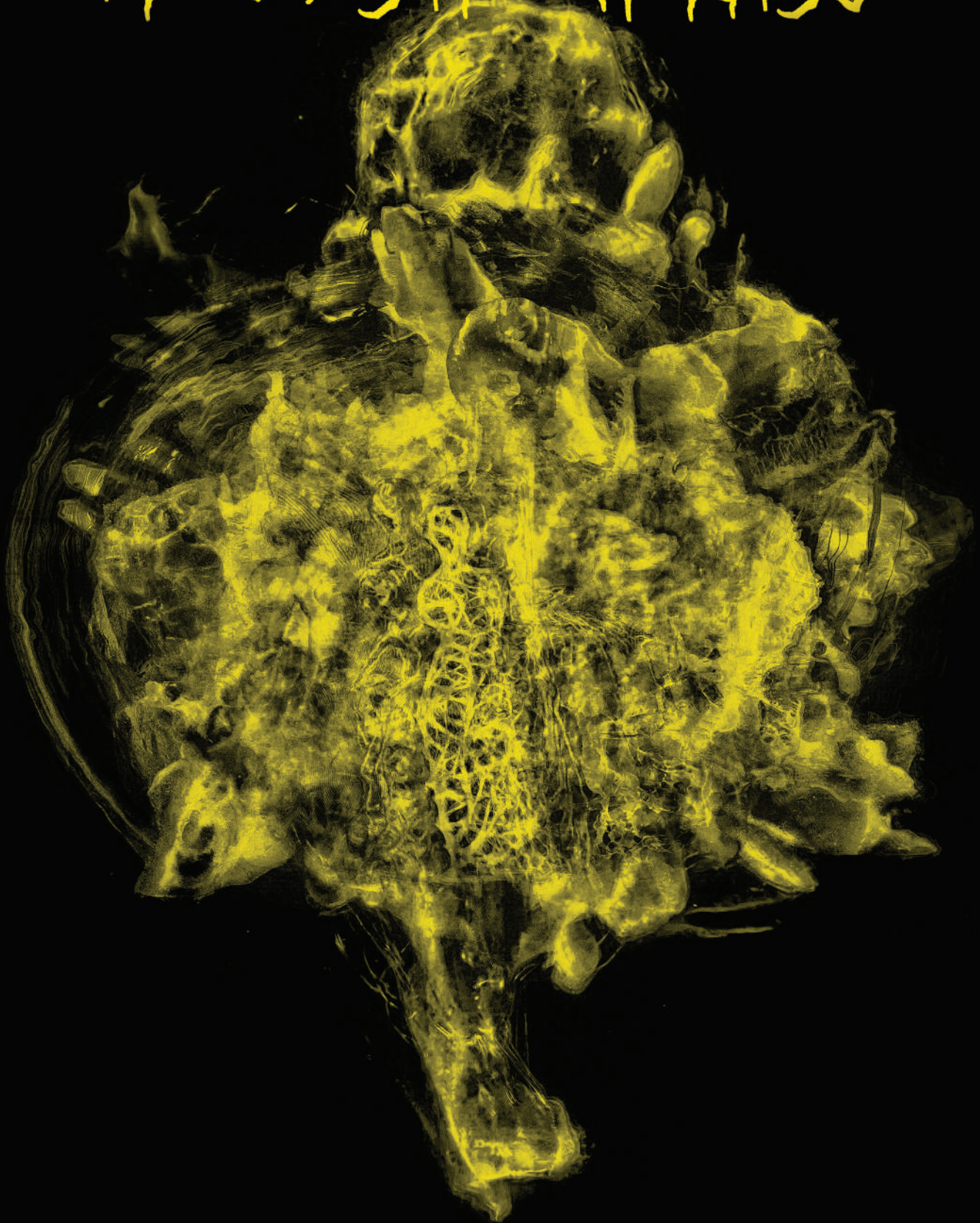


# SPECULATIVE HERITAGE



Evaluating how emergent technology can be used to assess our understanding of heritage.

Chalmers School of Architecture -Department of Architecture and Civil Engineering

Tadhg Charles - 2023

Examiner - Isabelle Doucet

Supervisor - Naima Callenberg

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### Project Plan

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I am very grateful to everyone who has enabled me to undertake this master's thesis. My eternal thanks go to my wonderful family and friends for all their assistance and support.

It was a pleasure and a privilege to have been able to explore architecture through education. I feel exceptionally fortunate to have had such great teachers along the way. In particular, I would like to single out David Wilson of RGU and Naima Callenberg of Chalmers for being guiding lights on my path.

It feels like I have been given many advantageous opportunities to continually expand my horizons throughout the course of these studies. Isabelle Doucet's role as my examiner allowed me to diversify and explore how to discuss my understanding of architecture in a manner which I would not previously have been capable of.

Looking back over the process now and all the content created over its course, I am struck by the traces of all those who influenced me along the way. I can read elements of their impact in the development of my work, allowing me to follow back the entangled course that shaped my approach to Architecture. Going forward, I can only hope that this interweaving of networks which has enriched every element of my development will continue slowly forming a rich thread of many parts. Thank you everyone, past, future and present, human and nonhuman, bodied and unbodied, I wish you all the best.

Tadhg

## ABSTRACT



Photograph of model by author made during design explorations 3-4 exploring lighting

In this thesis I explore what I perceive to be one of the main difficulties involved in architectural heritage practice. Our current approach towards preservation prioritises qualities in an inequitable manner and this results from a misconception about the singular correct interpretation of a building's essential character. In conventional historical procedure there is a prevalent concept that the best action is to preserve structures in stasis. This interpretation posits the idea that an architectural construct occupies a single state of correct intelligibility. I believe that a historical edifice is never one thing, it always embodies multiple readings simultaneously.

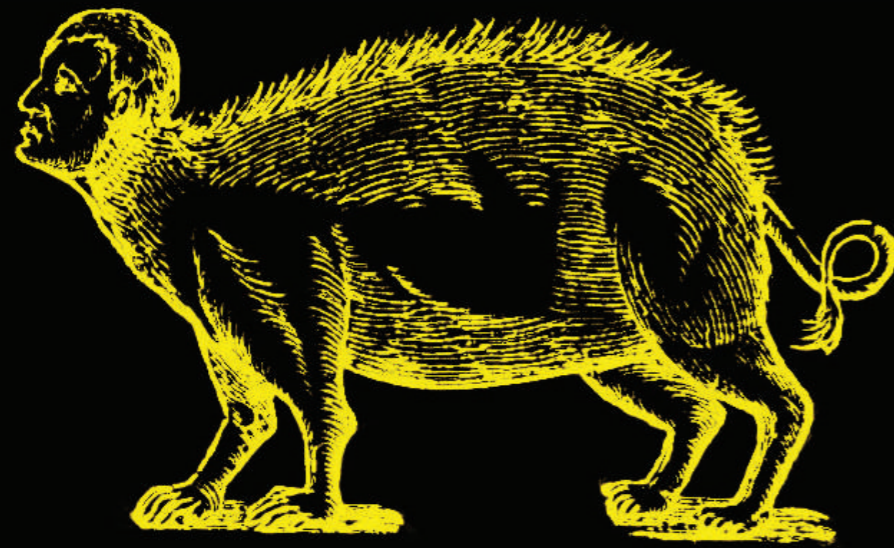
Using emergent technology, I highlight the subjective differences that proliferate in the individual comprehensions of a building's form. By contrasting subjective interpretations of the monuments against objective recordings I will highlight what lies at the centre of proclamations about their correct conservation. The reason for this investigation is to critically consider how we understand and engage with the physical manifestations of our past. It is important to re-evaluate how we work with this information given the accelerated rate of change caused by both climatic and social conditions which are resulting in the irreparable loss of countless artifacts.

