3D imaging technologies in *The Other Nefertiti* extends beyond the debate on repatriating the Nefertiti bust to Egypt. While digital repatriation projects are part of the discussion, Nelles and Al-Badri focus on the issue of relying on a nation-state as the claimant of artefacts. Instead, their practice highlights the gesture of giving and receiving knowledge and how the creation and use of digital forms of image mediation may embody a form of agency and transfer. The artwork attempts to change the conditions of the museum space, its role within society, and the claims to ownership that the institution embodies. It specifically questions the veracity of the questions we ask about institutional collections, data sovereignty, and how computational forms of imaging technology mediate these debates.

[333]Maya Margrit, "Archaeologist Launches Repatriation Campaign for Egyptian Treasures," *The Media Line*, 2020.
[334] See for example, Hess et al., "Niabara—War Canoe," 2009.

Another idea posed by the intervention is the extent to which the museum makes objects appear to be at the end of their historical lifespan or in a perpetual state of stasis controlled by the institution. How they function within the museum, in terms of social, art historical, and cultural capital, becomes important to negotiate. Questions arise about whether digital forms of computational image capture in the public domain becomes more entangled with conditions of observation and display than acts of restitution or repatriation to communities and invested parties. Such acts may consider different archives in Mbembe's sense, indicating that new methodological approaches, understandings of care, and intentions regarding institutional structures are necessary.

This is particularly important in the role of the historian, as Mbembe argues, who "is not content with bringing death back to life. S/he restores it to life precisely in order better to silence it by transforming it from autonomous words into a prop on which s/he can lean in order to speak and write beyond an originary text." [335] In what way does the intervention of the types of practice utilising computational forms of image capture attempt to equalise power balances within the museum space through performative action, new media technology, and the dissemination of digital scan data? How does intervention in the museum space by its visitors question the relationality, access, image, and power of the institution in this context? To what extent is digital forms of imaging technology capable of foregrounding dominant institutional structures in the museum, conceiving the world in ways other than through the knowledge claims established by the encyclopaedic or universal?

Though consumer-level technologies now incorporate advanced forms of sensors, [336] requirements for creating scans for conservation or high-resolution CT or LiDAR processes demand space, time, and equipment that are often unavailable. This creates a separation between the custodians of artefacts, who have close and direct access, and others who interact with the object vicariously, participating in limited and controlled access both in front of the object in the gallery and through the internet interface.

[335] Mbembe, "Power of the Archive," 2002, 25.
[336] Timothy B. Lee, "The Technology Behind the iPhone Lidar May Be Coming Soon to Cars," *Ars Technica*, October 8, 2020.

In this way, the conditions under which the performative act of releasing *The Other Nefertiti* as a digital file is read outside the museum context bring into question wider issues of how data is preserved, used, and accessed. For example, whether the Xbox Kinect used for the Nefertiti "heist" has the polygon resolution to have completed the detailed scan data disseminated to the public enters a completely different set of dialogues within the technology community than considerations of whether the museum intends to sue the artists for infringement of intellectual property, though both are directed towards the artwork as a catalyst. As Al-Badri comments, the authenticity of the narrative created through the context of the artwork initiates a "discussion on the originality and truth of data," [337] which is a necessary and important point of contestation from which to think about institutional data policy because "today's museums and collections all around the Western world are corrupted. Museums are telling fictional stories, their stories, just because they control the artifacts and the way of representation."[338]

The ability of new forms of computational image to operate across these kinds of discussions is an essential facet of the technology, which is being utilised by the institution as well as critiqued in other forms and practices. While the press surrounding the artwork[339] and the subsequent debates it provoked span a much wider field than the academic discussion on the criticality of the museum, there is little discussion of the agency of the scan and technology. Instead, the focus is on the technical limitations of the supposed method of image capture, the source of the data, and whether the data was authentic.

Technical discussion and questions over the authenticity of the artist's performative strategy, as well as forensic comparisons between scans completed by the museum[340] and data posted on the artist's websites, [341] have been extensive. However, the conceptualisation of the project may be too limited to ideas of authenticity, indexicality, and truthfulness in the context of utilisation of computational imaging through practice-based research. But the agency of this form of imaging is not solely located in

[337] Voon, "Nefertiti Scan Hoax," 2016.
[338] Voon, "Nefertiti Scan Hoax," 2016.
[339] See for example Charly Wilder, "Swiping a Priceless Antiquity ... With a Scanner and a 3-D Printer," *The New York Times*, March 1, 2016.
[340] Cosmo Wenman, "The Nefertiti 3D Scan Heist Is a Hoax," 2016.
[341] Cosmo Wenman, "The Other Nefertiti," AlloverSky, 2016.

considerations of how interactions are continually framed and reframed through the positionality of the scan data. Whether encountered in a museum building or online, digital objects are never simply transparent mediators. The computational image assemblage may constitute, house, or consist of a particular reading, but it is not exhausted by these singularities.

The duplication and replication of *The Other Nefertiti* across various contexts, conditions, and forms can be related to both the original performative gestures and the conditions of the museum space where the input data was created. This relationality allows for the examination of new and different conditions within critical debate through the agency of digital scan data. While the sculptural bust of Nefertiti, whether experienced in situ or reproduced through official images, postcards, or Google Arts and Heritage, has a specific register dictated by the institution—even through the sale of reproductions in the gift shop—the agency of remixing computational image data resides with the intentions of various users, audiences, and invested participants. The artists' intention is that museums "are no longer gatekeepers of culture and heritage; instead, they represent a fraction of seeders located at the zero point of digital circulation." [342] By using alternative networks, the gesture suggests that it is possible to minimise the institution's control over determining knowledge of the artefact within both broader visual culture and the specific assemblage of disciplines through which the scan data is processed.

In November 2019, Berlin's Neues Museum released the 3D data of the Nefertiti bust following a three-year-long Freedom of Information Act (FOIA) effort in Germany by artist Cosmo Wenman. [343] Wenman, who had previously challenged the authenticity of the process undertaken by Al-Badri and Nelles in their act of clandestine scanning, received the 3D data file from the Neues Museum on a flash drive, which he subsequently published online.[344] Wenman's court case represented an attempt to question the embedded power

[342] Nora Al-Badri, "Infinite Copies: Notes Toward a New Convention," in *A World of Fragile Parts/Infinite Copies: Notes Toward a Convention* (Venice Biennale/Victoria and Albert Museum, 2016), 211.
[343] Cosmo Wenman, "A German Museum Tried to Hide This Stunning 3D Scan of an Iconic Egyptian Artifact," *Reason*, November 13, 2019.
[344] The 'official' 3D scan data released is available to download form the peer-to-peer sharing platform Thingiverse, see Wenman, Cosmo. 2019. "Nefertiti Bust, Neues Museum, Berlin." Thingiverse. Available at: https://www.thingiverse.com/thing:3974391.

structures of the museum through legal engagement, aiming to expand access to collections beyond physical proximity to the artefacts and promote the ideology of disseminating open-source data online.

The act of making 3D images and working with them in different contexts becomes entangled with various assemblages of infrastructure outside the institutional museum space. It thus becomes urgent to consider how computational forms of image processes may be subsumed into other forms of knowledge creation and where the embodied experience of the museum visitor remains agential. In moments of capture in the museum space, the black-boxed computational process of the software, the manipulation and editing of scan data, and the context of peer-to-peer 3D file sharing platforms, multiple knowledge claims are made with and through the imaging technologies.

The Other Nefertiti effectively demonstrates the power of releasing data to a community of artists, hackers, and digital producers for re-contextualising the 3D file outside the controlled access of the museum. However, the choice of subject and the impact of the debate are very specific to this intervention, resonating with wider debates in the museum regarding digital repatriation projects and the languages used to describe these outputs, particularly in the emerging field of digital anthropology. The performance of scanning the bust with the Xbox Kinect serves as a poetic visual allegory for the process of data 'hacktivism,' the role of the artist in opposition to institutional positionality, and an illustration of how the conditions established in the museum through its photography policy can be creatively subverted.

However, it is unlikely that the image data acquired during the scanning of the Nefertiti bust in the Neues Museum, is the same scan data released at the *Chaos Convention*. Therefore, further work is needed to understand how 3D forms of computational image created through similar capture technologies are experienced, used, and encountered by museum visitors. What can be produced through accessible high-end low-fi technologies? How do these technologies relate to similar digital artefacts that substantiate institutional knowledge claims? What is the phenomenological experience of making 3D scans in the gallery space?

Towards the materiality of being in a computational image assemblage through processes of reality capture in the Universal Museum Space

The workshops titled *3D Digital Objects and the Post-Colonial Museum Space,* held from 2018 to 2019 at the British Museum in London, catalysed the practice-based research for this chapter which can be viewed in both the *Enlightenment Room*[345] and Docile Bodies Room[346] of the MoCIA. These events aimed to highlight the imperial legacy of the museum and the control evident in how visitors are positioned. They also explored how digital imaging technology can offer a different perspective on navigating the museum space, potentially subverting normative usage and expectations.

The workshops questioned the museum as an embodiment of possession and power, setting boundaries architecturally and conceptually, imposing hierarchies, and structuring meanings. The distinction between professional and technical usage of technology and the categorisation of museum visitors into specific demographic groups contribute to this hierarchy. Understanding the digital object as a computational process within a broader infrastructural and technical assemblage became crucial in determining how the museum is represented through this form of mediation and the voices privileged to speak.

Participants in the workshops were encouraged to use the consumer-level 3D scanning capabilities of mobile phones to consider the technology as an embodied process. They were tasked with examining how the museum's spatial organisation and display strategies impact visitor perceptions of artefacts and how this is further complicated by the physical act of scanning. The workshop emphasised the embodied movement and the positionality of the visitor in interacting with the museum space through this process. Those in attendance responded to an open invitation on Eventbrite and were instructed to meet at a specific location in the museum. The public audience often included PhD researchers from the Visual Cultures programme at Goldsmiths, students from the BA Photography course at the University of the Arts London, other participants with specialist knowledge of the

[345] Peter Ainsworth, "Museum of Computational Image Artefacts (MoCIA): Enlightenment Room," Available at: https://newart.city/show/museum-of-computational-image-artefacts-enlightenment-room
[346] Ainsworth, "Docile Bodies Room."

subject who heard about the events through word of mouth, as well as some inquisitive tourists who happened upon the Eventbrite link. Attention to the parameters of spectatorship and how these intertwine with the institution's rhetoric regarding openness, access, and the idea of the universality of the collection became an important methodology. This approach was not designed to produce substantive analysis of qualitative research data but to trigger further intervention in the space through practice-based embodied research developed relationally and in response to the outcomes.

Questions about how the museum displayed objects, and the relationship between digital objects and artefacts within the museum's display system became key outputs from the sessions. Participants examined how objects experienced behind glass of vitrines and those within software interfaces behind the glass of screens share similar sensual and material qualities, focusing on the conditions of museum spectatorship experienced through mobile phones as forms of computational image capture apparatus. The workshop methodology emphasised accessibility, requiring no specialist knowledge, equipment, or experience, making it open to many potential participants. While professional scans for conservation or high-res CT or LiDAR processes have specific demands on space, time, and equipment unavailable to visitors, consumer-level technologies like photogrammetry and 3D scanning apps are becoming more accessible on mobile devices. These technologies bridge the gap between professional, technically specific apparatus and consumer-friendly, automated programs, enabling the creation of realised 3D objects using ubiquitous mobile phone sensors

Considering the function of 3D images made with mobiles and other forms of imaging technology based on electromagnetic input requires rethinking the camera's role. This involves shifting from viewing the device solely as a tool for creating material documents through photographs or videos to seeing it as a sensor[347] that records electromagnetic data for transformation through computation. While this process can produce still or moving images, it is not limited to that capacity. The imaging technology becomes enmeshed with broader operative actions beyond the site of image data extraction and requires

[347] Asko Lehmuskallio, "The Camera as a Sensor," in *Digital Photography and Everyday Life*, ed. Edgar Gómez Cruz and Asko Lehmuskallio (New York: Routledge, 2016), 243–66.

considering the camera's ability to operate within a wider infrastructural assemblage. The question thus becomes how to understand this process of mediation and its impact on practice. How can practice within the museum context account for these relations, and how does this affect understandings of the images produced?

The museum visitor's positionality, initiated through the British Museum workshop and further practice-research, aims to highlight institutional display strategies that utilise digital forms of imaging in the enlivenment of display. This approach examines whether a different view of collections can be performed through computational forms of image creation by exploring the relationship between research, embodied experience, and technology. Creating digital photogrammetry involves capturing multiple inputs from different angles into a mobile app, which uses an algorithm to stitch them into a cubist-like digital 3D image. Different apps render the same data with varying forms and aesthetics, despite some technical similarities in image creation.

The visitor's position contrasts with the institution's use of high-end imaging technologies, which require unique access and specific conditions. Activities in this context still align with the institutional expectations and governance. Participants were encouraged to create photogrammetric images with a focus on the phenomenological experience of the museum space as mediated by technology. Practically, this involves a shift in focus to the museum's external conditions rather than just the interior of display cases. In the workshops, the museum became the focus of a performative examination of ritualised activities driven by in-app prompts, observation, and interaction, rather than a technical attempt to faithfully replicate artifacts through a computational interface.

The route taken around the British Museum's galleries encompassed most of the collection and included shops, restaurants, and other museum signage. This strategy was designed to mirror institutionally designated tails like the *Around the World in 90 Minutes*[348]tour but also to highlight the museum as an expanded experience beyond the individual galleries' curation and the taxonomic display system based on historical and geographical specificity. The workshop aimed to raise questions about whether the British Museum's display

[348] British Museum, "Around the World in 90 Minutes Tour," Museum listing, 2024.

perpetuates problematic histories of acquisition by emphasising processes of collecting and displaying status, education, or cultural membership through the auspicious display of artefacts considered foreign and exotic for visitor consumption.

Through informal conversation during the events, participants often commented on how the process of physically making the scans became something to navigate in the museum space. The positions of the body towards the display system often necessitated engagement with architectural features such as display cabinets and columns in ways different from other forms of spectatorship. The scanning process involves viewing the object at various angles engaging the viewer with a different kind of bodily experience towards displays. This performative process involves navigating around other visitors, often intervening in their viewpoints as completing a scan requires a direct line of sight, frequently obstructed by people's heads, arms, shoulders, or bags. Additionally, making the 3D scans can mean squeezing between display cabinets to capture an image of the artefact's back surface.

The workshop revealed that scanning the museum with mobile technology involves overcoming the physicality of barriers to find accessible spaces. When navigating restricted gaps, the bodily movement subtly challenges museum authority and tacit rules of participating with the display. This process heightens awareness of the user's body in relation to the display system, contrasting with the designed gaze for those able to perform body normative standing positions. The scanning performance requires choreography, as the technology's automated function plots a specific route and distance that is hard to follow. The technology compels the user to trace a path around the artefact, museum space, and technical apparatus, maintaining focus on the object viewed on screen. This interaction is mediated by the specificity of the experience, where the gaze is focused on fulfilling the scan conditions through the complex viewpoints required by the technology.

Factors such as the low light maintained in museums to preserve artefacts, glass vitrines, and the physical positioning of objects hamper the collection of ideal source data, making it difficult to achieve a complete digital 3D image due to gaps in the input. For objects behind glass, workshop participants often repeated the scanning process to obtain more

complete results. However, the algorithm frequently struggled to find coherence between images, relying on reflections from the glass display cabinets. In these moments of incompleteness, participants noted a poetic element in the technology. The condition and reflection of the institutional display often hindered 3D visualisation, suggesting the artefact could be resistant to being pictured or accessed through this technical process.

The glass of the screen functions similarly to Khadija von Zinnenburg Carroll's conceptualisation of the glass of the vitrine, as it "materializes only the potential of suspension in between states."[349] The screen acts as a container for digital artefacts, where what is behind the screen enters the epistemology and categorisation associated with exhibition displays, in relation to mobile technology and apps like iPhoto, which organise data by place, media type, album, date, and future memory. So, computational forms of image derived from sense data represent a complex set of relations initiated through the process of capture, intertwined with the museum's knowledge claims and the computational infrastructure's technoscientific assemblage, as visualised in the digital image on the mobile device.

Creating scans and transferring data from museum objects to a mobile device was seen as an attempt to liberate the works from the confines and interpretations imposed by the museum. However, this re-contextualisation, rather than repatriation, remains constrained by the same technological apparatus. Rather than liberating or decolonising the museum, the 3D scanning process underscores the barriers and limitations that reinforce established structures and distances within display architecture and curatorial practices. This occurs despite the illusion of openness and accessibility – particularly in relation to concepts of body normativity, which are inherent both in the execution of the scanning process and in the experience of the display system.

The creation of 3D digital objects outside institutional direction can function as an active process, articulating the visitor's presence where dominant and contested perspectives coexist in uneasy discourse. However, whether this process can renegotiate the power over

[349] Khadija von Zinnenburg Carroll, "The Inbetweenness of the Vitrine," in *The Inbetweenness of Things*, ed. Paul Basu (London: Bloomsbury Academic, 2018), 24.

knowledge claims made in the museum space into a broader conceptualisation of computation, with imaging processes being integral parts, remains to be considered. This methodology shifts engagement from the content of the display to fulfilling computational algorithm parameters. In these instances, the focus becomes less about the knowledge claims made through the objects on display and more about the interaction with the app and technological interface.

After the image data is selected, it is uploaded via a mobile network to a server where an automated computational process is applied remotely. The completed scan is then returned to the app interface to be viewed, edited, and shared. If the image capture is not done correctly or focuses on material artefacts difficult to scan, the algorithm cannot create a coherent point cloud, resulting in a failed process. The expected outcome is a complete or significant likeness if technical guidelines are followed. This gap between imagined results and the technological reality highlights the issue at the core of using 3D technologies in museums, resonating with Paul Virilio's idea that "totalitarianism is latent in technology."[350] The ideal of a perfectly rendered scan contrasts with the often ragged and imperfect captures on mobile devices. Investigating the museum with this technology dictates a curation process based on objects suitable for 3D mapping rather than time, geography, or an artefact's status as a museum highlight. This shifts the museum's proposed universality from common human experience to the universality of objects scannable by technical means. However, the time required for scanning also demands attention to the material conditions of artefacts and exhibits, shifting the focus from the museum's knowledge claims via signage and text to whether an object can be computationally imaged.

When viewing photogrammetric images through a mobile app, scanned objects appear as thin layers of digitally rendered skin that often vanish when rotated to another virtual camera angle. The 3D mesh feels ephemeral, often lacking a back or containing holes and gaps due to insufficient input data. The computational process frequently yields rough coherences, or what Hito Steyerl references as 'Blind Spots and Wrecked Data.'[351] These

[350] Paul Virilio, "The Silence of the Lambs," interview by Carlos Oliveira, *CTHEORY* 19, no. 1–2 (1996), 3.
[351] Steyerl, "Ripping Reality," 2012.

visually incomplete 3D models seem ripped or torn, though these are merely anomalies in our expectation of a complete scan, as the algorithm processes the data according to its programming. The question arises whether these empty 3D digital shells can be filled with meaning or if there are too many holes for meaning to take hold. The algorithm sometimes attempts to bridge gaps with polygon patches, exposing the vulnerability of the scan process while implying that the algorithm is designed to abhor vacuums.

These forms of relation, where scans subvert concepts of complete replication in Steyerl's conceptualisation, incorporate ethics and acts of resistance against hegemonic systems of control. Another way to conceive the incomplete process of these embodied scans is through the concept of the glitch, as posited by Legacy Russell. In Russell's analysis, she considers that glitches, the imperfections in 3D replication processes drawn upon by Steyerl, can be opportunities for creating new modes of being and becoming. Russell suggests that glitches, as departures from expectations of the normal, are generative ruptures that extend to become landscapes of possibility. Russell's exploration of this concept emphasises their role as agents marking a departure from predictability and recognition. She contends, "Errors, ever unpredictable, surface the unnamable, point towards a wild unknown."[352] This view positions glitches as powerful disruptors that challenge and redefine our understanding of what constitutes visibility, opening spaces for alternative narratives and identities, particularly in her concept towards empowered positionality of race, sexuality and gender.

The scan cannot always align all the inputted data in expected ways, and the 3D images created often extend beyond the perceived boundaries of an individual object. The amalgamated sense data partially captured becomes like digital moons orbiting the artefact. It is the museum space itself and the inherent relationships within its walls—including other visitors, signage, and architectural features—that are being pictured, even when the focus is on isolating a specific artefact. The meanings constituted by the scans include the museum space as context but are not limited to it. In this context, the interest in digital objects does not come from the exactitude of detail but from the new forms of relationality they expose. Fragmentary, partial, and incomplete elements made visible in the

[352] Legacy Russell, *Glitch Feminism: A Manifesto* (London: Verso, 2020), 74.

final scan articulate something essential about mediation as an assemblage of disparate parts. In professional museum display, these anomalies are usually removed in post-production. The more ethereal the image becomes, the less it replicates the specific artefact in time and space, but it may reflect the precarity of the museum object within the display system.

Gaps that cannot be repaired in automated computational renders highlight the disparity between the embodied experience of the apparatus and the expectations of its future potential as a complete simulacrum. This low-end, high-tech form of computational imaging embodies a disjuncture between images produced for display and those created through the visitor's experience, serving as a snapshot of the medium's current technological state. Scans are becoming increasingly sophisticated, and anomalies will likely be erased in a few years, making the process appear as seamless as professional iterations.

The teleology of photogrammetry as a mobile app and technological process aims to create exacting simulacra, focusing on detail and visual exactitude. This process extricates the tactile feel, smell, and phenomenological experience of the museum space from the *digital surrogate*, raising questions about the meaningfulness of these forms of mediation. The knowledge created through 3D Imaging is not a perfect simulacrum because multiple sensory features are mediated through the technological process. Instead, we experience an interpretive process of image creation, involving non-invasive data capture and interpolation through black-boxed computation.

Consumer technology aligns with the museum by cataloguing computationally constructed digital images in chronological order and with metadata that attest to their provenance. This technology emphasises storing and presenting 3D files within a digital repository or display system. Computational forms of imaging technology accessible via mobile devices perform the relationships between artefact and object, institution, network, technology, and positionality of knowledge within both the museum context and the technological interface experience. The ways in which visualising museum artefacts and displays through this technology is entangled with the limitations of access inherent to the museum space

highlights the partial and contrived perspective imposed on the visitor by the museum's display system.

During the workshop, participants examined how computational images might disrupt canonical readings of the imperial museum space. This discussion arose from questioning whether technological processes align with the extractive histories of colonial collecting and knowledge exchange in the museum. The act of making scans highlighted how display conditions and technical interfaces condition the body to be positioned in specific ways. Mobile devices, as ubiquitous interfaces, represent what Shoshana Zuboff calls *Surveillance Capitalism*, involving extractive forms of data collection and monitoring. Zuboff describes this as "the unilateral claiming of private human experience as free raw material for translation into behavioural data."[353] In this reading, users become operative agents of exchange within the Internet of Things and social media contexts, simultaneously consuming and being consumed. This interaction aligns with Alvin Toffler's 1980s concept of a *prosumer*, representing a "progressive blurring of the line that separates producer from consumer."[354] According to Zuboff, new mobile technologies potentially monetise personal data, embedding users in a pervasive exchange that facilitates extractive data collection. Computational forms of image mediation thus act as operative agents within the assemblages of users, technological interfaces, and corporate capital.

This positionality is further complicated by what Ruha Benjamin categorises as the *New Jim Code*, where the capability of new technologies to capture images is often biased, failing to register darker skin tones and thus enforcing racist prejudices, however it is not only highlighting problematic training data that is at stake.

"Ultimately the danger of the New Jim Code positioning is that existing social biases are reinforced – yes. But new methods of social control are produced as well. Does this mean that every form of technological prediction or personalization has racist effects? Not necessarily. It means that, whenever we hear the promises of tech being extolled, our antennae should pop up to question what all that hype of "better, faster, fairer" might be

[353] John Laidler, "Harvard Professor Says Surveillance Capitalism Is Undermining Democracy," *Harvard Gazette*, 2019.
[354] Alvin Toffler, *The Third Wave* (New York: Bantam Books, 1980).

hiding and making us ignore. And, when bias and inequity come to light, "lack of intention" to harm is not a viable alibi. One cannot reap the reward when things go right but downplay responsibility when they go wrong."[355]

The urgency of attending to the extent to which computational imaging technology can reveal fractures in hegemonic conceptualisations of technological mediation is heightened, particularly if the rhetoric of completeness serves to extend the inequalities evident in the spaces of capture into digital realms of circulation. This extends from the museum, as an embodiment of the shutter in Azoulay's terms, to the conditions of display under corporate governance online, potentially perpetuating inequalities rooted in other systems of oppression, as discussed within the context of the *New Jim Code* in Benjamin's terms.[356]

The workshop practice conducted in relation to the museum highlighted the need to engage with different ways of considering technology and the knowledge claims made through images. This aligns with Donna Haraway's concept of situated knowledge, which emphasizes "objectivity that privileges contestation, deconstruction, passionate construction, webbed connections, and hope for transformation of systems of knowledge and ways of seeing."[357] The traditional universal or encyclopaedic nature of the institutional museum often implies a conception of totality. Haraway's idea of situatedness, particularly in feminist epistemologies of scientific knowledge, counters the universal museum's positionality, inviting viewers to see beyond "the vantage point of the cyclopean, self-satiated eye of the master subject."[358]

While Haraway's conceptualisation is rooted in her critique of the technoscientific world-building of the late 1980s, challenging the "innocent powers to represent the world"[359] within "Global Systems"[360] and the feminist context of that era remains pertinent. Haraway differentiates between the universal and the situated, framing the positionality of the visual

[355] Benjamin, *Race After Technology*, 2019, 76.
[356] Benjamin, *Race After Technology*, 2019, 5-6.
[357] Haraway, "Situated Knowledges," 1988, 585.
[358] Haraway, "Situated Knowledges," 1988, 586.
[359] Haraway, "Situated Knowledges," 1988, 579.
[360] Haraway, "Situated Knowledges," 1988, 579.

as a matter of "the power to see," [361] where vision is implicated in acts of violence because it "requires instruments of vision; an optics is a politics of positioning." [362] This idea is important in the context of museums and aligns with Ariella Aïsha Azoulay's similar claims regarding the violence enacted through museum spectatorship. This also resonates with Ruha Benjamin's highlighting of biases embedded in technical imaging processes that "are sold as morally superior because they purport to rise above human bias, even though they could not exist without data produced through histories of exclusion and discrimination."[363]

In this context, Haraway's expanding conceptualisation of critical thought can be considered in terms of how "meanings and bodies" may be built for the "chance of life." Engaging with the idea of situatedness in new forms of imaging technology highlights an additional condition of the museum space, positioned between institutional display strategies and other onto-epistemological perspectives. The museum is experienced through specific bodily conditions, where the viewer's engagement with the screen interface may signify "a leap out of the marked body and into a conquering gaze from nowhere."[364] Haraway's perspective prompts questions of how practices utilsing computational images can allow for the "opening of nonisomorphic subjects, agents, and territories"[365] that are "unimaginable from the cyclopian, self-satiated eye of the master subject"[366] while also being embodied by technologies that can potentially oppress and enact violence. This duality of computational forms of imaging technology underscores its capacity to both challenge and reinforce existing power structures within the museum space.

Haraway categorises situatedness as the knowing self being "made and sewn together imperfectly."[367] This positionality is not just partial and incomplete but is also contested and marked by its own construction. This idea parallels the construction of digital images produced with mobile technology from sense data input, especially in 3D imaging, where

[361] Haraway, "Situated Knowledges," 1988, 585.
[362] Haraway, "Situated Knowledges," 1988, 586.
[363] Benjamin, *Race After Technology*, 2019, 10.
[364] Haraway, "Situated Knowledges," 1988, 581.
[365] Haraway, "Situated Knowledges," 1988, 586.
[366] Haraway, "Situated Knowledges," 1988, 586.
[367] Haraway, "Situated Knowledges," 1988, 586.

the computational process often results in holes and anomalies. This partial visioning towards a positionality that foregrounds and acknowledges incompleteness offers insight into both the technology and the museum as a vision machine, in Paul Virilio's terms in that, "from earliest childhood onwards, we now routinely see the encoding of increasingly elaborate mental images together with a steady decline in retention rates and recall."[368]

For Haraway, technological process is "always a complex, contradictory, structuring, and structured body,"[369] potentially contrasting with the encyclopaedic visioning that constitutes "the view from above, from nowhere, from simplicity."[370] Approaching the museum space as a visitor using computational imaging technologies on personal mobile devices complicates the knowledge claims made by institutional museum spaces, due to the specificity and situated nature of such interactions. The universal is replaced with the embodied, partial, specific, and temporal positionality of the visitor. In this way, the usage of computational imaging technology crosses thresholds, resonating with Haraway's assertion that objects are boundary projects. These boundaries are not fixed; they "shift from within; boundaries are very tricky. What boundaries provisionally contain remains generative, productive of meanings and bodies. Siting (sighting) boundaries is a risky practice."[371]

The discontinuity between scan images and artefacts within the museum display system reveals expectations of technological accuracy. The computational algorithm aligns sense data to form 3D digital images, determining correspondences between data input and image output. However, disparities in this process expose computational errors, revealing a discrepancy between the captured object and the software's mediation. Considering the technological process's goal to map with maximum accuracy through all photon wavelengths, down to a subatomic scale and rendered instantaneously, suggests a category mistake if something other than photorealism is being attempted in the process.

[368] Paul Virilio, *The Vision Machine*, trans. Julie Rose (Bloomington: Indiana University Press, 1994), 7.
[369] Haraway, "Situated Knowledges," 1988, 589.
[370] Haraway, "Situated Knowledges," 1988, 589.
[371] Haraway, "Situated Knowledges," 1988, 595.

Despite the accuracy of the 3D image produced, an essential difference remains between the terrain and the onto-epistemological meaning foregrounded by the algorithmic process of image creation. The affective experience of raw photogrammetric images in the software space highlights the fissures between input and output. The distinction between map and territory, between captured sense data and processed photogrammetric images, highlights the limitations of significance for the intended purpose, as shaped by the rhetoric surrounding utopian expectations of computation and its purported ability to replicate various forms of materiality through digital processes. However, as these relations emerge, the gap allows for new and specific alignments in how the image operates. The digital image serves as a mediating function, but the extent to which the model bridges certain sensual features of the artefacts in the museum space through the interface of the app needs to be explored further.

Ed Finn contends that technology has agency and impacts the environments in which it is situated. Machines designed to bridge the world of embodied phenomenological experience and material existence alter how humans think, interact, and engage in cultural practices. More importantly, "this happens because implementation encodes a particular formulation of the desire for effective computability, a desire that we reciprocate when we engage with that system."[372] The experience of viewing computational forms of image created through sense data input involves making the familiar strange through repetition and doubling. The relationship between mediation and the resultant images becomes a point of critical comparison, remaining in a state of flux.

Sarah Pink contends that "understanding the sensoriality of images as something that is generated through their interrelatedness with both the persons they move with and the environments they move through and are part of." [373] The algorithmic black boxed process used in creating computational images highlights a control system beyond the user's direct intentionality. So, understanding these images in the museum context involves "comprehending how images and other materialities, sensory perception, discourses, persons, and intentionalities might cohere to constitute economies of power and

[372] Ed Finn, *What Algorithms Want* (Cambridge, MA: MIT Press, 2017), 49.
[373] Sarah Pink, "Sensory Digital Photography: Re-Thinking 'Moving' and the Image," *Visual Studies* 26, no. 1 (2011), 4-5.

relatedness in specific situations." [374] Rather than static containers of meaning, computational image process are dynamic parts of larger assemblages of meaning and infrastructure. This resonates with N. Katherine Hayles' concept of cognitive assemblage, necessitating work to think about the mediation's positionality and how meaning may emerge through disparate interlocking contexts and components.

Hayles sees relationships between agential forces as part of cognitive assemblages that include material, nonconscious, and conscious processes. [375] In *Unthought: The Power of the Cognitive Nonconscious* (2017), she seeks to design new frameworks for conceptualising and defining cognition, emphasising this as a primary analytic category encompassing material processes, nonconscious cognition, and conscious awareness. She categorises cognition as a spectrum with no clear dividing lines, challenging the binary of human and nonhuman, which overemphasises human centrality. Applying this to digital forms of imaging means broadening our understanding to include material and non-conscious agents, such as algorithmic computation and technical apparatus. This re-conceptualisation affects understanding of how taxonomic systems of museum display function within cognitive assemblages experienced with technical apparatus.