Acknowledging the delicate finite quality of historical edifices, we should contemplate and simulate potential scenarios for legacy structures whilst reflecting on our own phenomenological attachments. It is my conjecture that emergent technology allows for a new and exciting means of exploring and questioning our actions while hypothesizing possibilities which traditionally would be considered contentious. What qualities do we aim to preserve and how might this be done in the most suitable manner? If all understanding of heritage is a personalised filter can technology allow for the sharing of this perspective. I propose a speculative approach that asks what is embedded in built heritage and our interpretation of it.

I want to see how possible it is to manifest subjectivity through emergent technology to allow for a more representative and inclusive demonstration of our historical narrative and how it relates to heritage.

Key words: Speculative heritage, Heritage practice, Preservation, Emergent technology, Simulations, Legacy structures, Phenomenological attachments, entanglement, Replicas, Authenticity and Composition of memory identity, subjectivity, objectivity

## ABOUT THE AUTHOR



Self portrait of the author

Tadhg Charles is from Dublin, Ireland and began studying architecture at Robert Gordon University in grey Aberdeen a relative lifetime ago. Following this Tadhg moved to Gothenburg, Sweden to pursue a masters in the same discipline at Chalmers University of Technology. This document represents the culmination of those efforts to date.

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## Revenant

I am the spectre who returns  
Unto some desolate world in min borne afar  
On the black flowing of Lethean skies:  
Ever I search, in cryptic galleries,  
The void sarcophagi, the broken urns  
Of many a vanished avatar;  
Or haunt the gloom of crumbling pylons vast  
In temples that enshrine the shadowy past.  
Viewless, impalpable, and fleet,  
I roam stupendous avenues, and greet  
Familiar sphinxes carved from everlasting stone,  
Or the fair, brittle gods of long ago,  
Decayed and fallen low.  
And there I mark the tail clepsammiae  
That time has overthrown,  
And empty clepsydrae,  
And dials drowned in umbrage never-lifting;  
And there, on rusty parapegms,  
I read the ephemerides  
Of antique stars and eider planets drifting  
Oblivionward in night;  
And there, with purples of the tomb bedlight  
And crowned with funereal gems,  
I bold awhile the throne  
Whereon mine immemorial selves have sate,  
Canopied by the triple-tinted glory  
Of the three suns forever paled and flown.

I am the spectre who returns  
And dwells content with his forlorn estate  
In mansions lost and hoary  
Where no lamp burns;  
Who trysts within the sepulchre,  
And finds the ancient shadows lovelier  
Than gardens all emblazed with sevenfold noon,  
Or topaz-built towers  
That throng below some iris-pouring moon.  
Exiled and homeless in the younger stars,  
Henceforth I shah inhabit that grey clime  
Whose days belong to primal calendars;  
Nor would I come again  
Back to the garish terrene hours:  
For I am free of vaults unfathomable  
And treasures lost from time:  
With bat and vampire there  
I fit through sombre skies immeasurable  
Or fly adown the unending subterranean;  
Mummied and ceremented,  
I sit in councils of the kingly dead,  
And oftentimes for vestiture I wear  
The granite of great idols looming darkly  
In atlantean fanes;  
Or closely now and starkly  
I ding as dings the attenuating air  
About the ruins bare.

(Smith, 1934)

In this poem first published almost 100 years ago a spectre outside of time despairs at how the endless progress of entropy slowly denigrates any understanding of history. Our past is preserved in artifacts, but the narrative is never as singular as the presented record. The actualised condition is excellently represented by the figure of the revenant trapped between the presented and the perceived.

Buildings are never a fixed entity they are instead as Edensor (2011) says an “ongoing emergence” “simultaneously destroyed and altered by numerous agencies and stabilised by repair and replacement building material.” “Always becoming, an emergence, and surrounded by so many relationalities and potentialities that they can never constitute a seamless whole.” (p1).

Constructions are a particular kind of place, in the words of Sheller and Urry (2006) always being “assembled and reassembled in changing configurations” (p216). Current ways of depicting and understanding history are very regularly blinkered and overly specific in their attempt to preserve a conceptualised idea of original correctness. This could be seen as emerging from western ideas of the original and the stabilising role it serves as proposed in the work of Hegel. As Walter Benjamin (1936) says “The presence of the original is the prerequisite to the concept of authenticity.” (p4) where the act of creation to quote Byung-Chul Han (2017) “marks a rupture that breaches the continuum of change” this “suppresses what has gone before, from which it has become, and establishes itself as an absolute beginning.” (p2).

A contrast to this can be found in classical Chinese theories of the original referred to as zhen ji. This can be conveyed as the concept of an authentic trace free from ideas of teleological determinacy (Ricketts, 2006). It never becomes one thing but deconstructs the idea of any centred presence of identity. (Byung-Chul Han, 2017) This relational concept of continuous becoming is in sympathy with notions of the interdependence of actors within a network where every entity modulates every other entity. (Latour, 2007)

When we acknowledge the unifying qualities that link all things in dispersed networks, we can more easily appreciate the importance of a considered approach towards how we manage the fabric of our heritage. Conservation is one of the most continual acts practiced by humanity that ensures a transference of information, and the maintenance of a continuum were knowledge transitions from one generation to another (Quintero et al., 2022). Artefacts act as Penates (Virgil, 2006) objects embedded with memories which help form a usable past (Zamora, 1997).

This is where I believe one of the main divergences occurs in our approach towards heritage, in the point between personal memories and the correct official narratives. Individualised recollections will always be subject to change and development over time. While formal records are usually far slower to adapt everything which is recorded is a construct and all subsequent engagement with this resulting material is subjective (Barthes, 1981). Buildings can mediate this containing both the personal and official accounts simultaneously to serve the function of memory Anchors (Ch’ng, 2022).

Through emergent technology it is becoming possible to finally begin to explore and represent multiple perspectives simultaneously allowing for the emergence of a richer and more representative understanding of what historical built forms mean to citizens on a personal level and the qualities they embed in themselves (Edensor, 2005). This can allow for discussions on alternative conservation strategies which acknowledge the impossibility of achieving perfection while recognizing the impracticability of struggling against entropy (S. Lemons, 2013). Instead, we should appreciate how opinions on form and aesthetics are subject to change and work towards focusing on how we might expand representative methods in order to incorporate as many subjective views as possible in the process of discussing heritage. This would allow for a bridging of the gap between subjective and objective determinacy in the discipline of how preservation is practiced.

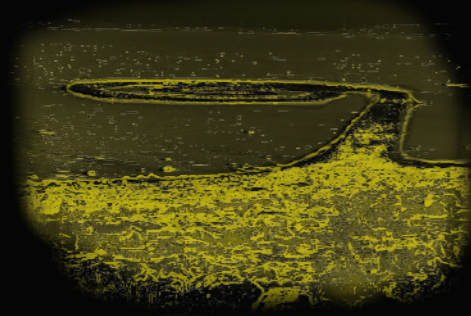
Rudolf Clausius coined the term “entropy” from the Greek entropion, “transformation and change.” (DeSilvey, 2017) and it is frequently understood to refer to the decay of a system but, it can also be interpreted as the release of component elements from one state to another allowing for emergent possibilities in their reconfiguration. The connotations surrounding entropy were perceived to be so negative by Buckminster Fuller that he invented his own term syntropy (Fuller, 2008) which focuses on the potential created by this process of change.

Scanlan (2005) states “Deteriorating matter embodies a time that exists beyond our rational time: in this shadow world, time is always running matter down,” (p145). This quote from Scanlan highlights the separation between individual and official narratives which is made manifest in the work of American artist Robert Smithson particularly his 1970, Spiral Jetty to which the process of time is central reflecting on stability and decay.

Edensor (2005) posits that processes of change “deride ideals which champion the virtues of seamlessness.” (p130) which are central to ideals of productivity and valuation currently associated with space (Lefebvre, 1992). The struggle against change is comparable to refusals to acknowledge and incorporate more varied perspectives into the narrative of heritage that could expand the spectrum of understanding and make it possible to, as Edensor (2011) proposes, “write accounts that do justice to the emergence, contingency and unpredictability in a world of innumerable agencies.” (p10)

This point brings us back to the figure of the revenant, a liminal presence existing between the presented and the perceived, embodying potential narratives and holding the light up to heritage practice. Through the application of emergent technologies, this thesis highlights this spectre that encapsulates the breath of individualised narratives contained within our built monuments showing the shadows that emphasize and give depth to historical narratives.

Starting with several case studies that highlight the existing inconsistencies within heritage practice and the concept of the original this section is titled “Replicas, Authenticity and Composition of Memory”. This will be followed by an exploration examining contemporary applications of emergent technology in the discipline and how some of these use novel methods to integrate a wider range of potential narratives than would be conventionally possible to represent. Following this, there will be a discussion of a few precedents that already utilize technology in a speculative manner to expand our perspective on heritage. These points are dealt with under the heading of “Emergent . technology and heritage”. All the examples and case studies which have been chosen exemplify a particular approach towards heritage and help underline both the inconsistencies in official narratives of heritage and how technology can augment our understanding of the past. Finally; a series of workshops and design-based exercises have been undertaken that will centre on the usage of artificial intelligence and hybrid fabrication techniques as a means of speculating how we might manifest a portrayal of the contrast between interpolations to the perception of heritage.

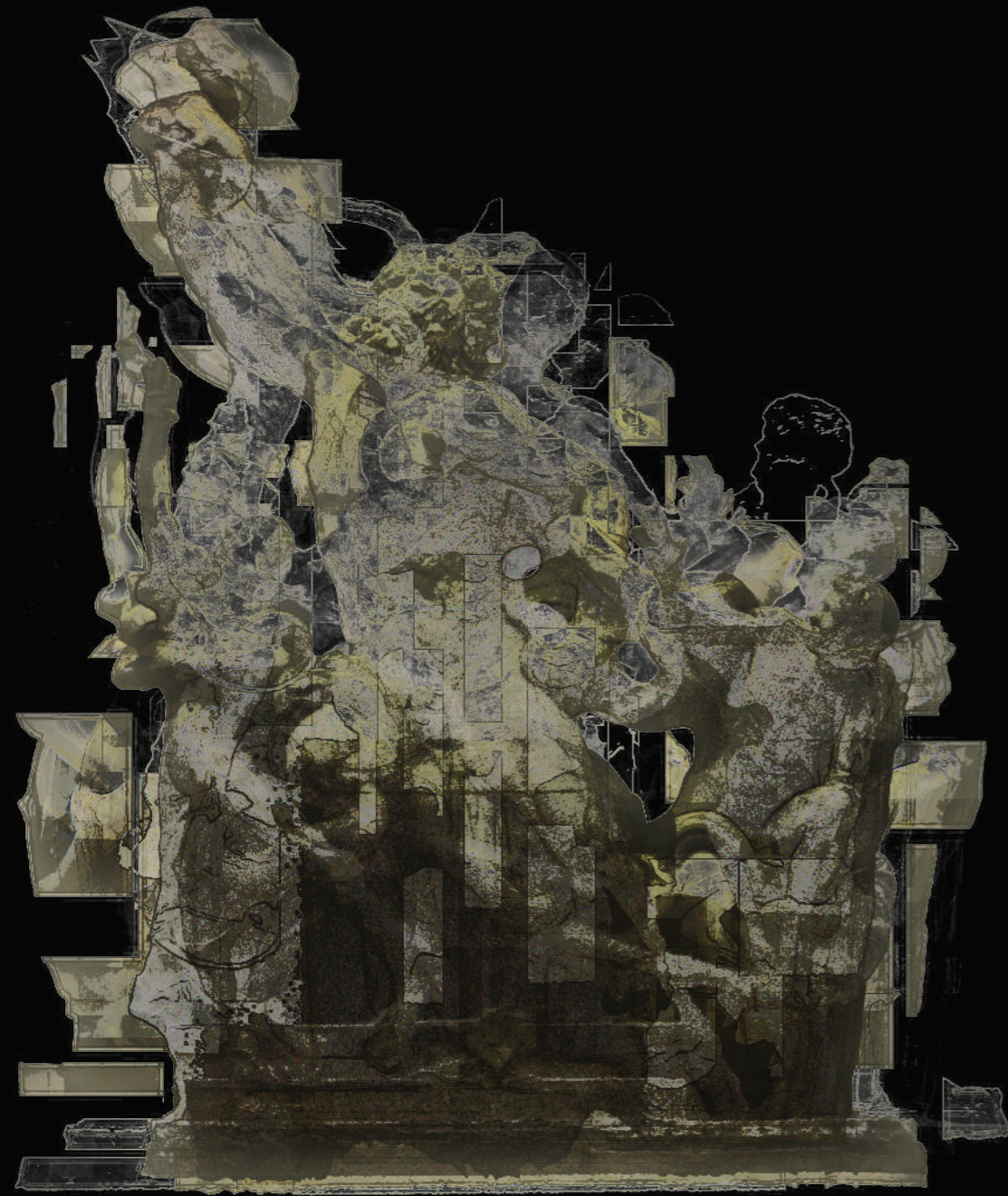


Authors drawings of Spiral by Robert Smitson considering temporality



Photograph of model by author made during design explorations 3-4 exploring lighting

## FROM REPLICAS TO AUTHENTICITY AND COMPOSITION



Mixed media interpretation depicting a statue of Laocoön and His Sons

“I think how little we can hold in mind, how everything is constantly lapsing into oblivion with every extinguished life, how the world is, as it were, draining itself, in that the history of countless places and objects which themselves have no power of memory is never heard, never described or passed on”  
(Sebald, Austerlitz, p125)

This quote reflects on the ephemeral nature of memory and history. It highlights the idea that much of what has happened in the past is not remembered, and that the world is constantly “draining itself” of its history. The speaker suggests that our individual capacity for memory is limited and that the history of many places and objects is lost with time. The quote speaks to the importance of preserving and sharing the stories of the past to better understand and connect with our present and future.