Hayles sees nonconscious cognition as adaptive, enabling systems (organic and technical) to function operatively "at a level of neuronal processing inaccessible to modes of awareness but nevertheless performing functions essential to consciousness."[376] The black-box functionality that enables consciousness to operate becomes apparent only when drawn to the level of consciousness—where our understanding of computational images resides. Her project compares "structural and functional similarities"[377] rather than reducing systems to singular traits. For example, using a mobile phone camera involves nonconscious and conscious cognitive processes with multiple agential forces. The act of manipulating the phone to "click" the shutter becomes part of broader processes beyond the human interface. In making photogrammetric images, multiple camera sensor inputs and algorithms engage with external stimuli, deterministic processes, and complex

[374] Pink, "Sensory Digital Photography," 2011, 6.
[375] N Hayles, *Unthought*, 2017, 9 – 40.
[376] N. Katherine Hayles, "The Cognitive Nonconscious," *Critical Inquiry* 42, no. 4 (2016), 784.
[377] Hayles, "Cognitive Nonconscious," 2016, 787.

computational systems. We interact with the photogrammetric mobile app, wireless routers, GPS signals, metadata, and infrastructure that persist even after the camera is put away. "But the human subject is no longer part of the particular cognitive assemblage," [378] whereas the 3D image data created may still be.

Hayles states that a deterministic machine, despite its nature, makes choices as it performs its tasks. It is this notion of choice, even if it is between zero and one, that Hayles sees as distinguishing cognitive processes from what she terms material processes. Material processes often possess agency that dwarfs that of a *cognizer,* but they lack cognitive possibility because they do not have the potential to choose their actions. The difference between photographic and computational forms of image processes could also be distinguished here—the photographic as a material, and the computational image as a non-conscious element of a cognitive assemblage. Furthermore, Hayles argues that choice lends itself to interpretation, which tends towards processes of meaning-making.

For example, in the camera's *Complementary Metal–Oxide–Semiconductor* (CMOS) sensor, the choice of a single pixel's luminosity and the way that light interacts with the surface material is a machinic material process. However, the image produced could be interpreted as an *intention towards*. The 3D scanning app, in creating photogrammetric images, follows a particular automated postproduction algorithmic process when searching for correspondent points across image data inputs. Within defined parameters, the software can process how to stitch these multiple sources together to form a complete scan and, responds to a changing set of conditions dictated by the input data it is working with. *Meaning* is equated to an outcome, but it is not *significant* to humans alone if one considers significance as being an affective quality equivalent to the intended consequence of relations in cognitive assemblages between actors and agents. This leads Hayles to conclude that for "the cognitive nonconscious, however, meaning has no meaning."[379]

Practices that explore the capacity of computational image processes in the context of the museum space as a cognitive assemblage may thus necessitate the consideration of visual mediation, which may be "infused with social-technological-cultural-economic practices that

[378] Hayles, *Unthought*, 2017, 2.
[379] Hayles, *Unthought*, 2017, 1.

instantiate and negotiate between different kinds of powers, stakeholders, and modes of cognition."[380] What appears or emerges from attempts to manifest systems of cognitive nonconscious in itself will stem from conscious/unconscious modes of awareness, in activities of "restaging within the theatre of consciousness." [381] Thus, meaning (for humans) signifies what happens in and for meaning in the human central context across several fields. However, as Hayles contends, it is not limited to this sphere.

"The search for meaning… becomes a pervasive activity among humans, animals, and technical devices, with many different kinds of agents contributing to a rich ecology of collaborating, reinforcing, contesting, and conflicting interpretations."[382]

An ever-increasing number of interactions with imaging technology involve connections between nonhuman actors, occurring between machines through what Hayles defines as a nonconscious cognitive process. Readings of the image through lenses such as anthropology, history, art, or social theory have become antiquated and inadequate as singular approaches to considering this changing ecology. Thinking about the onto-epistemology of computational forms of imaging technology and apparatus solely in terms of pictures creation for the human eye may be considered synonymous with a logic synonymous with what Eugene Thacker refers to as the *world-for-us*.[383]

The cognitive nonconscious may be a way of externalising technical mediations explored as an awareness of where human and technical, consciousness, nonconscious and material process are enmeshed. Therefore, in exploring different forms of digital image process, what is at stake are perceptions of meaning that are limited to the concept of the human—and specifically, the human as an imperial agent. Practice may initiate a dialogue about or indeed manifest a nonconscious cognitive process, and through this lens, serve to discuss the broader concerns of human relationality to the systems of museum display. These concerns may be better addressed through broader engagement with computational

[380] Hayles, *Unthought*, 2017, 178.
[381] N. Katherine Hayles, "Cognition Everywhere: The Rise of the Cognitive Nonconscious and the Costs of Consciousness," *New Literary History* 45, no. 2 (2014), 215.
[382] Hayles, "Cognition Everywhere," 2014, 217.
[383] Eugene Thacker, *In the Dust of This Planet* (New York: Zero Books, 2011), 4.

imaging technologies, extending beyond the museum's physical buildings to the internet as a knowledge repository, where the ideological foundations of what can be computed are highlighted in relation to the languages and knowledge systems established within the condition of the museum.

Museum of Computational Image Artefacts (MoCIA)

Link to the *Remote Access Room* in New Art City.

https://newart.city/show/museum-of-computational-image-artefacts-remote-access-room

Link to walkthrough video *Museum of Computational Image Artefacts (MoCIA). Remote Access Room* on YouTube

https://youtu.be/t2ACHCdfR1o

Chapter 05:
The Brutalism of Museums: Exploring Institutional Collections on Web-Based Platforms, Augmented Reality (AR) Technology and Other ways of Thinking Technology

Digital Preservation and Versioning of Cultural Heritage Using Computational Imaging

For the 2016 Venice Architecture Biennale, the Victoria and Albert Museum curated a project titled *A World of Fragile Parts*. Presented in the *Applied Arts Pavilion*, the exhibit installed a series of sculptural works, including Jan Nikolai Nelles and Nora Al-Badri's *The Other Nefertiti* (2016). The concept of the show revolved around the idea of the copy and how it can perpetuate forms of material culture. Curator Brendan Cormier's text *Against a Pile of Ashes*, [384] reproduced in the show's catalogue, underpinned the project by exploring contemporary understandings of the copy in the museum context and examining the challenges and considerations in preserving material cultural heritage.

His discussion, grounded in new forms of scanning and 3D printing, is set against a backdrop of global issues like the destruction of cultural heritage through ecological catastrophes and acts of war. Cormier contrasts these with damage caused by urbanisation, tourism, and neglect, which he defines as the lack of attentive maintenance by governmental bodies or invested partners. This neglect results in the destruction of global cultural heritage due to the withdrawal of care, highlighting that small acts of destruction happen daily in heritage sites and museums worldwide.[385] The museum's promise to preserve items forever is questioned by highlighting the fragility of materials in this supposedly suspended state. While conservation processes are considered a necessary part of custodianship, they ultimately only slow down the inevitable decay of artefacts contained within the walls of institutions.

Cormier argues that copies, whether made from plaster, as in the V&A's sculpture court, or through new forms of digital printing and scanning, are often considered insufficient

[384] Brendan Cormier, "Against a Pile of Ashes," *V&A Blog*, June 15, 2017.
[385] Cormier, "Against a Pile of Ashes," 2017.

replacements for historic objects. However, he contests this view by highlighting the V&A's plaster casts, which are meticulously cared for and conserved. Cormier states that it now holds sculptures in a better state of preservation than the original artefacts, such as Trajan's Column in Rome, which is affected by air pollution and other environmental factors.

The Victorian process of casting, initiated by Henry Cole, the V&A's founding director, is compared to new processes utilising digital technologies like LiDAR, CT, and photogrammetry. However, the challenges of physically housing plaster casts contrast with the digital archiving of material culture, which now relies on data stored in remote server farms or hard drives. While there has been resistance within institutions to share digital resources, high-quality scans of artefacts have revolutionised preservation efforts. Cormier advocates for the concept of 'perpetuation' of cultural artefacts rather than preservation in perpetuity, arguing that cultural heritage should be continuously reinterpreted and added to through contemporary forms of intervention with collections.

In the context of discussions surrounding the replication of cultural heritage, Bruno Latour applies Benjamin's concept of the aura to consider "facsimiles"[386] of cultural artefacts produced by the non-profit Milan based organisation *Factum Foundation for Digital Technology in Preservation*. Here, he argues that instead of fixating on the idea of the relationship to the original artefact being reproduced, we should consider the affective register embodied in the reproduction and the purposive effect it serves, whether positive or negative.[387] Referring to music and theatre to illustrate his point, Latour argues that the idea of having an original production of a Shakespeare play, for example, is problematic because the performance of the play always involves creative interpretation. While the text or sheet music may be, in some senses, considered an original or at least a referent, even in its multiple forms, a more fruitful way of looking at facsimiles is to consider the way the original is explored "to help redefine what originality actually is."[388] In this suggested change in thinking, attention is taken away from the *auratic* or mimetic functionality of the copy. Instead, Latour asserts, what should be foregrounded are the ways the qualities of reproduction allow for different forms of encounter, sensory experience, and critical

[386] Bruno Latour, "The Migration of the Aura—or How to Explore the Original Through Its Facsimiles," in *The Materiality of the Aura*, ed. Adam Lowe et al. (Madrid: Factum Arte, 2020), 33.
[387] Latour, "Migration of the Aura," 2020, 33.
[388] Latour, "Migration of the Aura," 2020, 33.

reflection. However, as argued throughout this text, the conditions of this conversation need to be carefully positioned.

In projects conducted by companies such as CyArk, which utilise preservation languages through 3D imaging processes and knowledge transfer, local interlocutors are trained in 3D scanning and software to document artefacts in their precarious environments. However, the remit for these projects is determined by global understandings of human achievement within the framework of organisations that determine "outstanding universal value." [389] On the CyArk website, young white male technicians, dressed in khaki safari suits, talk earnestly to the camera about the importance of 3D imaging processes in foregrounding historic sites as playing "a critical role in building and defining cultural and community identity." [390] CyArk describes how the company directs 'local actors' in computer labs and historic sites, guiding them in using photogrammetric apparatus and software. In images depicting their visible role in uniting community and technology, technicians are shown standing benignly among groups of people at sites such as Busanyin Shrine in Nigeria or the temples of Bagan in Myanmar, in their work "creating more equitable and respectful access to places through digital technologies." [391]

The importance of this type of project is seen as self-evident, facilitating remote access through the perception that "places play a critical role in building and defining cultural and community identity, yet often remain unknown or out of reach for many." [392] However, this positionality is problematic as the cultural riches, history, and universal understanding of humanity are presented to be consumed and experienced by those who can afford and access, and have infrastructure for technologies such as VR, despite images of novice monks wearing CyArk-branded headsets. It could be argued that the optics of the process bring the exotic to the homes and institutions that can afford to utilise the technology, enabling those 'local actors' to participate in the potentially extractive commodification of their cultural heritage through this specific lens.

[389] UNESCO, "Criteria for Selection," 2005.
[390] CyArk, "Mission," 2022.
[391] CyArk, "Mission," 2022.
[392] CyArk, "Mission," 2022.

This complex set of relations can also be explored through the work conducted by *Factum Arte*, particularly in relation to Latour's conceptualisations of the aura of digital materiality.[393] Latour suggests that future uses of computational imaging technologies will lead to increasingly exact and accurate forms of replication of cultural artifacts. This idea is emphasised in the introduction to Factum Arte's *The Materiality of the Aura: New Technologies for Preservation*, where co-founder Adam Lowe discusses the role and function of digital technology. He emphasises the importance of using advanced processes of computational sense data accumulation to be rigorous and detailed, while also recognising the agency of digitalisation, as files can be "analysed, studied, shared, and rematerialized for a variety of purposes." [394] While Lowe references how technology can be used to create exact and precise reconstructions, he notes that this data does not necessarily have to be applied in this context.

Lowe sets out a relationship between different types of materiality in which the technologically produced surrogate acts in a specific relational mode to highlight questions of sovereignty within the context of the institutional space. Specifically, in alignment with Latour's conceptualisation of versioning, rather than viewing copy and original as diametrically opposed concepts, what is made through technological processes "encourages us to become aware of our temporal and perspectival limitations." [395] Furthermore, while digitally created cultural artefacts have often been associated with the virtual in computational terms, they are becoming more linked to the dependency on infrastructure for them to function. Despite this, they still share something of Benjamin's concept of the aura as they "are far from being discrete, stable, and clearly defined." [396] However, Lowe contests Benjamin's determination of the auratic as something "intrinsic to, and emanating from, the object; in reality, the aura is projected onto the object by the viewer and is the product of our own perception of value, our beliefs, and prejudices. When these change, the aura can relocate." [397]

[393] Adam Lowe, Guendalina Damone, and Carlos Bayod Lucini, eds., *The Materiality of the Aura* (Madrid: Factum Arte, 2020).
[394] Lowe, Damone, and Lucini, *Materiality of the Aura*, 2020.
[395] Adam Lowe, "Introduction," in *The Materiality of the Aura: New Technologies for Preservation*, ed. Adam Lowe, Guendalina Damone, and Carlos Bayod Lucini (Madrid: Factum Arte, 2020), 15.
[396] Lowe, "Introduction," 2020, 18.
[397] Lowe, "Introduction," 2020, 18.

This proposition has been articulated by Lowe in his intervention on discussions surrounding the repatriation of the Elgin Marbles. His proposal is to reproduce the sculptures and distribute the copies between the *Acropolis Museum* in Athens and the *British Museum* in London to the extent that neither institution knows which has the originals and which has the copies.[398] This purported ability to reproduce with precision and detail indistinguishable from the 'originals' lies at the core of how the digital image is becoming an increasingly significant rhetorical concern. However, the ideological positions of these acts and the ways in which digital imaging processes are utilised need to be explored, particularly in terms of the sovereignty of computation within the process and the ideas of ephemerality that cannot be replicated through digital processes.

The role of the 3D image in facilitating ideas of mimesis and replication is subverted by re-contextualisation. The function of the artefact becomes entangled with the site where it is re-positioned through the screen, both in exhibition displays and through private usage through technologies such as the Augmented Reality (AR) functions of mobile apps. Scenes of lived experience, mediated through the screen, are intertwined with broader assemblages of 3D imaging technologies, image processing, and AI-driven algorithms, producing autonomous or individually personalised, computationally augmented perspectives through collaged or layered forms of digital imagery. This disjunction resurfaces upon returning to the physical museum space, drawing attention to the governance and material infrastructure underlying technological imaging processes.

Haidy Geismar's idea of being co-present[399] with imaging technology highlights how the digital creates new forms of self-consciousness and connections to objects. The potential of 'post-photographic' practices broadens the specific knowledge that institutions can disseminate within the closed system of the institution. Computational forms of imaging technologies convey meanings and associations in divergent circumstances, expanding the understanding of the computational images created and presented in museum spaces. However, projects like CyArk's emphasise gestures of equitable access and respectful use of digital technologies in preserving cultural heritage. This raises the question of whether

[398] Anthony Sattin, "Meet the Master of Reproduction," *Christie's*, March 5, 2015.
[399] Geismar, "Post-Photographic Presences," 2015a, 309.

digital cultural heritage projects, sponsored by corporate entities, can truly be carefully managed to avoid replicating imperial practices of the shutter in Azoulay's terms.

The extent to which the use of computational forms of imaging, derived from specified source materials and refracted through multiple epistemological lenses—archaeological, curatorial, forensic anthropological, art historical, or clinical scientific—reinforces or illustrates knowledge claims in the museum may also depend on the attentive participation of visitors with these technologies. But the museum is not a hermetically sealed institution; it is relationally connected to the substantially larger repository of information that the internet represents. The online museum space establishes networks or infrastructures accessed through the same interfaces as Facebook, X, TikTok, Pinterest, and Instagram. The internet plays a central role in the expanded and embodied experience of the museum, often through digital images captured through sense data inputs that are relationally placed alongside other forms of signage and illustration on the screen's interface, sometimes conflicting with institutional positions.

André Malraux's perception of the *Museum without walls*,[400] exemplified through usages of images where visitors curate their own experience of viewing artefacts, resonates with how the museum is experienced online. This is particularly evident in the context of social media streams, both from the institution and through personal accounts, hashtags, and geolocated images. An ability to curate an image identity on sharing platforms can juxtapose different sources in stark contrast with other elements of daily life or reflect personally determined curatorial concepts. Sonia Katyal states, technology enables the modern museum to move "from a space that cast visitors as spectators, spaced apart from one another by gallery walls, into a world of collaboration."[401] So, the potential in utilising technologies in new ways "offers a pattern of interactivity that can be characterised by its nonlinear, associative patterns of information retrieval."[402]

Augmented Realities: Reframing Museum Spaces and Artefacts

[400] André Malraux, *Museum Without Walls*, trans. Stuart Gilbert and Francis Price (London: Secker & Warburg, 1967).
[401] Sonia K. Katyal, "Technoheritage," *California Law Review* 105, no. 5 (2017), 1119.
[402] Katyal, "Technoheritage," 2017, 1123.