The image on the opposite page is an amalgam of digital scans, drawings and photographs, made representing alternate stages in the development of what is frequently referred to as the most famous statue from antiquity (Boardman, 1993). It shows Laocoön and his sons being strangled by snakes sent by the goddess Athena to prevent them from disrupting the passage of the Trojan horse inside the walls of the town. It was excavated in 1506 CE and put on display in the Vatican. We have written descriptions of this piece dating back to Pliny the elder in the 1st century CE (Barkan, 2001). It was reportedly sculpted by Agesander, Polydorus, and Athenodorus of Rhodes (The Elder Pliny, 2018). The statue itself can be used as a symbolic allegory for the problems of approaches towards representation of heritage (Pliny’s Natural History in Thirty-seven Books).

In the first place the sculpture is presented as a marble copy of a much earlier work in bronze that has not survived. Here, it acts as a representative piece standing in for a no longer extant version. This begs the question of when the agency of a reproduction outstrips its connections to the original. I will explore this under the term of the REPLICA.

Secondly in the writings of Pliny it is presented as being carved from a singular block of marble, yet the current sculpture is made from multiple pieces leading to debate over the authenticity and origin of the work (Boardman,1993). This will be discussed in reference to AUTHENTICITY.

Thirdly, the piece itself has been reconfigured on multiple occasions to bring it in line with transitory notions of historical correctness. The positioning and arrangements of the figures have changed substantially over time, which we can see documented in the drawings and reproductions of numerous artists (Barkan, 2001). (See the attached figures) Does this not ask us to examine approaches towards how our heritage is composed. This idea will be explored in the section entitled COMPOSITION.

These three points are central to explaining my stance on the distance that lies between ideas of correct historical practice and their enactment. Each point will now be explored in more detail. Starting with REPLICAS and how the act of copying and reproduction is an essential part of historical maintenance. This will be followed by diving into a full discussion of how AUTHENTICITY is perceived and constructed. To conclude this section, there will be an explanation of my comprehension of COMPOSITION with reference to how it shapes our narrative understanding of the past.

Depictions of statue of Laocoön and His Sons



Figure 1

Figure 2

Figure 3

Figure 4

WHAT "THINGS" EMBODY



Authors interpretation of the statue of Athena described in the Parthenon of Tennessee.

The concept of copies and the original is highly contested within western approaches to objects. Most people would probably still agree with Walter Benjamin's (1936) statement that "The presence of the original is the prerequisite to the concept of authenticity." (p4). Which argues that reproductions are shadows of their precursors lacking the "aura" that can only manifest in the initial object (Benjamin, 1936). Benjamin goes on to argue that individual uniqueness is subject to traditions of situatedness that cannot possibly be simulated in a reproduction. A deconstructivist approach towards the idea of creation allows for a far more flexible narrative wherein the created object is in fact part of a continual narrative forming a structure that houses the Freudian "memory-trace" that denotes the positioning of artefacts in a continual procession of rearrangement (Freud, 1953); meaning that Byung-Chul Han (2017) interoperates as "The trace effaces the artistic subjectivity, replacing it with a process that allows no essentialist positing." (p6). This questions what it is we are trying to preserve, maintain and sustain through heritage and conservation practice.

THE PARTHENON IN TENNESSEE

What do replicas say about our desires for the past? By attempting to remake a pre-existing structure we emulate elements of the qualities we perceive as valuable to connect with the narrative history of the original. We try to recapture that forgotten memory trace and, much like the statue of Laocoön and his sons, appreciate the perceived embedded qualities that are brought forth. The Nashville Parthenon in Tennessee built in 1897 claims to be a reproduction of the Parthenon during the hight of its functional greatness in ancient Hellenic Greece. It comes completely restored and painted even going as far as to include reimagining of extant sculptures now absent from the Greek Parthenon, including a gaudy 42-foot statue of Athena (truly something we never wanted but possibly needed) in the building's sanctum. It is an attempt to return to an instance state in the progression of a building and so reinhabit the perceptual space of memory located at this save point.

Symbolic archetypes represent more to us than just markers of societal achievement they summon the image of what Christian Norberg-Schulz called the spirit – "Genius Loci"- of the place (Norberg-Schulz, 1980). There are copies of Californian suburbs, an Austrian village and even a sphinx in China. The Eiffel tower has been reproduced at various scales all over the world; and one of the most popular theme parks in Japan shows solely scale replicas of famous heritage sites from around the world. Do all these imitations, to quote Edensor, "conjure up various histories, evoke a range of memories, signify obsolescent fashions and products, bear the imprint of the timed schedules of yesteryear" (p22). Or are they something more, attempts to create mnemonic anchors as Caitlin DeSilvey (2017) posits when she says "The memories associated with these monumental forms may be popular or elite, consensual or contested, but the link between material persistence and memorial function goes largely unquestioned." (p13). I interpret this statement as meaning that the physical manifestation of an edifice allows the ideals associated with it to become materially tangible. Allowing us to understand important socio historical narratives that are entangled in the physical forms from the constructed past.

Alcock (2002) hypothesizes that "People derive identity from shared remembrance—from social memory—which in turn provides them with an image of their past and a design for their future" (p7). But how original does the representation of that past need to be? Is it possible that through a replica it is viable to convey the essential qualities we desire to express, remember and preserve. To what extent do these made artifacts guide our comprehension of heritage (Kracauer and Levin, 1993) particularly when we consider the Barthesian concept of counter-memory this seems like a risk that all artifacts are subject to and not just replicas. (Barthes, 1981) I believe replicas are part of the process of creating memoryscapes that Edensor (2005) says "materialise memory by assembling iconographic forms and producing stages for organising a relationship with the past." (p22). Heritage is described by Laurajane Smith as a cultural and social process carried out at individual, group and societal levels to create, represent, and negotiate identity (Smith, 2006). It is also the line of convergence which denotes were and how societal memory is manifested in an identifiable form allowing for a "usable past" (Zamora, 1997).