The experiences of accessing institutions during the COVID-19 lockdowns, along with the subsequent re-evaluation of the societal functions of collections through digital platforms, brought the role of new forms of imaging technologies to the forefront of debates about museum access. This period of rapid reinvention demanded new forms of innovation and has permanently reshaped our understanding of how the experience of museums and other art spaces can be considered through digital realms. Augmented Reality (AR) technology may not yet have substantively transformed the way we interact with and understand museum spaces, and it is still considered a novelty or used in specific specialised display conditions. However, as various forms of wearable devices used to augment experiences become more widely available, they may exert a greater influence on museums in the future. To this end, the potential of AR in altering the museum space as an experience and in framing collections in contexts outside the institution is explored in this project.

In current institutional design, the technology often functions under the rubric of enlivening traditional forms of display. AR apps are perceived to allow users to interact with 3D models of artefacts, providing a more immersive and interactive experience than traditional displays. VR tours enable remote visitors to explore museum spaces and exhibits as if they were physically present. Additionally, digital archives and online exhibitions make collections accessible to a global audience, ostensibly breaking down geographical barriers and democratising access to cultural heritage. Examples include the Smithsonian Institution's *Skin and Bone*,[403] which adds digitally rendered flesh to historically displayed skeletons, and the Royal Parks' *Great Exhibition 1851*,[404] an AR experience that situates a virtual full-size Crystal Palace in Hyde Park. In the home, projects such as the BBC's Civilisations AR app[405] allowed users to download 3D digital renderings of cultural artefacts from around the world. These artefacts can then be virtually placed and viewed on kitchen tables through users' mobile phones, replicating the ideology access and systems of knowledge synonymous with the museum space.

Digital 3D scans experienced through AR interfaces can change how visitors contextualise objects from collections and explore museums beyond their physical location. It is used in

[403] Smithsonian Institution, "Smithsonian Brings Historic Specimens to Life," January 13, 2015.
[404] Royal Parks, "Great Exhibition Augmented Reality Experience," 2024.
[405] BBC. "Civilisations AR." *BBC Taster*. Available at: https://www.bbc.co.uk/taster/pilots/civilisations-ar.

various experiences designed to expand connections with historical collections through digital means in new and novel ways. Engagement with how mobile technology is conceived to change the understanding of cultural artifacts, both inside and outside museum spaces, also raises issues of how competing uses, forms of attention, and intentions intersect. The use of scanned 3D objects in AR within spaces exemplifying heterotopic power might signal a new comprehension of the restrictions of institutional space, the function of displays, and how access to artefacts is controlled. Placing 3D images in incongruous contexts may influence the experience and understanding of artifacts from museum collections, but it could also create problematic and extractive juxtapositions that transgress cultural boundaries.

Digitised collections and archives often involve complex legal governance, comparable to the contentiousness of physical objects in museums. These digital "assets" are increasingly subject to debates about repatriation and conditions of access. Digitised material, particularly those created from violent and extractive methods, raise important questions about ethics, ownership, representation, and authorship. However, when considering how collections are experienced through digital platforms, the power relations embedded in their role as knowledge repositories and the motives guiding the presentation of material are often entangled with the museum as an image rather than the artefact as having a lifeworld needing careful attention. The potential issue here is that the appropriateness of context and content in different forms of appropriation may transform contested objects into experiences likened to other forms of AR, like Snapchat filters or mobile shopping apps, rather than addressing the access to collections that scanning technologies are often intended to initiate.

A concern that Deidre Brown raises is that "Indigenous peoples are concerned that culturally significant aspects of their heritage have often been appropriated, made into commodities, or used in inappropriate ways." [406] While it is important for "organizations to seek to replicate in digital environments the protocols of access required to interact with culturally-sensitive material in order to facilitate indigenous interpretation of collections," [407]

[406] Deidre Brown and George Nicholas, "Protecting Indigenous Cultural Property in the Age of Digital Democracy," *Journal of Material Culture* 17, no. 3 (2012), 309.
[407] Brown and Nicholas, "Protecting Indigenous Cultural Property," 2012, 310.

this limitation may not be transferred to visitors' creation of computational images and their re-contextualisation on platforms beyond this space. This is further problematised in the context of First Nation Canadian and Māori understandings: "there may be little or no difference between cultural property (i.e., things) and intellectual property (i.e., ideas or knowledge) and thus no separation between intangible and tangible aspects of cultural heritage, nor, indeed, between past and present." [408] This issue is potentially exacerbated when artefacts are further decontextualised in the juxtapositions of space and time created through AR technology.

The experiments presented in the context of the MoCIA's *Remote Access Room*[409] complicate the rhetoric surrounding new forms of imaging technology from the perspective of the institution. This includes the supposed potential for digitally reproducing objects to be placed into situations closer to their original lifeworld or cultural associations, as opposed to the museum setting. Additionally, it addresses the extractive nature of this technology, where the contrast between an object's origins, its role outside the museum context, and its re-presentation can result in problematic instances of cultural appropriation.

The *Remote Access Room* of the MoCIA is segmented into various sections, each exploring different iterations of the museum through the presentation of computational forms of image via AR technology. Throughout the space, various practice-based experiments are presented as short screen recordings from mobile apps. In these works, scans are displayed in relation to public spaces outside the museum in various forms of juxtaposition, as well as within the museum itself.

The works created as part of the research process are staged in a LiDAR scan of Gallery 18 of the British Museum, which contains the Parthenon frieze. These works explore debates about the relationships between different forms of display, particularly where technologies of reproduction are used to represent or replace other material artefacts. Images around the walls document how copy, replication, and substitution function in the museum space. A scan of the head of Augustus, displayed in Gallery 70 of the British Museum, features a replica of the 'Meroë Head' dated 26 BCE, which replaces the original sculpture in the

[408] Brown and Nicholas, "Protecting Indigenous Cultural Property," 2012, 309.
[409] Peter Ainsworth, "Museum of Computational Image Artefacts (MoCIA): Remote Access Room," Available at: https://newart.city/show/museum-of-computational-image-artefacts-remote-access-room

Museum display. Also included are images documenting the museum's use of one-to-one photographic reproductions to represent elements of the Parthenon Frieze and other artifacts on international loan or undergoing conservation.

The explorations are interlinked with how they embody different heterotopias, which, in Foucauldian terms, juxtapose "in a single real place several spaces, several sites that are in themselves incompatible."[410] Within the context of the research output of the MoCIA, the research process is twofold. AR technology is used to superimpose 3D scans over artefacts on display, creating a relationship between digital versions that is weird[411] and temporal. Additionally, the new functions of 3D video capture, which have an ephemeral quality when viewed in AR, are explored. Overlaid onto moving image depictions of the gallery, they form a ghostly or eerie[412] interaction with the space.

The gallery focuses on specific sites in London, intentionally selected to draw parallels between different forms of governance and power structures. Many of these sites are associated with the contexts of European imperial expansion of the 19th century and share characteristics with the problematic universality claimed by large Western museums. This is particularly in reference to how these institutions organise and categorise through systems such as taxonomy, geographic location, or curated thematic collections, which have been determined relationally to academic scholarship.

Notably, the gallery includes works exploring the Royal Botanic Gardens at Kew, which opened to the public in 1840, and the London Zoological Society, which opened in 1828. These sites are used to compare how artefacts from the British Museum, akin to plants and animals in botanical gardens and zoos, are connected to collection, categorisation, and display, and are linked to the imperial legacies of discovery. This comparison also references the problematic relationship between the capture of animals and the condition of enslavement, as explored by Achilles Mbembe. [413] These research focuses have historically been analysed and displayed in ways that reflected the interests and

[410] Michel Foucault. 1967. "Of Other Spaces: Utopias and Heterotopias," Architecture /Mouvement/ Continuité, trans. Jay Miskowiec, October 1984. 6.
[411] Foucault, "Of Other Spaces," 1984, 15.
[412] Mark Fisher. 2016. *The Weird and the Eerie*. London: Repeater Books, 61.
[413] Mbembe, *Necropolitics*, 2019, 161 – 166.

perspectives of the colonisers, often without considering the cultural significance or ecological context of the collected items in their countries of origin.

The focus on the Royal Botanic Gardens at Kew and London Zoo is further contrasted with the context of Frieze Masters. According to the art fair's rhetoric, the event offers "a unique contemporary perspective on thousands of years of art history, from collectible objects to significant masterpieces from the ancient era and Old Masters to the late 20th century."[414] This remit reflects some functions of the universal museum space. However, it also pertains to the broader context of artifacts as commodities, where value and worth are linked to finance. This complex positionality is often substantiated by the inclusion of scholarly activities, acts of public debate, and guided tours. However, it also involves the capitalisation of wealth, asset management, and the role of artefacts from diverse global contexts and cultures within this extractive realm. The rhetoric is also intertwined with ideas surrounding the fair and its corporate relations, referencing concepts of benevolence, charity, philanthropy, and dialogue as driving factors for the event.[415]

This positioning in the MoCIA is further contrasted with a domestic space in a North London suburb during lockdown, where the museum is shut and accessed institutionally through the function of apps. Although the use of remote access to collections is often associated in UK primary education with homework activities for children and young adults, it also introduces the conditioned atmosphere of the museum—and the embedded context of imperialism—into this space. The potentially extractive violence of disconnecting times, people, and places is activated using remote access technology and facilitated through computational forms of visualisation. In the context of this text, these implications are considered and referenced throughout as inherent in the act of looking, visitation and use. They are intertwined with the technology's promise to bring the museum and its objects into intimate interaction at home, thus manifesting relationally the institutional message and its political construction. However, the experiments also question whether viewing 3D digital images through AR technology can creatively subvert the intended conditions of remote access, and to what end.

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[414] Frieze. n.d. "About Frieze Masters." https://www.frieze.com/page/about-frieze-masters.
[415] Deutsche Bank. "20 Years of Deutsche Bank as Global Lead Partner of Frieze Art Fair." https://www.deutschewealth.com/en/insights/art/deutsche-bank-global-lead-partner-frieze-art-fair.html.

The usual order of display and the absence of guided tours, signage, or other forms of control, inherent in experiences like the BBC AR Civilisation app, are no longer present. The experiments question the extent to which scan data represented in the context of the home no longer function in relation to the lifeworld of the object and the historical conditions associated with them in the context of the museum. This lack of signage challenges traditional museal perceptions of artefact interaction and display. For example, in the experiments, acts of care, such as drying a child's hair, are juxtaposed with enactment of small world play, remnants of meals, and contexts of remote working synonymous with lockdown conditions. While some of the artefacts placed in AR would have come from domestic spaces where similar activities occurred, others hold specific places within very different religious, sociopolitical, or military contexts. However, the experience of the artefacts functions more like interacting with virtual furniture through IKEA's *Place* app[416] than engaging with the conditions and messages of display in museum spaces.

The works presented in the space encourage reflections on the implications of these technologies for our understanding of museums, questioning the boundaries between the museum experience and other aspects of everyday life. They highlight how digital technology not only brings museum collections into different contexts but also changes the nature of engagement, shifting the museum from a physical space to an entity entangled with other forms of knowledge claim and context. The focus is on the museum's extension beyond its physical boundaries as tools reshaping visitor interaction and experience.

Digital Placemaking, Surveillance Capitalism, the Museum and Pokémon Go

In 2023, The Metropolitan Museum of Art collaborated with the gaming platform Roblox on a project called 'Replica.' This experience allowed visitors to scan works of art on view at the museum to unlock and digitally "acquire" replicas of the objects in their Roblox inventory, enabling their avatars to wear or accessorise with them at any time.[417] That same year, the Van Gogh Museum marked its 50th anniversary with a Pokémon collaboration, leading to scenes of chaos as people ransacked the gift shop for Van Gogh-inspired

[416] IKEA. n.d. "Mobile Apps." https://www.ikea.com/gb/en/customer-service/mobile-apps/.
[417] The Met, "The Met Meets Roblox," 2023.

Pokémon trading cards.[418] Digital engagement projects within museums often necessitate partnerships with external companies to utilise the reach of different platforms and engage new (younger) audiences. However, outside of these specific collaborations, multiple other forms of attentive engagement with computational images through screens—from social media posts to other forms of performative attention—are being played out.

Pokémon Go is widely considered the most popular AR mobile app, with millions of global players still actively engaged with the platform eight years after its launch.[419] The game's global community is active on social media, with extensive websites, blogs, Discords and subreddits dedicated to player conversation, analysis of new game features, and responses to announcements made by creator company Niantic. In addition to player-to-player engagement through Niantic's social platform 'Campfire,' there is also encouragement for in-person meetups at specific events through Niantic's ambassador program.[420] The role of Pokémon in the context of the museum is contested. On one hand, it is seen as beneficial to the museum, attracting new demographics. The infrastructure of the game does not require significant institutional intervention, as museums are essentially passive partners in players' engagement.[421] However, it may reiterate societal inequalities, emphasising the dominance of digital technologies as interfaces for experience and seeing the sanctity of certain sites overridden by gaming.

The media furore surrounding Pokémon Go's launch in 2016 was dramatic, marked by extensive clickbait-style headlines and controversy that still garners attention today. For example, in 2022, two Los Angeles police officers were fired for chasing Pokémon instead of responding to a robbery at a Macy's store.[422] Additionally, a nineteen-year-old playing Pokémon Go discovered a dead body in the Big Wind River, under a Wyoming Highway Bridge.[423] This context extends to global locations and governance, where issues surrounding state control of public access and mobility are prevalent. Iran, Vietnam, the Philippines, and China have banned or restricted access to the game, citing concerns about

[418] Senay Boztas, "Pokémon No-Go: Van Gogh Museum Stops Free Cards Amid Tout Chaos," *The Guardian*, October 18, 2023.
[419] Susan Laborde, "Most Essential Pokémon Go Statistics & Trends in 2023," *Tech Report*, 2023.
[420] Niantic, "Community Ambassador FAQs," *Pokémon GO*, 2023.
[421] Jack Ashby, "Why Pokémon Go Is a Gift to Museums," *UCL Culture Blog*, August 2, 2016.
[422] BBC News, "Two Police Officers Sacked for Ignoring Robbery to Play Pokémon Go," January 11, 2022.
[423] BBC News, "Pokémon Go: Body Found in Wyoming River While Playing Game," July 10, 2016.

its use of geolocation data.[424] Kuwait has restricted Niantic from operating the app in the Emir's Palace, mosques, energy facilities, and military bases.[425] In Bosnia and Herzegovina, authorities have warned that the app's navigation potentially encourages users to enter minefields left from past conflicts.[426] Furthermore, playing the game in certain spaces has led to calls for bans, such as at *Auschwitz-Birkenau State Museum* in Poland and the *Holocaust Museum* in Berlin. The *Holocaust Memorial Museum* in Washington and *Arlington National Cemetery* in Virginia have also encouraged the public not to play the game on their grounds.[427] In Cambodia, players have been banned from the *Tuol Sleng Genocide Museum*, where the context of play contrasts starkly with the experiences of prisoners in this space of historic violence.[428]

These types of contrasted attentions, where engagement with the interface dominates the experience without consideration for the surrounding environment, also leach into other aspects of lived experience. Shoshana Zuboff details incidents where, in the early stages of the game's release, certain Pokémon appeared on people's front lawns, triggering stampedes of Pokémon hunters who entered properties with complete disregard for the residents. While the functionality of the platform in 2024 is less dependent on the spawning of these digital creatures in particular locations, the problem of the difference between how environments appear to Pokémon hunters and how it appears to those not engaging with the app remains stark. In the context of Zuboff's example, she perceives that "the game seized the house and the world around it, reinterpreting all of it in a vast equivalency of GPS coordinates. Here was a new kind of commercial assertion: a for-profit declaration of eminent domain in which reality is recast as an unbounded expanse of blank spaces to be exploited for others' enrichment."[429]

These examples highlight the attention required when engaging with mobile platforms and AR technologies in historical, cultural, and everyday urban or domestic spaces. They

[424] Saeed Kamali Dehghan, "Iran Bans Pokémon Go," *The Guardian*, August 8, 2016.
[425] Noah Browning, "Wary Mideast States Warn of Pokémon GO Security Dangers," *Reuters*, July 15, 2016.
[426] Emma Graham-Harrison, "Pokémon Go Players in Bosnia Warned to Steer Clear of Landmines," *The Guardian*, July 20, 2016.
[427] BBC News, "Pokémon Go: Holocaust Museum and Arlington Cemetery Plea for Players to Stay Away," July 13, 2016.
[428] Aun Pheap, "Pokémon Go Players Banned from Cambodia Genocide Museum," *The Guardian*, August 10, 2016.
[429] Zuboff, *Age of Surveillance Capitalism*, 2019, 310.

underscore the effects of systems of consumption, where one condition of global interaction through the screen of computational imaging process is imposed onto the conditions of other forms of governance. This layering of digital experiences—particularly onto sites of genocide, military areas, or physically dangerous sites like minefields—raises questions about the affective register of engagement with mobile technologies and how these technologies condition experience of space.

In the context of what Zuboff terms *Surveillance Capitalism*, these consequences are only part of the problem. Zuboff states that the "genius of Pokémon Go was to transform the game you see into a higher-order game of surveillance capitalism, a game about a game."[430] In her argument, there is the game played by players through their interaction with the app, but there is also a second-order game where Niantic is extracting and utilising data tacitly. In this scenario, prediction "products take the form of protocols that impose forms of telestimulation intended to prod and herd people across real-world terrains to spend their real-world money in the real-world commercial establishments of Niantic's flesh-and-blood behavioral futures markets." [431]

It is certainly a stated aim of Niantic to produce an intricately detailed real-world map, far more comprehensive than *Google Street View*. It's collaboration with users aims to attain this, and is described by Niantic CEO John Hanke as "one of the grand challenges of augmented reality, and it's the key to making it work the way we want it to — to make the real world come alive with information and interactivity." [432] User participation through scanning and AR technologies in the game seemingly offers the ability to address challenges of computer vision related to how programs understanding the world semantically. In Hanke's parlance, human cartographers are likened to bots that trawl the internet, where "the data received is the opportunity as an analog to the web crawlers that search the web for pages to be indexed by Google." [433] This explicit intention of the company prompted tech journalist Joseph Bernstein in 2016 to contend that "it's incredibly

[430] Zuboff, *Age of Surveillance Capitalism*, 2019, 310.
[431] Zuboff, *Age of Surveillance Capitalism*, 2019, 319.
[432] John Hanke, "The Metaverse Is a Dystopian Nightmare. Let's Build a Better Reality," *Niantic Labs*, August 10, 2021.
[433] Hanke, "Metaverse Is a Dystopian Nightmare," 2021.

granular, block-by-block map data, combined with its surging popularity, may soon make it one of, if not the most, detailed location-based social graphs ever compiled."[434]

In Pokémon Go, users map real-world spaces designated as PokéStops through 3D scan processes as part of the game. This activity is incentivised with the gift of an item usually costing 100 Pokécoins (approximately $1). However, the data accumulation only incurs costs for Niantic related to data analysis, storage, and broader use of the information. Users do not retain access to the data sent to the company and are not directly aware of its functionality, aside from its purported role in enhancing the game's accuracy and performance. This exchange resonates with the extractive processes of data collection described by Zuboff in wider systems of computation. Functions integral to Pokémon Go merge concepts of scale, scope, and actuation into the interactive experience of the game. Through this fusion, the company can generate "continuous sources of behavioral surplus" and receive a stream of "fresh data to elaborate the mapping of interior, exterior, public, and private spaces." [435]

In his 2021 blog post responding to the conceptual positioning of the metaverse by Mark Zuckerberg amongst others as the future experience of technology, Hanke envisioned a reality not detached from embodiment, but one where embodiment and interactivity are enhanced by technological interfaces. He describes a future where these experiences, currently mediated by screens, will be facilitated by wearable technology. The conceptualisation of what Hanke terms "the real world metaverse" is bound up with a vision of a "shared state" where, "we are all seeing the same thing, the same enhancements to the world. If you change something it's reflected in what I see, and vice versa, for the millions of participants using the system."[436] Where the condition of this form of technology is currently limited to certain interfaces and experiences, Hanke's vision suggests this will not always be the case.

The challenges in building the interface through which the real world metaverse will function resides in "synchronizing the state of hundreds of millions of users around the

[434] Joseph Bernstein, "You Should Probably Check Your Pokémon Go Privacy Settings," *BuzzFeed News*, July 12, 2016.
[435] Zuboff, *Age of Surveillance Capitalism*, 2019, 312.
[436] Hanke, "Metaverse Is a Dystopian Nightmare," 2021.

world (along with the virtual objects they interact with), and tying those users and objects precisely to the physical world."[437] The relationality established here feeds into the conceptualisation of the computational image interface as a versioning of the world, understood and augmented for the purposes of play, in this instance. However, this does not mean this is the limit to how the world can be interacted with or indicate the conditions of these types of interpretive systems and how they operate on an onto-epistemological level. In experiences mediated by mobile technologies utilising GPS data, the concept of place, Zuboff contends, is reasserted as being blank and ready to be overlaid with various understandings. At the same time, the way Pokémon Go maps, scans, and monitors user movements benefits Niantic and its corporate partners. Engagement with the platform in the context of the museum intertwines with how mobile technology, supported by corporate infrastructure, can reshape social interactions, community engagement, and knowledge claims across various spaces.

When visitors use Pokémon Go at museums, they interact with the exhibits through the game. The app uses the museum's layout, directing players to scan certain spots or visit specific locations. This interaction is shaped by the game's infrastructure, which is overlaid onto the museum's layout. This integration affects how users experience the space but may also subvert the museum's governance. However, while scanning in the museum for personal use or research is often viewed as a security threat, scanning Poké Stops, where the same computational image data is transmitted to a corporate entity, is considered acceptable and even encouraged.

The interface creates an idealised, fictionalised interaction with physical space, governed by the app's parameters. This form of engagement, dominated by the quest for Pokémon, is pursued by players with a zeal reminiscent of 19th-century extractive collection processes of butterflies. The experience of playing the game and navigating the Pokémon world is dictated by the mobile device's functionality. Superimposed onto various sites and spaces, this interaction operates in the interstices of different forms of regulation and governance controlling the city's public and private spaces. Engagement with the app elicits various forms of user interaction, ranging from casual social use to extremely labour-intensive and

[437] Hanke, "Metaverse Is a Dystopian Nightmare," 2021.

costly involvement in self-directed or Niantic-directed "research" tasks. However, all users are continually nudged to have certain interactions on the digital platform.

Museums, having multiple points of interest determined and created by the app's users, are particularly effective at focusing gamers' attention. This effectiveness is not only because they attract large numbers of visitors from a global audience, a proportion of which who are potentially players of the game, but also because the experience is contained. Moreover, the docility of the gaze and the level of visitor engagement and focus on the space may be similar between the digital platform and the embodied experience. Using mobile devices is already prevalent in museums, and interaction with the environment is safe and controlled by invigilation staff and security. However, visitor interaction with the exhibits through Pokémon Go may differ from the institution's ideal form of attention.

While the museum often aims to foster attentive engagement with displays, such as encouraging contemplative and educational focus, Pokémon Go players might be more absorbed in game objectives, such as finding PokéStops or capturing rare Pokémon. This difference in attention can lead to a more fragmented experience of the museum space, where the historical and cultural context of the exhibits may be overshadowed by the goals of the game. This divergence highlights the tension between traditional forms of museum engagement and the new modes of interaction facilitated by AR platforms.

The relationship between Pokémon and interaction with museum spaces is not as incongruous as it may first appear. In a 1999 interview, Satoshi Tajiri, creator of the Pokémon franchise, stated that the inspiration for Pokémon resided in his childhood desire to become an entomologist.[438] Pokémon was inspired by concerns about how children in urban areas were becoming detached from nature, with the irony now being that interaction with this world occurs primarily through the interface of a screen. As the franchise evolved, Pokémon have been derived from various source materials, including Japanese folklore, Hawaiian origin stories, fossil species, historic monuments, and interpretations of global cultures or regions. For example, the Pokémon *Jirachi* is associated with the Japanese holiday *Tanabata* (Star Festival). *Whiscash* is based on the Japanese

[438] Howard Chua-Eoan and Tim Larimer, "Can Such Cute Critters Be Bad Influences?" *Time* 154, no. 20 (November 22, 1999): 96.

mythological creature *Namazu*, a gigantic catfish that inhabits the underground realm and can create earthquakes. Similarly, the Pokémon *Bronzong* is inspired by bronze *dōtaku*, and the Pokémon *Ninetales* is inspired by the Japanese folklore surrounding *Kitsune*.[439]

Pokémon are also inspired by Tyrannosaurus Rex, Archaeopteryx, Ammonites, and Triceratops, as well as various fish, lizards, insects, amphibians, and fungi. These creatures are all categorised based on their attributes, taxonomies, and evolutionary lineages, mimicking systems of display prevalent in the museum space. This categorisation and the diverse inspirations behind Pokémon highlight the parallels between the franchise and the educational and taxonomic goals of museums, making the relationship between Pokémon Go and the museum space a conceptual extension of these shared themes, albeit through the lens of fictive worldbuilding.

The relationship between the way museums present their collections and the internal logic of Pokémon Go experienced relationally to museums turns the site and the contextualised displays into backdrops for the app's functionality. The primary goal of this interaction is to collect Pokémon positioned at specific locations, rather than engage with the museum's content or curatorial message. The tasks performed within the realm of the interface can potentially conflict with how others, who are not interacting with the app, experience the same locations. This is also resonant with the process of completing 3D digital scans through mobile technology as explored in Chapter 04 of this text.

Players, incentivised by the game's parameters, are often encouraged to alter their destinations, going to specific designated places to find Pokémon while engaged with the app. If, as Ashley Colley et al. contend, the conditions of urban uses of Pokémon Go can "incent people to do something they rarely do: substantially change where they choose to go," [440] then what is posited by the practice-based research is that Pokémon Go could change how users move through the museum. From the institution's perspective, an optimistic reading of the relationship suggests that the app, as an enlivening presence, has the potential to alter visitors' paths and focus within museum spaces. Attention could be

[439] For a comprehensive peer-to-peer wiki on Pokémon see Bulbapedia, *Bulbapedia: The Community-Driven Pokémon Encyclopedia*, n.d.
[440] Ashley Colley et al., "The Geography of Pokémon GO: Beneficial and Problematic Effects on Places and Movement," in *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems* (New York: ACM, 2017), 1180.

directed towards specific exhibits or areas that might otherwise be overlooked, thereby reshaping the experiential relationship between the museum and technology. However, a more likely outcome is that the museum becomes a side quest for visitors, overshadowed by engagement with experiences like Pokémon Go in the performative enactment of the "real-world metaverse," in Hanke's terms.

Focusing on "small slices of the world"[441] through the phone's screen and the conditions set by the game directs users' attention primarily towards the interface as the primary means of understanding embodied experiences. The game effectively captures the location where it is played by instrumentalising bodily action and attention through repetitive, endorphin-induced responses to in-game tasks. This process is enabled by the mapping of GPS coordinates from the virtual environment onto real-world geographic areas. In this attentive mode, all spaces are regarded as equally significant, as their function is subsumed under their use within the game's structure and conditions.

Ashley Colley et al. also contends, based on their research into the effects of Pokémon Go on urban navigation in the US, that the attention directed within the game and the spaces considered appropriate for engagement can, from a critical perspective, "remake place, often in a fashion that reinforces pre-existing power structures." [442] They argue that data and code that 'augments' reality can also perpetuate societal inequities. Navigating urban space can be controlled, albeit fractionally. But, certain destinations, such as those designated in Pokémon Go as PokéStops or Raid Gyms, intensify engagement in these areas. Conversely, spaces and locations without these features are less visited as part of the game interaction. In the context of Ashley Colley et al.'s research, this significantly correlates to distributions of certain demographic groups, highlighting the ways place-making is enacted: "Put simply, this means that as the share of the population that is African American, Hispanic, and other minorities increases, the number of PokéStops per square kilometer decreases, often by a significant margin."[443]

[441] Zuboff, *Age of Surveillance Capitalism*, 2019, 310.
[442] Colley et al., "Geography of Pokémon GO," 2017, 1180.
[443] Colley et al., "Geography of Pokémon GO," 2017, 1180.

While some academic studies emphasise Pokémon Go's role in fostering a sense of belonging and strengthening social ties, [444] enhancing health benefits,[445] creating new activation to cultural heritage,[446] and combating mental health issues,[447] particularly during the COVID-19 pandemic, this practice-based research contends that these perceived benefits are also intertwined with how technological interfaces and AR interactions can override specific attentive positionalities toward the present condition of gameplay in an embodied sense. The integration of readily accessible technology allows for the apparent seamless incorporation of Pokémon Go into everyday life. This raises questions about whether the focus of engagement is the game itself or if the players are simply functionaries being exploited for data extraction, like computationally directed bots scraping the lived environment through the computational imaging functions of their mobile phones for the creation of a future real-world metaverse.

However, augmenting the museum space requires a broader understanding that directs attention to the inherent extraction processes within new technologies. While Hanke's intention in developing the "real-world metaverse" is to overlay experiences so that "reality itself can appear malleable, enabling brand new experiences," and towards what he terms "reality channels,"[448] it is important to contend with these concepts beyond the governance of the interface, the embodiment of the experience, and the complexities of corporate messaging towards a more general understanding of how different forms of knowledge compete for attention. One aspect to consider is how the internet has already transformed concepts of relationality. The juxtaposition of vast quantities of material positions even extensive museum collections—comprising millions of items—in stark contrast to the immense knowledge repositories available online.

Performing Acts of Collection through Image Search on the Internet and the Positionality of the Museum through Remote Access

[444] Kelly Vella et al., "A Sense of Belonging," *Games and Culture* 14, no. 6 (2019): 583–603.
[445] Alf Inge Wang. 2021. "Systematic Literature Review on Health Effects of Playing Pokémon Go." *Entertainment Computing* 38: 100411.
[446] Dean Paton, "Playing with the Past: How Pokémon GO Is Inspiring People to Discover Heritage," *Niantic Labs*, January 31, 2018.
[447] Tanja S. H. Wingenbach and Yossi Zana, "Playing Pokémon GO: Increased Life Satisfaction Through More (Positive) Social Interactions," *Frontiers in Sports and Active Living* 4 (2022): 903848.
[448] Hanke, "Metaverse Is a Dystopian Nightmare," 2021.

I first experienced Camille Henrot's film *Grosse Fatigue*, released in 2013, under the conditions the artist designed for its viewing during the 2018 exhibition *Strange Days: Memories of the Future* in London. Displayed in a room painted Yves Klein blue, the film was shown on a large cinema screen, providing an immersive experience despite the freezing temperature. During my visit, I watched the 13-minute film multiple times, taking notes and making drawings. However, after six years, my recollection has faded, and my notes have become less legible. To reconnect with the work, I turned to online sources like YouTube for exhibition clips, artist interviews, and critical analyses, which highlights how artworks are often revisited vicariously, differing from the artist's intended gallery experience for this kind of interpretation.

In my attempt to write an accurate analysis of Henrot's film, I unintentionally created an incomplete replication from various sources, as the full film remains elusive online. This unauthorised version, reminiscent of early 21st-century cam versions of blockbuster movies, lacks the narrative subtlety of Henrot's original. The privilege of access to the exhibition is replaced by the experience of the work gleaned through different forms of digital materiality. The variable video quality on YouTube reflects diverse recording conditions, prompting further research to trace references missed during the initial viewing. This phase employed online image prompts and image searches as a methodology, involving the reverse engineering of the film's formal structure.

Henrot's artwork features a balletic series of gestures on an OS X Lion desktop of a Mac computer, enacting the constant accumulation of materials produced through internet trawling. It contrasts language, image, artefacts, and knowledge claims, linking the internet as a repository with human efforts to comprehend existence through oral histories, storytelling, and other processes of worlding. The precise visual edit synchronises with poet Akwetey Orraca-Tetteh's spoken-word performance, highlighting the ubiquity of browsing and the experience of entering algorithmically determined rabbit holes. Created from material gathered during Henrot's 2012 Smithsonian residency, the film explores questions about the universe's origins. Through image references and poetry, it juxtaposes various accounts, highlighting the museum itself as a contested space of narrativisation.

Henrot's creative process, seemingly reflected in desktop folders, is juxtaposed with the museum's exhaustive attempts at categorisation and the vast repository of information the internet now represents. These sites are all considered privileged and specific in terms of the knowledge they situate. The internet is portrayed as treating everything as equivalent, transforming the viewing of images into shareable and transformable data. By referencing origin myths from diverse cultures, Henrot explores how search processes are often performed through esoteric and personal perspectives. This serves as a metaphor for engagement with the museum space, where different forms of knowledge are placed relationally through systems like taxonomy in displays.

Stories from Navajo, Sioux, Inuit, and Shinto traditions are juxtaposed with artifacts from the Smithsonian Museum collection, and texts like Theodor Reik's *The Creation of Woman* and Charles Darwin's *Origin of Species* are interposed with *Samsung Galaxy Note II* advertisements and footage of a *Wacky Waving Inflatable Tube Man*, all placed in relation to one another. This methodology denies a straightforward representation of origin, acknowledging that ascertaining ideas from the internet or through objects displayed in museums is simultaneously a partial and incomplete experience. The film suggests that the universal claims of the museum are irrational, driven by the ambition to reconstruct the world yet confined within controlled limits. It also alludes to the lack of cohesion in contemporary knowledge through the internet, drawing attention to the rise of mental health conditions caused by this experience, referencing statistical data on bipolar disorder and schizophrenia from Wikipedia.