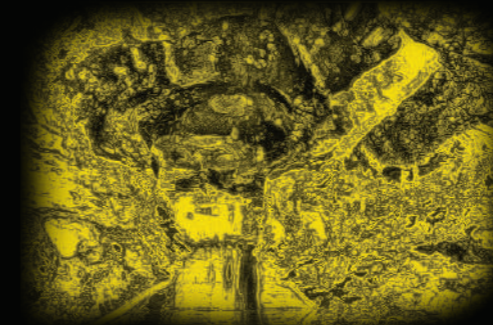
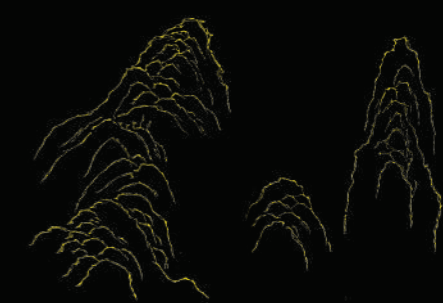


Image made by the author merging the iterations of Lascaux



Authors interpretation of mountains as depicted in the manual of the mustard seed



## THE ITERATIONS OF LASCAUX

Consider the case of Lascaux, one of the world's most prominent archaeological sites. First rediscovered in 1940 it contains approximately 10% of all France's recorded cave paintings. The cave was opened to the public in 1950 and closed permanently to them 18 years later. This was a response to the exacerbated wear which tourism was inflicting upon the space. Since then, there have been 3 alternate replicas of the cave constructed, each iteration utilising the latest available techniques and technology (Leresche, 2019). They span the range from the initial replica made from a mixture of analogue surveying and casting to the latest iteration which utilised highly accurate digital scanning in its fabrication allowing for the creation of a closer analogue. Both the first and third reproductions of Lascaux share a visitor centre, while the second version takes the form of a traveling exhibition (James, 2017). As the case now stands, most visitors have never experienced the original cave. Instead, they may potentially possess memories of interactions with three alternate replicas of the same space. What does this mean to experience multiple interpretations of a single container without ever having seen its initial form. How does this change our understanding of the space? This could potentially be a manifestation of a counter-memory (Barthes, 1981), or it could be an example for how replicas can become part of a heritage network that disseminates the core values of their originator forming a "extended mind" (Clark & Chalmers, 1998)

## VALUATION AND PRODUCTION

The idea of reproduction as simulacrum can best be shown in the art world. Famously in the case study of the Musée Cernuschi's 1956 exhibition at which the displayed worked was a collection of past Chinese masters which transpired to be painted by Chang Dai-chien who at the time was also exhibiting works under his own name at the Musée d'Art Moderne. The exhibition was closed on the grounds that the nature of the works production robbed them of their authenticity, and this subsequently devalued the display expunging any merit from it. Yet many of the displayed works were painted by Chang based on accounts that described lost historical art works (Yang Liu, 1998). Like the marble statue of Laocoön and his sons these works are signifiers of the values associated with the lost original and allow us to glimpse an aspect of the quality being continued regardless of physical authenticity. A more recent example of this approach towards perceived authority being physically embedded in an aspect of the original can be seen in the 2007 Hamburg Museum terra-cotta warriors' controversy. During this incident the museum shut down the exhibition and refunded any entrance fees that had been paid after discovering that the terra-cotta statues were in fact reproductions and not originals (Deblauwe, 2008). The Chinese response to this was to emphasise the fragility of the actual artifacts and question how perfect copies would detract from the viewers experience in any way. The Hamburg Museum's approach could be said to exemplify an imperialist program towards objective possession of history through artifact. The idea that an organization which purportedly aims at the preservation and dissemination of historical content would place the importance of displaying original artifacts over the inherent danger to them resulting from their transportation seems rather counterintuitive.

The Manual of the Mustard Seed Garden is a Chinese instructional manual originally published in 1674. It acted as a pattern book which artists could draw on while developing their skills. Its influence in eastern art cannot be understated (Mai-mai Sze, 1978). Learning through imitation is a tradition that has clearly been crucial to the development of the art world (Gombrich, 2006). Yet in the west we frequently denigrate a reproduction or imitation as being less than the original. In a seeming contrast to this, once an artist is an established persona even their imitations are seen as being imbued with the quality of genius. How are the paintings made by Van Gogh that reproduce Asian works any more than reproductions that the artist has filtered through the lens of his own abilities? I think on reflection we might struggle to explain and codify this intrinsic artistic aura that was so important to Walter Benjamin and still haunts our approaches towards conservation, heritage and the original.

The case study of Han van Meegeren is an excellent example for expanding upon this point. Han van Meegeren was a gifted painter and possibly one of the most notable forgers of the last century (Lopez, 2008). In September 1938 he presented a newly rediscovered Vermeer which was authenticated by several prominent Vermeer experts who rejoiced in this newly revealed masterwork. After the second world war he was placed on trial for having sold a Vermeer painting to Hermann Göring. While under oath he stated that the painting was in fact a forgery. To prove his innocence, he painted his final Vermeer under close supervision explaining all the techniques he had used to replicate an original. Overnight, paintings that had been considered priceless master works became worthless forgeries. (Dolnick, 2009)

There is nothing inherently wrong with a re-creation. Forgeries however are denigrated and outlawed as they have the potential to devalue and destabilize markets of commodification. When accumulated capital is manifested in a painting, questions of the singularity and scarcity of this product challenge its liquidity. This is an intolerable slight to those who use works of art as ways to hide or protect their accumulated wealth. If we abandoned the ideas of value in relation to the singular nature of an author, we might all own the art that we deserved whether it be made by hand or inkjet printer. This approach is no less applicable to heritage. Should we not all own the past we deserve?

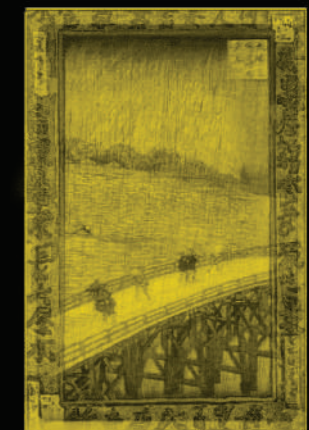
The art collective MSCHF bought a sketch by Andy Warhol and created 999 exact copies of it. They then mixed the original in with the replicas and sold all 1000 drawings for \$250 a pop. Every drawing comes with two certificates of authenticity one stating its legitimacy as a work by Andy Warhol and the other stating its legitimacy as a piece by MSCHF (McGreevy, 2021). The certificates of authenticity were made by the collective and are in no way associated with the Andy Warhol foundation. The collective explained their performance with a statement on their website "By forging en masse, we obliterate the trail of provenance for the artwork. Though physically undamaged, we destroy any future confidence in the veracity of the work."

Be it a forged Vermeer, a reimagining of a vanished painting, or the remaking of Laocoön and his sons in marble is there genuinely a difference between an original and a re-creation beyond that which we perceive? If a work can invoke an authentic emotional response in us through its presence and presentation while conveying narrative information, does it not serve the function of the original. The agency of a reproduction never outstrips its connections to the original, it is instead part of a continual onrushing torrent that allows us to better connect with the past and prevent the world from "draining itself" (Sebald, 2012).

Authors interpretation of the supper of Emmaus Han Van Meridian



Authors interpretation of Christ the adulterer Han Van Meridian



Authors interpretation of merging a Sudden Shower over Shin-Ōhashi bridge by Hiroshige with van Gogh reworking

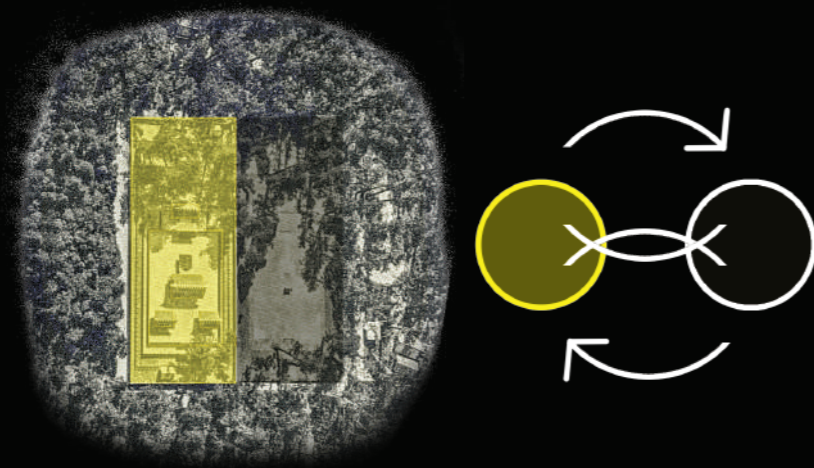
# AUTHENTICITY

## THE GENUINE ARTICLE

The concept of Authenticity or uncertain origin is the second point of interest in this exploration. It is different from a replica or reproduction whose genesis can more easily be apprehended. It presents a greater degree of ambiguity containing far more variables which disparage the precarious notion of correctness in relation to heritage. The examples discussed here are in the main remakings as opposed to reconfigurations or replicas. This thesis understands the definition of preserve as “to keep alive or in existence; make lasting.” This means in these cases there was at one stage an absence of the entity and it was subsequently preserved through reconstitution. As opposed to the process of reconfiguration, where an existing structure is altered, or reproduction which is when an entity is duplicated. Viollet-le-Duc stated that “To restore a building, is not only to preserve it, to repair it, or to rebuild, but to bring it back to a state of completion such as may never have existed at any given moment.” (Tyler,1999)

## ISE SHRINE AND THE MAINTENANCE OF ETERNITY

Ise shrine is an important Shinto temple in Japan that was originally established in 4 BCE. It consists of a complex of buildings, walls and walkways constructed of timber using traditional carpentry without a single nail (Coulmas, 1994). Every 20 years the complete edifice is dismantled and made anew to celebrate the Shinto belief in tokowaka meaning renewal. This process allows for the preservation of building techniques as well as the adaptation of the structure to cope with emergent requirements. The practice is common to Shinto temples throughout Japan. It can take anywhere between 12 and 19 years for the reconstruction process at Ise to finish (Pierconti, 2019). Due to the remaking, the shrine was until recently denied UNESCO world heritage status as they viewed the structure as being only 20 years old. This approach on heritage was so contrary to the local belief structure that Japan introduced intangible heritage concepts into their heritage protection system (Inaba, 2009: 161). Intangible cultural heritage is defined as living heritage, elements so intrinsically linked to the values and traditions of a society that they are vital to its continuation and considered crucial to preserve. UNESCO since updated its procedures to include the category of intangible cultural heritage under which the Ise shrine is included but it still does not count as a heritage monument. They state that sites must possess authenticity resulting from historical antiquity (Nezhad et al. 2015). This linguistic game of separation that denies the monument status of the Ise shrine is telling of difficulties current to approaches towards heritage and conservation. How is the Ise shrine any less authentic because of its reconstruction? Might it not be the case as Byung-Chul Han (2017) suggests “Instead of a difference between original and copy, there appears a difference between old and new. We could even say that the copy is more original than the original, or the copy is closer to the original than the original, for the older the building becomes the further it is from its original state.” (p43).



Drawing of the Ise shrine highlighting the two interchanged building plots

## THE BARCELONA PAVILION AN EMBODIED GHOST

Expanding upon this idea of original authenticity in a western context is the Barcelona pavilion. Designed by Ludwig Mies van der Rohe it was constructed in 1929, demolished in 1930 and remade in 1986. We only have highly edited air brushed black and white photographs, incredibly stylised drawings lacking almost all context and written descriptions of the pavilion at its initial erection all of which are frozen in time (Hosey, 2018). Many architects and critics dismiss the building as imitation or worse a fake. Paul Goldberger stated, “This building is not supposed to exist,” while Philip Johnson posited “The problem before us is should a dream be realized or not? We have made such a myth of that building. Shouldn’t it be left in the sacred vault of the memory bank?” These statements highlight some of the main uncertainty in professional circles about the pavilion and what it represents. First the question of authenticity and secondly the question is a ghost with a body still a ghost? The persistent revival of elements is hauntology an idea which was distilled by Jacques Derrida (Derrida, 2006). It deals with the continual coming forth of past elements into the present like spectres they question the myth of authenticity. In Derrida’s work hauntology is used to explore creation in relation to Marxist theories of cultural production. What fascinates me from a heritage perspective is the idea of an edifice being distilled and transfiguring into spiritual form that has the potential to be incarnated in multiple iterations each containing the same memory trace of authenticity.

What is it we aim to preserve in a building? Is it the physical shell, a concept, or a memory maybe it is a combination of the three working together in concert as a trinity that defines the actualisation of a whole preventing the world from “draining itself”. Or maybe each has its own distinct relative value that allows it a unique and personal pattern within the tapestry of a structure’s existence. The painstaking remaking of the Pavilion was based on the material which represented an idealised form of the building’s essence and not an existing building. Through this process the pavilion’s latest iteration could be said to be a more perfectly distilled version than its previous one (Johnson, 1947). Walter Benjamin wrote of the “aura” associated with a work of originality, he believed this was lost through translation (meaning one medium can never adequately represent another; think of a photo of a sculpture or a sculpture of a photo) and multiplication. In Benjamin’s mind both can only ever result in weak shadows of their subject.

One of the most continual concerns about the remaking is that of authorship given that the architect was dead by the time of the remaking he could in no way be personally involved in the process. But a Barthesian reading of the project would state that Mies’s view is not necessary to our comprehension of the project and its manifestation. If the Pavilion had become for a while the most elusive of things an ethereal architecture that lives in the mind its authorship and ownership had become dispersed no longer requiring the interpretation of its originator.

In 1986 Georgia van der Rohe appeared at the inauguration ceremony announcing that “for a second time, the German Pavilion of Barcelona has been given to the world.” Capdevila-Werning notes, “Only a work that is not unique can be given ‘for a second time’ and still continue to be the same; only allographic works can be reproduced and maintain the same identity, which compels us to affirm that the building recovered in 1986 is the same as the one erected in 1929.” Since the abstracted fame of the Barcelona pavilion far out shadows that of its built form. Is it the case that when we refer to the Barcelona pavilion, we are in fact discussing an idealised spiritual concept which has been manifested twice as both the German National Pavilion 1929 and the Mies van der Rohe Pavilion 1986 (Mertins, 2000). What does historic preservation mean when the thing to be preserved is an abstraction? This has a strong correlation to the Ise shrine in that its rebirth is its continuation. It is also reminiscent of the previously discussed MSCHF project were the concept of original and reproduction combine to create a reflective piece that makes us question the very idea of authenticity.

How much of our concept of authenticity is connected to ideals of homolocality? “Even the most perfect reproduction of a work of art is lacking in one element: its presence in time and space, its unique existence at the place where it happens to be. This unique existence of the work of art determined the history to which it was subject throughout the time of its existence.” (Benjamin, 1936) “Accordingly, spaces receive their being from locations and not from ‘space’.” (Heidegger, 1951). This is the concept of place and identity returning us to the previously given example of the Nashville Parthenon. If that structure were transported to Athens and put on top of the site where the Parthenon was first built would it not have a more convincing claim at authenticity. In fact, it would change from a replica to a remaking given how much of the buildings actual fabric is extant. This would mean that it would be- nothing but the Parthenon itself.