The film unfolds as a structural exploration of types, intertwining form, visual resemblance, conceptual associations, and rhythmic spoken word. It examines the interplay of images, ideas, and formal qualities, visually linking elements like white spots on a black horse, a woman in paint-splattered jeans, and Jackson Pollock's action painting. These connections lead to explorations of the molar and molecular, touching on galaxies, phenomenological experience, non-human entities, and the act of art creation. Pantone charts in the studio signify the artist's attempt to depict subjects with photographic fidelity while also resembling the display of objects on shopping channels. The work explores the attempt to achieve accuracy between cinematic colourisation and our embodied perspective,

highlighting the challenges of understanding an artefact through mediated interpretations and the universality of experience.

Visual layering metaphorizes contemporary information overload, situating these conditions within the computer desktop and the quest for remote access to knowledge. The film navigates visual relationality by equating disparate objects like ravioli and CDs as circles, conveying the holistic nature of existence. This is reminiscent of computational form searching and pattern recognition inherent in algorithmic processes. The film portrays senselessness and violence as intrinsic to our current condition, highlighting the irony of taxidermy in historic museum spaces associated with ideas of care. The handling and storage of material objects in the collection appear synonymous with expertise, fragility, and dignity but may also seem paradoxical, as this protective attention necessitates the death of rare animals to become specimens, illustrated in the drawers full of toucans, scarlet macaws, or flamingos folded into neat bundles.

Henrot's work explores the problematic opposition between collection and care, and processes of extraction, as exemplified in systems of display that present the world within the museum's ecosystem. It indicates the museum as "an irrational project driven by the ambition to reconstruct a world,"[449] highlighting that processes of preservation and categorisation exist within controlled limits. The film emphasises the challenging limitations of narrating the universe's story but underscores the necessity of trying. It becomes a self-reflective process, drawing attention to the act of creation through artistic practice. Henrot critiques the authority communicated by institutions through this structure, noting its role in containing the subversion and disorder of complex systems.

"The function of the museums is to contain this subversion with the limits of the institution, just as newspaper offers an image of the world's disorder enclosed in rectangular format. A dash of disorder is necessary to prove the strength of the ordering system" [450]

[449] Camille Henrot, *Elephant Child* (London: Koenig Books, 2016), 80.
[450] Camille Henrot, *Elephant Child* (London: Koenig Books, 2016), 58.

Henrot's statement underscores the power dynamics in delineating boundaries, emphasising the act of making and producing between inside and outside, in reference to the digital image, the computer as an interface, and the museum as an institution. In her usage, search parameters are personal and fluid, driven by aesthetic qualities and poetic relations rather than conventional categorisation. The scale of experience in the gallery space is crucial for Henrot, who suggests that the computer screen is too small to overwhelm the viewer. However, the emphasis on direct, specific experiences raises questions about the limitations imposed on globally and socially specific access to institutions and how information is disseminated.

The immersive and visually seductive design of the installation aims to activate attentiveness in the viewer. Despite Henrot's efforts to compare the logics of museum taxonomy with the knowledge claims initiated by browsing search engine results, her conceptualisation of the gallery space experience negates the extent to which her work may now also be subsumed under the conditions experienced through the screen outside this context. Viewing the work vicariously through multiple sources complicates the positionality of the visitor established in the gallery installation. While the artist emphasises the importance of showing the film in a controlled projection space to convey the experience of "density,"[451] she also states that the film should be a "physical experience."[452]

The artwork, created through post-production editing, becomes a simulacrum of the internet search experience, presented in the context of what Hito Steyerl calls the "rich image" of high-resolution art production and institutional display. These conditions establish their "own set of hierarchies, with new technologies offering more and more possibilities to creatively degrade it."[453] However, like the museum itself, how the work is understood when not experienced in this explicit context is important, despite the artist's desired intentions.

Henrot's construction of referentiality requires viewers to decipher visual clues, mirroring the experience of mass information consumption. The result is an overwhelming flow of information, where some references may be familiar, while others remain obscure. Although

[451] Collectif Combo, *Camille Henrot: "Grosse Fatigue"*, Vimeo video, 2013.
[452] Collectif Combo, *"Grosse Fatigue"*, 2013.
[453] Steyerl, "In Defense of the Poor Image," 2009.

the work does not aim to have every reference understood, it underscores the crucial difference between the cinematic experience and the potential for active viewing on the internet. The geographical specificity of the installation becomes particularly marked in YouTube comment threads, where viewers unable to access the work request links to full versions, seeking to understand Henrot's detailed research process.

The work has inspired user-generated content on sites like Vimeo and YouTube, where Grosse Fatigue serves as a starting point for individual research projects, fan art, and homework tasks, utilising Henrot's methodology of computer desktops and screen recording technologies.[454] These replications prompt consideration of how forms of facsimile, replication or versioning, in Latour's terms, contribute to a deeper understanding of knowledge creation and internet culture through computational image technology. Despite differences in technical, conceptual, and methodological approaches, it is interesting to look at how Henrot's work becomes transformed in these referential contexts. For example, Henrot's Grosse Fatigue meticulously orchestrates the opening and closing of windows in a purposeful arrangement, showcasing an absence of the creator's hand in its production. As Henrot states, "When using a touchscreen, gestures are rendered and interpreted according to clearly defined rules, obscuring as much as they reveal,"[455] and further, "the absence of the hand's handiwork in a creation is symbolic of the divine."[456]

YouTube recreations lack the polish of the original, revealing the creator's hand and mouse movements, which introduces an element of embodied performance to the films. While these reproductions may appear amateurish compared to Henrot's professionally crafted piece, they offer a sense of immediacy and connection to the creator, bridging temporal and geographical distances. The YouTube recreations display an intimate, performative liveness absent in Henrot's calculated and controlled work. This effect is particularly pronounced when the works are viewed on a laptop, as the performance is refracted through the screen of the technological apparatus used to view it, especially where operating systems and skeuomorphic iconography have evolved over time.

[454] See for example ElliotSeon, "Grosse Fatigue Response," YouTube video, 2016.
[455] Henrot, *Elephant Child*, 2016, 154.
[456] Henrot, *Elephant Child*, 2016, 154.

These works of homage or fandom may offer a critical perspective on specific forms of knowledge dissemination and ways of navigating responses to artworks produced by current practitioners. They also provoke critical discussion about pedagogic discourse regarding the task of referencing or recreating work. The online positionality of these adaptations becomes interesting, particularly when considering broader questions about whether institutional spaces may be increasingly subsumed under what Flusser terms the "world image scenario."[457] Knowledge and understanding disseminated on the internet dominate the language through which these institutions are conceived. However, what is presented in this space often undergoes changes, distortion, or even complete negation in favour of alternative forms of narration and intent. Yet, this still overlooks the condition of the apparatus and how computation affects our understanding of the present as a means of understanding reality itself. Where once the adage 'pics or it didn't happen' prevailed, we now face a condition where things seem not to exist unless they can be computed, archived, and categorised in some way for search parameters and access.

Towards a Practice Attentive to the Minerality of Technological Interface in the Sphere of Calculation.

In his concept of *Brutalism*, Achille Mbembe invokes the architectural movement to frame current conditions where human experience and actions are transformed while human life is simultaneously under threat. At the centre of this problematic, Mbembe explores the relations and distinctions between life and non-life, are no longer evaluated based on "human liberation and universalism."[458] He views that inherent in this condition are questions pertaining to the transformation of the human body and contends that the prevailing understanding is that "the human is the product of technology, or even a simple economic agent that one can use as one pleases—and, moreover, whose desires and expectations can be anticipated, behaviours fixed, and fundamental traits sculpted."[459]

Brutalism, as Mbembe conceptualises it, represents an implicit program of global conditions, integrating all that exists into the "sphere of calculation."[460] This pervasive state

[457] Flusser, *Towards a Philosophy of Photography*, 2000, 10.
[458] Joseph Confavreux, "Decolonial Anxieties in a Postcolonial World: An Interview with Achille Mbembe," *Postcolonial Studies* 25, no. 1 (2022), 129.
[459] Confavreux, "Interview with Mbembe," 2022, 129.
[460] Confavreux, "Interview with Mbembe," 2022, 133.

involves acts of force and conceptualisations of history, now inextricably linked and altered by framework dictated by computation. Mbembe asserts that history, including that of power, is now, "by definition, geo-history."[461] *Brutalism* as a conceptual understanding and process of questioning becomes about "the process through which power as geomorphic force is constituted, expressed, reconfigured, and reproduced through acts of *fracturing* and *fissuring*." [462] *Brutalism* is thus intertwined with molecular and chemical global processes, environmental toxicity impacting biospheres and bodies, and the dangerous waste processes associated with technological obsolescence.

The questions posed in this last section, and in the context of the practice outputs for the *Mineral Room* of the MoCIA,[463] revolve around how digital image practices can address these conditions. The focus is on how museum practices can be attentive to different logics and ways of being, engaging with the challenges Mbembe identifies as problematic. This project then seeks to understand how computational forms of image practice inhabit and reveal these circumstances within the museum context. Additionally, it considers how this framework can shift our understanding of the languages through which technologies are read.

Mbembe argues that the impact of personal technological devices, or nano-devices, is substantial in the context of brutalism. These devices, he contends, have taken control of the multiple self, a role once held by other forms of authority. The concept of what the world materially constitutes is now plural, involving an energy-consuming extraction of resources, an acceleration of computational processes, and new imaginary and linguistic mediations. The event of world creation, which further shapes how societies function, is under "a single sign: digital computation."[464]

In Mbembe's conceptualisation, digital computation functions as a technical system for capturing and processing data, emphasising abstraction and calculation. It involves storage and networked functionality, encoding and circulating consciousnesses, memories, and traces. This system shapes the communality of the world, creating new forms of power and

[461] Achille Mbembe, *Brutalism*, trans. Laurent Dubois (Durham, NC: Duke University Press, 2024), xii.
[462] Mbembe, *Brutalism*, 2024, xii.
[463] Peter Ainsworth, "Museum of Computational Image Artefacts (MoCIA): Mineral Room," Available at: https://newart.city/show/museum-of-computational-image-artefacts-mineral-room
[464] Mbembe, *Brutalism*, 2024, 31.

concepts of reality. Driven by technolatry, this computational world influences practical activities, institutions, and environments we inhabit, including the internet as a conceptual space for the existential migration of humanity. Our understanding of things is increasingly mediated through technical systems of ordering abstractions, the conditions of networked knowledge, and reasoning driven by reverence, or even worship, of the capabilities of current and future technology.[465]

The image, in this context, becomes the subject's privileged language, displacing traditional religious experiences. Mbembe highlights the mobile phone's role as a crucial assemblage that has transformed how people communicate, imagine their identities, and relate to the world. This transformation extends to museums, traditionally designed to present the world through classification and scholarly narratives, which must now account for the transition to digital computation as a dominant framework.

Computational media, particularly mobile devices, extend beyond mere functionality to become integral to personal identity and societal interactions. These devices allow individuals to express ideas, create content, and circulate it without prior authorisation, impacting all aspects of social and private life. However, this system also removes the concepts of limits and truth, essential for forming democratic subjects and maintaining a vibrant public sphere. This condition is particularly problematic as "if practically anything can be said (and disseminated) about almost anything and everything, at any time, and under any pretext, then the way is opened to a cannibalism of a rather unusual kind."[466]

While these technologies carry narratives of emancipation and global connectivity, they also collapse traditional regimes of belief and technical systems. The digital's power lies in its plasticity, grafting onto different cultural matrices and complexly relating to social conditions it is meant to augment. Consequently, computational technologies and corporations continue to shape the world, reinforcing existing power structures and creating new sovereign spaces. The focus on the screen as a material object in the context of the practice research reflects Mbembe's perspective on the intersection of humanity and the digital world. Mbembe argues that the "distinctive characteristic of contemporary

[465] Mbembe, *Brutalism*, 2024, 32.
[466] Mbembe, *Brutalism*, 2024, 48.

humanity is to constantly traverse screens and be immersed in image machines that are at the same time dream machines."[467] This process of "cybernetization" involves both the human and the more-than-human or "divine" being "downloaded into a multitude of tech objects, interactive screens, and physical machines."[468]

While the "techno-digital universe" acts as a double for our world, offering various forms of self through screens, it is the new modes of presence enabled by these technologies of networked circulation that are most significant. This experience creates a dichotomy, splitting the self into multiple parts. Through the projection of these multiple selves, which can exist at different geographic locations and times simultaneously, we are authorised to transcend bodily boundaries, allowing for "the plunge into all sorts of parallel worlds, including the beyond, without a safety net. In being transported to the other side of the screen, humanity can be present to itself while simultaneously keeping a distance from itself."[469] However, this condition also highlights "how much each body, human or otherwise, however singular it may be, bears on and in itself, in its essential porosity, the marks not of the diaphanous universal, but of commonality and incalculability."[470]

From Mobile Devices to Mineral Displays in the Museum of Computational Image Artefacts

The *Mineral Room* at the MoCIA explores the relationship between mobile devices as technology and the assembly of mineral components and the extractive processes from which they are constructed. While significant problems exist regarding the infrastructure of technology—such as electrical energy usage, the ecological impact of server farms, and the drain on resources from refinement and industrial manufacturing processes—the gallery space aims to draw comparisons between the context of display and the materiality of the mobile device. The backdrop of the exhibition space features a scan of the Historic Mineral Gallery at the Natural History Museum in London. This gallery, which has preserved much of its original design since its opening in 1881, is used at the MoCIA to explore the

[467] Achille Mbembe, "Meditation on the Second Creation," *e-flux* 114 (2020b).
[468] Mbembe, "Second Creation," 2020b, 2.
[469] Mbembe, "Second Creation," 2020b, 2.
[470] Mbembe, "Second Creation," 2020b, 2-3.

relationship between mineral extraction, global acquisition processes, embodied experience in the museum, and AI image generation.

Catalysed by the workshop *Camera Phone Recording its Own Mineral Condition,* conducted in the *Natural History Museum*, London, in 2019, the practice-based experiments associated with this final part of the text, and presented within the *Mineral Room* of the MoCIA, investigate whether the computational imaging processes of mobile devices can be foregrounded as an assemblage of agencies, infrastructures, and materials. These are examined in relation to the condition of the museum and the historic context of display. The engagement questions the extent to which our understanding of what is being pictured can be augmented to include the comprehension of the screen as a technology and its material constitution.

The workshop invited participants to explore the museum collaboratively and investigate whether a relationship could be established between the act of using the imaging capabilities of mobile technology and the systematic containment of minerals within the display. The workshop title references John Hilliard's *Study for Camera Recording its Own Condition (7 Apertures, 10 Speeds, 2 Mirrors),* (1971), which explores the camera as a mechanical device. The concept for the approach was also informed by Dan Graham's work *Two Correlated Rotations, (*1969) which features simultaneous rotations of a camera and performer, exploring perception, spatial dynamics, and the act of recording.

Those who engaged with the workshop were given printouts highlighting the minerals contained within mobile phones and the locations of ores or minerals associated with these in a global context of mining and refinement processes. They were also provided with instructions and encouragement to use the cameras on their phones to engage with the space. Additionally, the handouts included information on where the elements could be found in the historic mineral collection, drawing attention to the relationship between the items presented as artifacts and the geographic locations that constitute the largest suppliers in the current context of global infrastructure and manufacture.

The participants primarily focused on examining the relationship between the screen as a device and the glass behind which the objects were contained. They aimed to incorporate reflections both within the digital image plane and in terms of obscuring the minerals

through blown-out highlights triggered by reflections from various light sources, both synthetic and natural. Through their engagement with the space, participants layered different frames within video works they created, resulting in pieces reminiscent of infinity mirrors. This visual strategy, discussed and explored during the workshop, aligns with conceptual art processes that highlight the conditions and materiality of the medium itself. The video works depict each screen displaying another screen, creating a recursive visual effect where a screen pictures another screen, which in turn pictures yet another screen. This technique emphasises the digital nature of the medium and the layered experience of viewing digital content. Despite the visual effects of screens within screens, the minerals contained within the cabinets are always present in the frame, ensuring that the depiction remains focused on both the physical context of the museum and the essential components that enable the technology to operate.

The act of engagement within the context of the workshops conducted at the Natural History Museum became a collaborative activity, with participants recording each other's phones while they filmed the exhibition space. This created different iterations of the performative process, foregrounding the experience of viewing the collection through various forms of glass as a technological interface. Experimenting with the camera phone facilitated discussion and reflection about both the collection and the act of documenting the museum, emphasising the phone as an embodied performance rather than a transparent apparatus. The process of making, combined with contextual signposting, provided participants with a space to discuss and reflect on the ethical implications of mineral extraction, the role of imaging technology as an intrinsic function of daily life, and the impact of viewing museum artefacts through a digital lens that attends to the material conditions under which experience as a computational image is brutalised.

The practice-based research developed from discussions during this workshop occurs both in the context of onsite phenomenological experience and within the software interfaces of the App Record3D. The subject of this work is the content of the cabinets in the *Mineral Room* of the Natural History Museum, with a particular focus on minerals used in the construction of touchscreen technology, such as Bauxite, Tantalite, and Indium. The connection between the museum in its current and historical state, the imperial projects of the 19th century, and modern forms of extractive mining and industrial refinement is

complex. Without explicit signage and direction, this connection often goes unnoticed, much like the material conditions and infrastructure involved in creating images through technological apparatus.

In the creation and construction of the 3D LiDAR video works, the surfaces of the scans are treated topographically. This approach references the use of technologies such as photogrammetry, traditionally utilised for cartography, but also evokes the top-down view of dominance implied by these types of imaging processes that Eyal Weizman references as the "politics of verticality."[471] In this conceptualisation, the geopolitical and spatial dimensions of vertical space, such as airspace, underground tunnels, and high-rise buildings in Weizman's analysis, constitute a form of control and dominance that resonate with the conditions of brutalism. LiDAR is a remote sensing method used to examine the surface of the Earth, applied to diverse contexts from mapping spaces for construction to missile guidance systems, cultural preservation projects, and the creation of models used to stage gaming. The pulsating videos of the LiDAR scans shift from depicting a mineral in a cabinet to resembling breathing landscapes, complete with contour lines and undulating peaks, but are anchored to the museum context by the sound of visitors engaging with the space.

These works explore whether by attending to the molecular details present in the images and zooming in to abstract their forms, something of their material condition is revealed. By reconfiguring the experience of the scan in terms of its representation of the minerals contained in taxonomic and geographic relation within the cabinet, the surface becomes reminiscent of a landscape. In this act, the video works become gesturally referential to the locations from which the materials are extracted, with something of their corporeality as minerals forming the content of the experience on screen. Furthermore, they are visually connected to processes of computational mapping and the creation of computer-generated landscapes, as seen in other technological engagements like gaming or cinema.

The range of experiments conducted in this context serves as an area for engaging complex elements, while also returning to the embodied experience within the space itself. Siegfried Zielinski contends that the analysis of new forms of media communication is "no longer a question of individual objects and forms in which technology is articulated but a complex

[471] Eyal Weizman, "The Politics of Verticality," *openDemocracy*, 2002.

structure."[472] This is also tied to what Zielinski terms a chaotic space of alchemy, where creative intervention takes place; "if one understands chaos to mean that dynamic linkage of multifarious elements, of chance and necessity, which is by nature opaque and out of which arise phenomena and processes that we can comprehend."[473]

The urgency of understanding both the museum and the image processing through which it is conceived as part of broader claims to knowledge and governance is emphasised. This approach considers how global processes impact specific bodies and contexts. Throughout the project, these themes have been examined in relation to historical and ongoing processes of imperialism, as well as their consumption and subsumption by various agents and markets, which now influence how industrial societies operate. The focus has been on shifting the attentive register through the enactment of practice engagement. This is particularly relevant to utilising the museum's foundation to explore the "plurality of soils,"[474] in Mbembe's terms, which contrasts with the universalised conception of the earth as a singular entity. It involves drawing correspondences between the museum's context, the context of extraction, the digital process and interface, and the landscape.

It is also referential to the idea that the black box of the apparatus is full of black boxes, each with its specific diagnostic purpose, but also a testimony to the infrastructure that contains the technology. Bruno Latour asks us to think about the origins of materials and the many entities involved in their creation, reminding us of the intricate networks that sustain our everyday activities and technologies. This perspective encourages us to consider the broader implications of technological devices, from the extraction of raw materials to the complex assembly processes, and the environmental and social impacts along the way. This condition resonates with Latour's conceptualisation in *Pandora's Hope* of understanding technological devices as a series of integrated black boxes. When these black boxes—smart speakers, TVs, computers, mobiles, servers—are opened, each part is further codified through the construction of a new assemblage. This prompts questions about the infrastructure needed to make and unmake these technologies, the origins of the materials in the context of deep time, and how we entangle these forms of relationality

[472] Siegfried Zielinski, *Deep Time of the Media* (Cambridge, MA: MIT Press, 2006), 277.
[473] Zielinski, *Deep Time of the Media*, 2006, 278.
[474] Mbembe, *Brutalism*, 2024, 31.

present in computational objects. Furthermore, it raises questions about how we trace these forms of relation, through what language and agency. As Latour asks, "from which forest should we take our wood? In which quarry should we let the stones quietly rest?"[475]

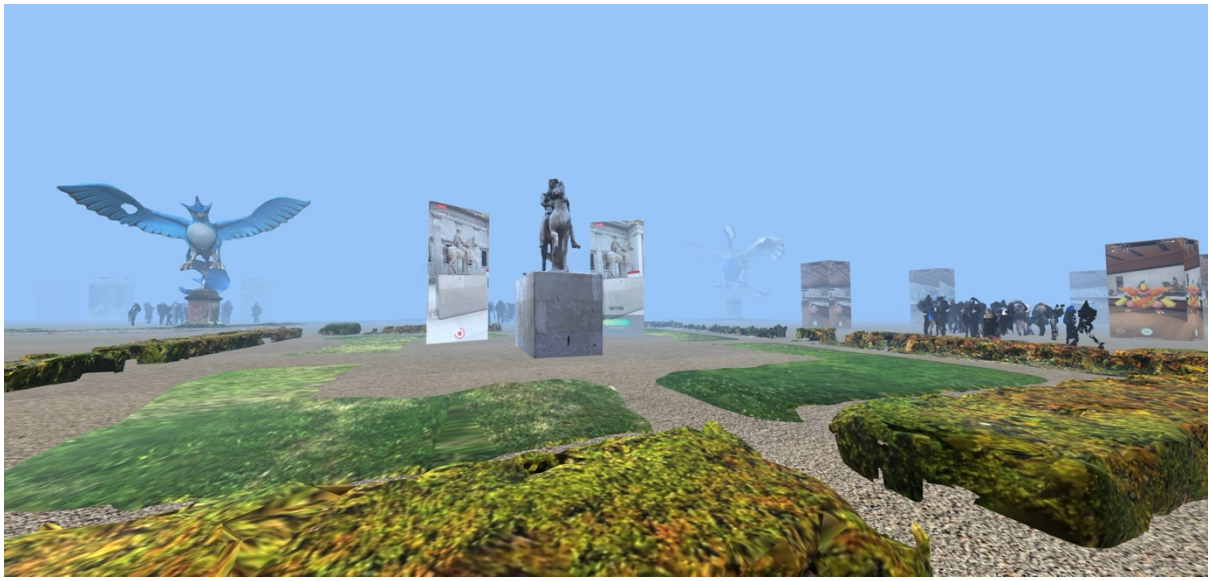
While the focus of much of the work in the *Mineral Room* of the MoCIA is on the physical construction of mobile phone technology, particular emphasis is placed on the experience and construction of the screen. Through this reference, ideas surrounding translucency and transparency are sought to be connected to concepts of touch and the positional embodiment of the visitor. The physicality of crystalline structures and glass objects is considered to have further resonance in the production of 3D digital images. This is not least because these types of surfaces are particularly difficult to replicate using image input data in the creation of photogrammetric scans. The technology, which relies on the ability to interpolate different interest points across multiple data inputs, is unable to do so when the object scanned is transparent. This situation thus represents a limit to the current form of the technology and serves as a metaphor for the complex ways in which the interface acts to seemingly transmit the world to our palm.

The slippage between the expected results of the scanning process and incomplete, partially realised 3D images represents a current technical limit of the apparatus. However, in the context of this research, it also acts as a poetic form of relation, linking the materiality of the imaging device, the embodied experience of the museum, and the unseen processes of image construction. It draws attention to what Hito Steyerl references as the "blind spots and wrecked data"[476] of 3D images, which are replete with fractures and holes. The difference between how objects appear in 3D computational images and how they are perceived by the human eye is influenced by our expectations of the technology's capabilities, shaped by the rhetoric of software companies claiming precise and detailed terrain mapping.

These expectations are further complicated by the embodied interaction with artefacts in the gallery space within their display context. However, this gap may highlight the agency of unseen processes—like a form of dark matter, present but unable to be measured or

[475] Bruno Latour, *Pandora's Hope: Essays on the Reality of Science Studies*, trans. Catherine Porter (Cambridge, MA: Harvard University Press, 1999).
[476] Hito Steyerl, *Duty Free Art: Art in the Age of Planetary Civil War* (London: Verso, 2017), 190.

understood through conventional forms of knowledge yet constituting most interactions. This includes cognitive material and non-conscious, black-boxed algorithmic computation, conditions of manufacture, mining, and global infrastructures of technology, which remain invisible to the user during their interaction with mobile devices in the creation of computational images.



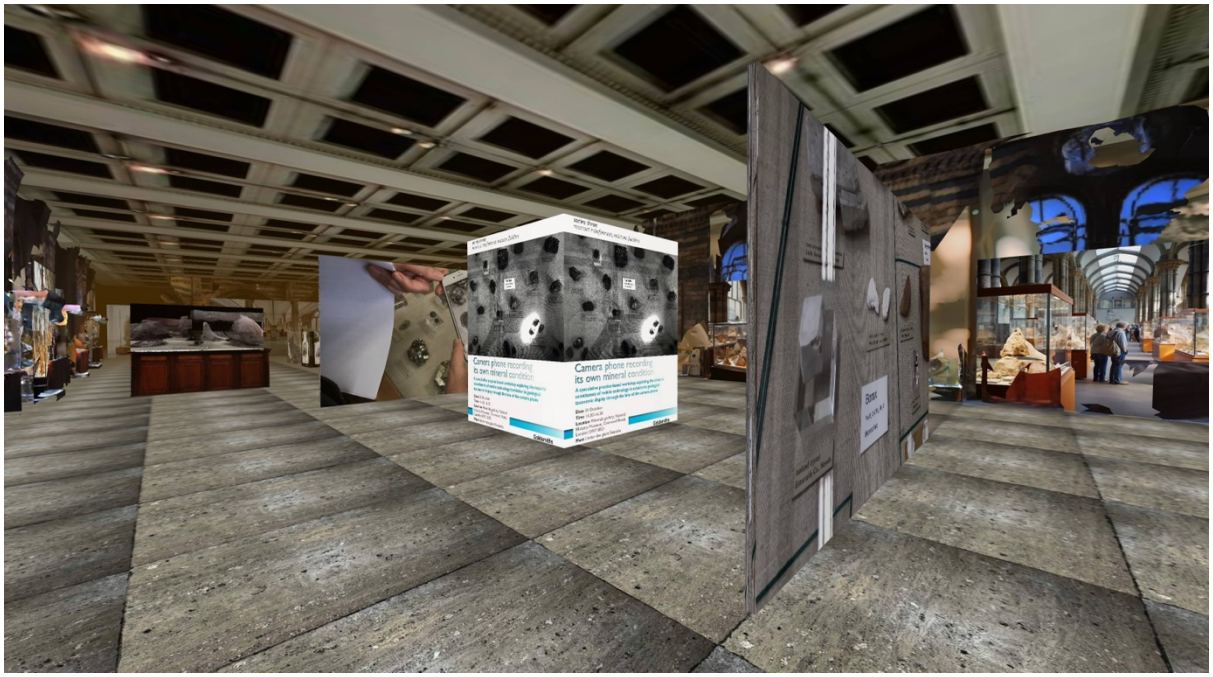
Museum of Computational Image Artefacts (MoCIA)

Link to the *Courtyard* on New Art City.

https://newart.city/show/museum-of-computational-image-artefacts-courtyard

Link to walkthrough video *Museum of Computational Image Artefacts (MoCIA). Courtyard* on YouTube

https://youtu.be/5IWq_ZVzQys



Museum of Computational Image Artefacts (MoCIA)

Link to the *Mineral Room* on New Art City.

https://newart.city/show/museum-of-computational-image-artefacts-mineral-room

Link to walkthrough video *Museum of Computational Image Artefacts (MoCIA). Mineral Room* on YouTube

https://youtu.be/8955FUI-kPc

Coda

In an interview for the Hard Fork Podcast,[477] Sam Altman, CEO of OpenAI, was asked about the future skills and abilities that AI will not replace. He stated, "AI tools totally change what one person can do. You want to get really good at using AI tools. Having a sense of how to work with ChatGPT and other things is the high ground. We're not going back; they're going to be part of the world, and you can use them in all sorts of ways. Getting fluent at it is really important (sic)."[478] This statement, made in the second decade of the 21st century, echoes Walter Benjamin's speculative predictions from the early 20th century. Benjamin, responding to an earlier anonymous quotation by Moholy-Nagy,[479] suggested that the illiterate of the future may not be those ignorant of reading or writing, but those unable to read photography and photographers unable to inscribe their photography. [480] A revised combination of these sentiments suggests that the illiterate of the future will not be those unable to use AI tools but those unable to understand and ascribe importance to them.

The shift from using computational tools to enhance images to generating images entirely by algorithms without real-world references has begun on a large scale. This transition signifies a point of no return, fundamentally altering our conception of image creation and representation. However, this comes with a significant cost, as the operational use of AI technologies has an exponentially larger carbon footprint than other types of computation.[481]

Most of the work in this project is grounded in the embodied experience of the museum as a site and its conditions of display. Although recent AI imaging technology available have

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[477] Casey Newton and Kevin Roose, "Tech's Weirdest Weekend," *Hard Fork* podcast, November 20, 2023.
[478] Newton and Roose, "Tech's Weirdest Weekend," 2023.
[479] "The illiterate of the future will be the person ignorant of the use of the camera as well as of the pen." ^1
^1 László Moholy-Nagy, *Fotografie ist Lichtgestaltung*, Bauhaus II/I (1928); reprinted in Kriztina Passuth, ed., *Moholy-Nagy* (London: Thames and Hudson, 1985), 307.
[480] Benjamin states, in his 1931 essay Little History of Photography, that "The illiteracy of the future," someone has said, "will be ignorance not of reading or writing, but of photography. But shouldn't a photographer who cannot read his own pictures be no less accounted an illiterate? Won't inscription become the most important part of the photograph?" ^2
^2 Walter Benjamin, "A Little History of Photography," in *Walter Benjamin: Selected Writings, Volume 2, 1927–1934*, ed. Michael W. Jennings et al., trans. Rodney Livingstone (Cambridge, MA: Belknap Press, 1999), 527.
[481] Melissa Heikkilä, "Making an Image with Generative AI Uses as Much Energy as Charging Your Phone," *MIT Technology Review*, December 1, 2023.

been utilised, most practice-based research is still created through sense data input from a defined source in front of vitrines in the museum space. If started now, with recent developments in imaging processes, I doubt this approach would be followed to the same extent. While AI imaging has been used in the later stages as a premonition of what may be on the horizon, what is presented requires more focus and attention beyond the context of this project. The utilisation of text-to-image tools in the museum context, though not likely to be widely used in current museum displays, finds its place in social media debates, particularly surrounding how histories are depicted and by whom.

In the current state of computational images, particularly in the processes used in this practice-based research, it is important to consider the edges of the museum and the areas into which it is expanding. These are seen as places where possibilities of restitution may start to occur and where, Haidy Geismar references, *digital surrogates*[482] may have potential and use. Issues surrounding what it means to digitise, reproduce, or refuse to reproduce become paramount as conditions of imaging change.

We are entering a world where AI creates an abundance of images, complicating the influence of historical training data used for this purpose. Issues of text-to-image AI encompass not only how museums are depicted through digital imaging but also how computational forms of image production is entangled with the historical context of corporate extraction on the internet. This is highlighted by the recent controversy surrounding the launch of Google Gemini. When prompted to depict America's founding fathers, the AI pictured them as a racially diverse group. This led to criticism, particularly from right-wing commentators, who argued that the AI tool was reluctant to generate images of white people, especially in historical contexts. Google acknowledged the problem, attributing it to overcompensation in their efforts to promote diversity and avoid reinforcing negative stereotypes. The company's tuning of the AI model aimed to ensure inclusivity but inadvertently led to the exclusion of white people in generated images. [483]

[482] Geismar, "Post-Photographic Presences," 2015a, 307.
[483] For an example of contemporaneous coverage and response, see Sarah Shamim, "Why Google Gemini Won't Show You White People," *Al Jazeera*, March 9, 2024.

However this signals the *New Jim Code*[484] still embodied in the technology that necessitated this kind of human intervention.