Figure 5 Barcelona Pavilion, 1929



Figure 6 Barcelona Pavilion, 1986



Figure 7 Barcelona Pavilion, 1929



Figure 8 Barcelona Pavilion, 1986



Figure 9 Barcelona Pavilion, 1929



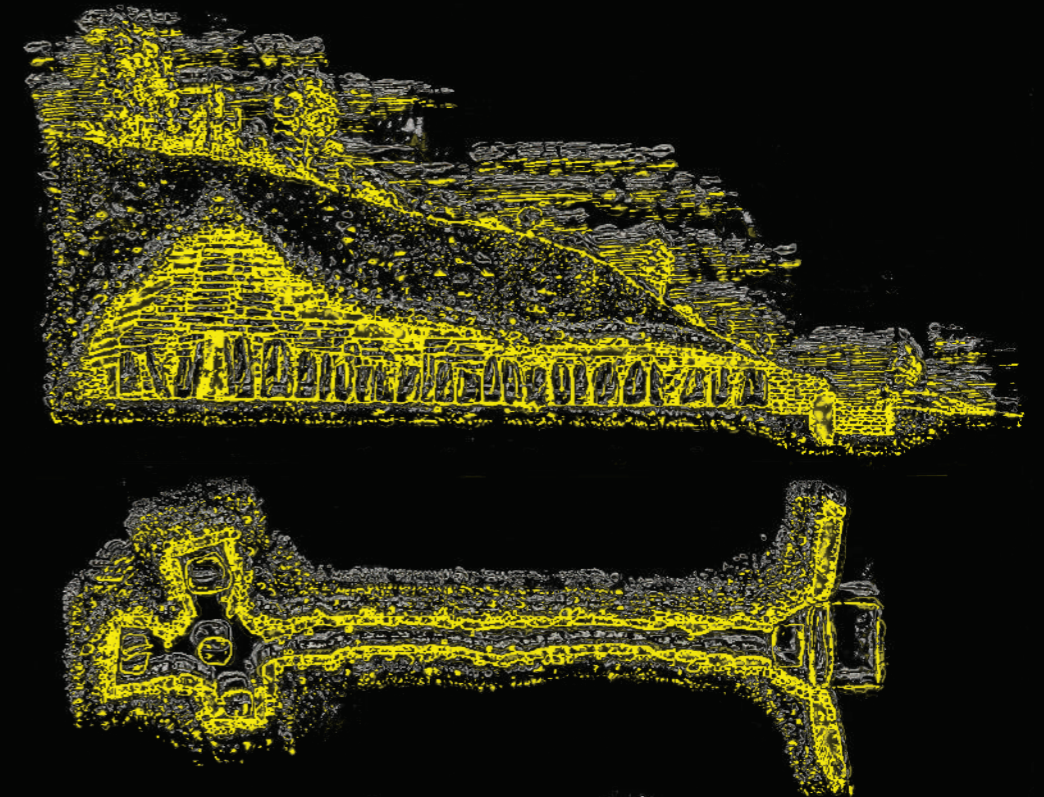
Figure 10 Barcelona Pavilion, 1986

### THE REMAKING OF NEWGRANGE

The prehistoric monument of Newgrange from the neolithic period is located in water-soaked county Meath just west of beautiful Drogheda in the country of Ireland and offers an excellent case in point for expounding upon this process of remaking in the context of homolocality. It is believed to be a passage tomb built around 3200bce. The structure is aligned so as on the winter solstice the sun upon rising illuminates the central chamber for 17 minutes traveling through a 19m long stone tunnel. The monument slipped into a state of folk consciousness and was only officially documented in the 17th century CE when a local landlord began to quarry stones from the mound and subsequently uncovered the burial chambers. The 1st major excavation started in 1962 CE and involved an almost complete reconstruction (O’Kelly, 1982).

All existing documentation of the edifice dates back only as far as the 17th century and its appearances in myth do not offer clear descriptions. This means that all the reconstruction is highly speculative in nature. The passage entrance and frontage were all reconfigured between 1962 and 1975, with the team responsible for the restoration going as far as to use concrete to fix the retaining wall of the façade. There are no historical traces of that material being used in the era from whence the structure dates. Newgrange is a world heritage site and its depictions in historical books display the reconstructed elements as if they were original to the structure. This is highly speculative at best since the majority of the mound was remade in the 1960s (Freeman Marr, 2018). It could be argued that the building as it is currently experienced is only some 60 years old as opposed to 5000.

The monument long had a place in the mythology of the country and was associated with a number of local deities as well as the original inhabitants of the area. The idealised interpretation of the structure accompanied by folklore undoubtedly influenced the reconstruction as there was already a conception of the building. It is like the remaking of the Barcelona pavilion and the Ise shrine as it is located on the site and so its credentials as an authentic structure are bolstered by this point (Meegan et al., 2022). But how is this building any more authentic than either of the previously discussed examples much like the Ise shrine it is built of new material and like the pavilion any attempts at engaging with the intent of the authors are futile. It is how ever generally excepted as a genuine building as opposed to a falsehood. This highlights and exemplifies the difficulties surrounding discussions of authenticity in relation to built heritage (Hensey, 2015). This is not an isolated incident; there are many historical examples that have completely remade monuments. We need look no further than the Mausoleums of Timbuktu or the Frauenkirche of Dresden to strengthen this point. I believe these examples highlight how authenticity is the result of consensus and a belief that the perceived form of a monument is in keeping with the cognitive interpretation of its narrative, which very regularly involves a site based situatedness.



Drawing of Newgrange by author

## COMPOSITION

### WHAT IS AUTHENTICITY AND DOES IT MATTER?

Is authenticity a unique irreplicable quality that depends on concepts of authorship and originality in relation to Randian ideas of ingenuity and creativity? Is it a means of creating systems of valuation that are configured by a cult of personality? Or is it in fact part of that “memory trace” that forms our continuously developing intangible heritage.

When a structure is remade do we reunite the spirit with the flesh in a resurrection, or is it a vile act of necromancy which results in nothing but an animated corpse?

This question depends on our understanding of how we reflect on the identity or the spirit of a building. If like the pavilion the notional idealised fame of an abstracted concept has come to outshine the memory of its physical manifestation, the transition of the enlarged spirit back into a physical form will be difficult and may possibly result in a bifurcation of its preserved essence. Thus resulting in the continuation of two alternate existences; that of the body and that of the mind, the building as made on earth and the structure that lives in our thoughts.

Philosopher Nelson Goodman proposed a separation in the conceptual nature of how we perceive authenticity. He argued that it was dependent on the medium of expression defining two categories: autographic works, and allographic works. Goodman (1976) expressed this difference by saying “Let us speak of a work of art as autographic if and only if the distinction between original and forgery of it is significant; or better, if and only if even the most exact duplication of it does not thereby count as genuine.” “Even exact copies of a Rembrandt are still considered copies”– “simply imitations or forgeries, not new instances”–while all performances of a Mozart symphony are considered authentic, new instances of the work: “in music, unlike painting, there is no such thing as a forgery or a known work.” (p. 113.) This approach can allow us to perceive the authenticity of heritage being like that of a song it is in the continual nature of its becoming that it is defined and, much like music, constructed works are interpretations of notations. The score of a composer and the plans of an architect have the same degree of similarity to their end stage realisation as sound and structure (Levinson, 1980).