The widespread scraping of data for AI model training, and the scale and exactitude of this process, are still being unpacked. Problems surrounding the diversity of training data are seemingly compensated for after the training process is complete, rather than being addressed at the source. This approach treats the data as a static archive, unable to be changed significantly enough to negate the need for oversight in the AI modelling system. The need for intervention at this stage due to deficiencies in training models is telling. Digital images created through sense data are being consumed in the creation of large language models, with AI-generated images being disseminated back onto the internet, to be scraped by other training models for new image creation. This creates a potential endless loop of inequality and problematic representation following new forms of imaging or what Mbembe references as the cannibalism of ideas.[485]

Naming, categorising, and narrating images created vicariously from the context of the museum and their relation to other forms of materiality are fraught with complexity. Layered thinking is required to contend with how a practice-based response may embody types of dissent. This is further entangled in how practice disseminates digital reproductions, including challenges related to the politics, governance, and infrastructure of the digital, as well as the imperialism of the museum as a site.

The experience of COVID brought Seth Price's 2007 concept of *Dispersion*[486] into sharp focus. The relationship between the site and space as a monument, and the experience through the installation shot, navigable digital galleries on platforms like Google Arts and Heritage, or museum website glossaries accessed through 'search the collection' features, emphasised the urgency of his idea: "What if it is instead dispersed and reproduced, its value approaching zero as its accessibility rises? We should recognize that collective experience is now based on simultaneous private experiences, distributed across the field

[484] Benjamin, *Race After Technology*, 2019.
[485] Mbembe, *Brutalism*, 2024, 48.
[486] Seth Price, *Dispersion* (2007), Available at: http://www.distributedhistory.com/Dispersion2007.comp.pdf.

of media culture, knit together by ongoing debate, publicity, promotion, and discussion."[487] These concerns are exemplified in this research focus, where the imaging capabilities and functions of mobile devices are utilised by visitors to see the museum.

During the COVID-19 pandemic, engagement with museum spaces through computational forms of mediation and remote access became even more pronounced, as the experience of collections worldwide was experienced entirely through digital communication and interaction via screens. These interactions altered the function of museum experiences, and the parameters of the phenomenological research conducted in this project. This shift highlighted scenarios where the assumed universal condition of the museum as a repository of material objects, governed by the museum and the parameters of display, could no longer operate in the same way. A new paradigm emerged, transforming collective experiences into a network of simultaneous private interactions interconnected through media culture and ongoing public discourse. However, this condition was relational to both the internet as a knowledge repository and the experience of institutional spaces, creating a contrast and competition in how they responded to the pandemic. This further highlighted the digital infrastructure through which the platforms necessarily functioned.

Instead, the conditions of interaction with the output of this practice-based research project, the Museum of Computational Image Artefacts (MoCIA), may exist in a place where boundaries are blurred between where the museum resides, who the stakeholders are, and what agency and governance the technology has in new forms of interaction. The pandemic catalysed a process already underway, highlighting the potential of digital processes and necessitating a shift in how digital visualisation technologies are conceived, positioned, and understood. Models previously designed to conceptualise imaging processes for human perception, as Trevor Paglen argues, are inadequate for understanding the functions these processes now perform—particularly because most interactions with computational forms of digital imagery occur between machines and are interpreted solely as data. This is particularly relevant where human experience is either not needed, present, or intended for the reception of the image data. How, then, will this impact the understanding of ephemeral knowledge ever-present in the context of the lifeworld of artefacts in museum

[487] Price, *Dispersion*, 2007, 13.

collections? How can other forms of knowledge be inhabited to redefine how these institutions act on a global stage?

One conclusion from this line of questioning is that we must scrutinise the apparatus used in training these technologies to "see" the world, as they are often linked to extractive processes that oppress people, places, and ecologies. Further research that practice could explore and develop from the methodology of this project includes engaging with conditions where technology is evolving rapidly. Human oversight aimed at guiding the philosophical and ethical principles underpinning AI is often outstripped by the practice of making products. This is partly compounded by the insufficiency of languages and methodologies used to frame them conceptually. Additionally, corporate priorities often explore the technology in different existential or accelerationist terms, where the concept of oversight is considered a hindrance in a teleological sense.[488] In this scenario, if the technologies with which we are symbiotically entangled change the conditions of our relationship or act in unexpected ways, it is urgent to reconsider the conditions of exchange and what kind of life would be rendered bare.

In the context of the MoCIA, the navigable space of gaming is co-opted into the experience of cultural heritage through the simulated 3D environment. This strategy is designed to mimic projects created by large corporate bodies such as Google Arts and Culture, CyArk, and Factum Foundation, as discussed in Chapter 05 of this text. As Mark Paterson states, the project of accessibility was intrinsic to the mass rollout of the internet, where slogans like 'Amazon and you're done' and Microsoft's 'Where do you want to go today?' proliferated. These mantras promoted the experience of web navigation as if, through the computer screen, there was "this kind of isometric space where everything is equally accessible to everyone at all times and in all spaces."[489] Projects that emulate, compile, and present navigable 3D photogrammetric images to be consumed through a specifically defined interface experience seemingly embody this ideology.

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[488] See for example Marc Andreessen, "The Techno-Optimist Manifesto," *Andreessen Horowitz*, October 16, 2023. Horowitz is very clear in his rhetoric about who the 'enemy' is regarding those who own 'zombie ideas' concerning the future of technology. This concept references and echoes Nick Land, *The Dark Enlightenment* (Self-published, 2022). Land is also considered by Horowitz to be one of the "Patron Saints of Techno-Optimism."

[489] Mark Paterson, "Re-materialising the Digital," Conference at University of Edinburgh, 2023.

Throughout the MoCIA, a mixture of multiple forms of digital media created through sense data are presented, including LiDAR scans, 3D photogrammetry, moving images, still images, augmented reality, 3D moving images, and Gaussian Splat. These forms of computational imaging fall under the categorisation and terminology specified in this thesis due to their relation to the input of sense data. However, in the latter stages of the research, the utilisation and co-production of work through AI serve as a starting point for further projects, exploring an expanded imaging process and profoundly challenging the boundaries of my use of computational image production in this project. There is significant work to be done in connecting the concept of sensory data input to the conditions of text-to-AI image creation, particularly regarding the input data scraped from the internet to train AI models. Further exploration is also needed to examine how images that appear indistinguishable from digital photographs relate to the conceptual frameworks of photography. This approach can be applied to the museum context but also holds potential for exploring how knowledge claims are iterated in other repositories and archives, which are entangled with different types of ideology and epistemological claims.

In constructing the MoCIA, the sound element of the design situates the museum within a specific institutional context, featuring the echo of high ceilings, the hum of visitors, and the passing echoes of a narrated audio guide. Field recordings from sites of marble and glass, positioned in the online museum, link these sites to the conditions of the institution, offering a relational experience in a different contextual form. This effort is also present in the creation of the audio for the Walkthrough videos, produced through Elevenlabs' 'Text to Speech & AI Voice Generator,' tailored to the specificities of what is presented in the MoCIA. The fiction of the museum is perpetuated in the ways objects are labelled and ostensibly accessioned within the collection.

Additionally, some of the images produced to anchor the project in the *Entrance Hall* and the *Mineral Room* speculate on how the museum may be viewed in the future. These images attempt to reconcile human-centric cognitive processes with the agency of black-boxed computational imaging and the thesis's context regarding computational images. The images embody how AI pictures the museum and how visitors are depicted within this

space, reflecting how the training data perceives the museum's function and expectations of engagement. Directed through chatbot-generated text prompts, the project includes acts of spectatorship, the position of the phone in the museum, and activities surrounding 3D scanning and collections. It also speculates on how museums could focus on viewing the space through the screen and the minerality of the mobile device in relation to extractive global mining practices.

The usage of advanced automated imaging processes raises questions about the agency and morality of computational systems, often trained on problematic sets of prejudicial data. It explores how text-to-image prompts differ from expected results, typically based on human-generated digital images gleaned from online institutional spaces or social media, and how history and narratives in museum spaces are perceived through computational form searching. These considerations replicate debates surrounding the museum and restitution, particularly concerning digital assets.[490]

However, these questions also extend into new fields of enquiry regarding what the museum is, how it functions, and what constitutes appropriate research methodology. These issues resonate in other realms within the museum in different contexts. For example, as explored in Chapter 02, they relate to contestation surrounding the remains of *Kennewick Man*, viewed through the lens of forensic anthropology and genetics. These debates have, in some instances, reinforced racist claims to indigeneity by right-wing settler colonialist groups in North America. The differing images of the remains created through forensic facial reconstruction embody various ideas of ethnicity, illustrating how scientific methods can be co-opted to support conflicting ideologies. While these issues are not significantly different from existing debates surrounding the institution, they are now framed by evolving conditions and infrastructures of imaging technologies.

The MoCIA serves as a methodological pilot, exploring how digital 3D and other forms of computational practice, particularly those generated through phenomenological research and the affordances of a general visitor to an institutional space, can be presented and made accessible to the public. It has potential applications for future practices involving

[490] See for example Pavis and Wallace, "Response to Sarr-Savoy," 2019.

various institutional spaces, enabling other repositories, experiences, or archives to be positioned in a publicly accessible 3D navigable realm, requiring no prior knowledge of coding or advanced software skills to present the created work.

There are many avenues for expanding upon this potential, which have been experimented with in various ways within the rooms of the MoCIA. These include engagement and relations created via Pokémon Go, the usage of AR technology in different contexts in the *Remote Access Room*, the exploration of human remains through the focus on the screen of interaction in the *Docile Bodies Room*, and the attempts to relate the process of mineral extraction with the experience of different forms of computational images in the *Mineral Room*. These experiments posit new forms of interaction and the creation of repositories towards the museum space.

While the technology is accessible and user-friendly, especially for digital natives familiar with gaming platforms, the challenge lies in allocating sufficient time and space for engagement. Participants need opportunities for attentive interaction and investment, which are precious and often precarious resources. Nevertheless, the process of engagement is significant, enabling multiple collaborators to work together on a project in a single space at low or minimal cost, with the results being globally accessible.

This research has developed creative strategies integrated into practice-based methodologies that utilise new forms of imaging technology available on consumer level mobile devices. These strategies push the boundaries of where the museum resides, the effect technology has on interaction with institutional spaces, and how digital forms of image mediation can be understood as an interface. The processes employed throughout the research serve as a foundation for considering imaging technologies' role both as a broader strategy to engage with institutional spaces and as part of extensive research aimed at challenging traditional display structures and interaction through digital tools. The relationship of the museum space to the creation of AI text-to-image, text-to-video, and emerging forms of text-to-3D artefact is a potentially contested area of future research.

However, the museum is not the only institution where inequality resides and through which computational forms of image proliferate. These emergent technologies are rapidly increasing in capability, making it urgent to examine how they function. This examination is particularly important in contrast to the claims made about their capabilities and the concerns related to their operational functions. AI-integrated computational imaging technologies differ from other forms of advanced imaging processes by lacking the intrinsic link to the referent that characterises other computational images related to the project's practice output. There is a correlation between the visualisation of the data cloud and what Lev Manovich references as *photorealism*.[491]

In one of the last works created for the *Mineral Room* of the MoCIA, an AI-generated image of a diverse group of people engaging with their mobile phones, created through the platform Midjourney, is used as a prompt for another AI image-to-video process. The catalyst image depicts several people, with a young woman of apparent Asian descent in the foreground, situated in what appears to be a museum entrance hall, looking at her mobile phone. The image is relatively believable, or photographically realistic in Manovich's terms, as something created through algorithmic interpretation of sense data via lens-based media. The prompt created through GPT-4 was specifically designed to diversify the representations achieved in the context of the image work, which predominantly depicted older white men looking into display cabinets at iridescent rocks, hybrid skeletal creatures, and other strange objects in referential sites like the Natural History Museum, the British Museum, or the MET.

When this image was entered into RunwayML's AI video generator with the same initial prompt, the ethnicity of the people depicted, and the context of the situation changed considerably within two or three seconds of processing. From the context of the museum, the participants appeared to be placed in a space resembling an airport lounge or high-end shopping mall. Additionally, the depiction of a diverse group of people transformed into a singular Caucasian woman with long dark blonde hair. This suggests that the AI training model lacked sufficient diversity in its training data to accurately represent different ethnicities. A solution would be to urgently include more diverse training data to represent

[491] Manovich, *The Language of New Media*, 2001, 200.

a broader range of people through text input requests accurately. Alternatively, as in the case of Google's Gemini, different parameters could be imposed on the algorithm to ensure certain groups are pictured more often than those categorised as white, though this approach can also be problematic in different ways.[492]

The operation of imaging processes, particularly those emerging from generative modelling, can be interpreted as emblematic of what Achille Mbembe calls the brutalism[493] embedded in our engagement with computational governance through which we are subjugated. New forms of imaging processes exert control over what is pictured and how the world is imagined to function. The default result, whether explicitly problematised or not in terms of representation, often returns to a hegemonic response to the text prompt. As the computational process becomes more complex and advanced, this control becomes less visible and more subtle, mirroring the development of other forms of computational image technology.

In the development of 3D photogrammetry apps, around 2016, the first mobile apps that created photogrammetric images produced results that were partial and incomplete, replete with holes and ruptures to visuality. By 2024, using Niantic's Scaniverse app and its AI-assisted capture process, a relatively complete 3D scan of a whole environment can be produced with the ease of making a panoramic digital image on a phone. This represents a progression from fractured, disjointed, and visually complex forms toward completeness, with the scene appearing to be hermetically sealed within the ground of the interface.

In the context of how the museum is pictured through AI imaging in its current state, the expectations of behaviour and the socially constructed conditions within which images are created and interpreted play a significant role. The AI system draws upon an extensive repository of existing images, each embedded with its own historical and cultural biases, resulting in outputs that reflect and reinforce existing power structures, social hierarchies, and relations to the space. AI image generation processes are inherently referential, relying on patterns and structures present in the training data, a problem foregrounded by Safiya

[492] Prabhakar Raghavan, "What Happened with Gemini Image Generation," *Google Blog*, February 23, 2024.
[493] Mbembe, *Brutalism*, 2024, xii.

Noble in her work *Algorithms of Oppression*.[494] This can lead to the replication of problematic depictions and the reiteration of museums' messages of care, custodianship, and the supposed naturalness of artefacts belonging within their walls.

So, the issue is not merely one of diversity in the training data or the ways that this data is taught to picture but also involves the broader context in which these images are situated and the underlying assumptions and power dynamics they perpetuate. Addressing the diversity of training data alone is insufficient; it is equally important to develop the critical vocabulary through which these images are understood, critically examined, produced, and challenged in terms of the socio-cultural constructs and power relations that inform their creation and interpretation.

The wider problems embedded in the process still reside in the conditions of exchange and the problematic loop that the utilisation of technology embodies. If computational imaging processes can be said to have governance, and if this agency is linked to assemblages of violence, extraction, and imperialism on massive scales, the impact is not aligned with techno-utopian or neo-accelerationist fantasies about the role of machinic forms of imaging to liberate humanity. Instead, the governance and power structures inherent in these technologies often perpetuate existing inequities, leading to exploitation and harm.

The question thus becomes: how can technology in museums and cultural institutions promote and embody ethical practices, equity, and care? Considering the visitor as an agential stakeholder through their engagement with space may offer a way forward. Future work could focus on developing new methodologies and case studies to explore the impact of computational imaging technologies on visual culture. Different forms of museums or places of radical hospitality, such as the anti-museum[495] in Achille Mbembe's terms, or places of affective custodianship, care, and loan—like the post-museum[496] in Paul Tapsell's conceptualisation—could become spaces for rethinking and engaging with new forms of imaging technology that are not top-down or focused on reproducing objects digitally, but instead employ diverse creative strategies. However, this proposition requires addressing

[494] Safiya Umoja Noble, *Algorithms of Oppression* (New York: NYU Press, 2018).
[495] Mbembe, *Necropolitics*, 2019a, 172.
[496] Tapsell, "(Post)musings," 2015.

discrepancies and limitations posed by *digital surrogates* of people, places, and things. Key considerations include how these *digital surrogates* are created, under what access circumstances, their actions, their conditions, what they can achieve, what remains intangible, their entanglements, and the effects of their intrinsic relations.

Museum of Computational Image Artefacts (MoCIA)

Link to the *Viewing and Reading Room* in New Art City.

https://newart.city/show/museum-of-computational-image-artefacts-mineral-room

Museum of Computational Image Artefacts (MoCIA)

Link to the secret space[497] of the MoCIA: *Experiential Futures Room* in New Art City.

https://newart.city/show/museum-of-computational-image-artefacts-viewing-and-reading-room

[497] The space is only accessible through a hidden portal concealed within one of the 'books' in the reference library of the *Viewing and Reading Room*.

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