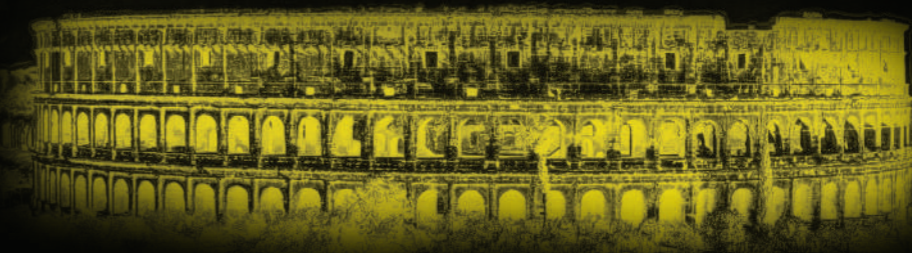
Roland Barthes offers some clarification for how we can deal with this point in relation to origin with his concept of “The Death of the Author,” in which he argues that there is never a singular meaning in a text, but by the very fact of existing in the world they become multi-dimensional entities that resonate on one another (Barthes, 1977). This returns to the Heideggerian approach that every entity is modulating every other entity which should allow us to see our own subjective interpretation as part of the greater myth that composes identity. (Heidegger, 2010)

Aristotle (1984) pronounced that “The essence of each thing is what it is said to be in virtue of itself.” (p154) in this quote which explores the Aristotelian metaphysical understanding of identity we can start to get at the real heart of authenticity. This is like object orientated ontological approaches, meaning that there are certain qualities which cannot be added or subtracted from an entity without changing its essence, a unicorn without a horn is just a horse (Harman, 2018). Peter Pesic (2002) goes further on this topic when he discusses the ship of Theseus “We recognize the ship... by comparing it with the form we already know, its original archetype, as the real thing.” (p127). This point on recognition is crucial in the 1973 sculpture An Oak Tree by Michael Craig-Martin, which uses the power of naming as a vehicle of transfiguration. It is used in a humorous manner which forces us to question how we know a thing to be itself. The concept of individual reference is central to this. The fact of recognition creates the reality of the thing which demonstrates the subjective nature of authenticity. The Oxford Dictionary says that to preserve is to “maintain in its original or existing state”; which indicates that, on occasion, we in fact could practice more genuine preservation through the wholesale remaking of a structure. This brings us back to the statue of Laocoön. Despite any doubts experts might have on its actual origin, it receives its authenticity from the remaking and embodiment of its form.

### HOW THINGS SEEM

The composition of elements as it relates to concepts of heritage and the original is a point central to the continuation of a structure. I have previously mentioned the ship of Theseus problem with reference to remaking (Carter, Kolakowski, 2020). Issues that arise from evaluating this paradox include thoughts on identity, place, time and matter. All buildings require maintenance or else they decay into ruins, which is not permitted in modern society. Edensor (2005) puts it best, noting how they “question the persistent myth of progress” (p45). Even our sites of heritage are remade in a way that allows for their incorporation as part of highly regulated space, functioning solely as a tourist or historical monument (Edensor, 2005). Ruins mark the manifestation of entropy, which is slowed and dissuaded by the act of maintenance.

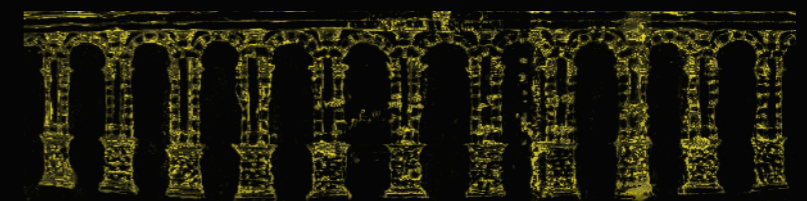
Composition is a means by which buildings continue their existence but at what stage does the central character adapt and change so fundamentally that it becomes something new. If repair is a contingent endeavour that employs continually changing techniques and must recognise shifting materialities, surrounding social and environmental conditions, agencies and aesthetics. Is there a point when the body of an edifice is possessed by a new driving spirit so different to its initial soul, that like the character played by Isabelle Adjani in the 1981 film Possession, they become unrecognisable even to those closest to them. The amalgam of factors that compose our history should cause us to critically evaluate what it is we view as being central to the Genius Loci of an artifact (Rossi, 1999).



Drawing of the colosseum by author

### THE MANY FACES OF THE COLOSSEUM

More than most, the Colosseum can contest to the transience of myths relating to comprehensions of character identity and value relating to specific elements of a building’s physical form. This structure has been many things at different times in its life and much like the statue of Laocoön and his sons it has been continually reconfigured as needed, with substantial changes to its appearance. The amphitheatre, which was originally built as a venue for a wide array of entertainments, has been more versatile in its existence than any of its creators might have imagined. It has functioned as a chapel, housing, a home for a religious order, a cemetery, workshops, a haunt for bandits, the power centre of a wealthy family, a quarry for stone, a verdant biologically rich microclimate and a national monument which acts as a symbol of identity, and a tourist attraction drawing significant revenue from visitors (Woodward, 2003). How many constructions have had the opportunity to play so many parts in their time, to adapt and show change as required, but always contain an essence of their form which allows them to seem eternal while being continually reconfigured in the composition of their elements (Jokilehto, 1986)?



Drawing of the arches of the colosseum by author

The current structure is composed of travertine limestone, volcanic rock, and brick-faced concrete. The building itself has been stripped of its original ornamentation, the marble cladding that was burnt to make quick lime and almost all its metal elements; leaving the highly pockmarked surface that the building shows to us today. In the lifetime of Bernini, it was used as an active quarry. Rome cannibalised itself making the new from the old. In the library of the Vatican, we have a receipt for the removal of 2,522 tons of stone between September 1451 and May 1452 (Woodward, 2003). There were also additions of brick arches added at intermittent periods to support the buildings structural integrity (Jokilehto, 1986). It has been overgrown by vegetation at various points in its existence, which has added substantially to the weathering of its remaining original elements.

The botanist Richard Deakin wrote a book titled 'The Flora of the Colosseum' which lovingly detailed all the various species that made the edifice their home. Through this he captured a snapshot of an often-forgotten period in the building's existence (Deakin, 1855). Its current appearance is the result of Italian nationalists in the 1930s attempting to exploit ideas of greatness and an extensive rebuilding project undertaken in the 1990s.

When we consider all this embedded quality it is difficult to argue what if any is the correct and most vital part of the Colosseum to preserve. If we return to the Oxford Dictionary's definition of 'Preservation, which it defines as to "maintain in its original or existing state." we might struggle to actually agree on what the original or existing state of the building is. Unlike in the buildings I have discussed previously in relation to remaking or replication, reconstituted structures regularly contain fractured identities a legion of multiple shadows of their past selves. These are stacked in such a way that we struggle to determine what is the correct interpretation and are left with the understanding that, like the statue of Laocoön and his sons, a physical manifestation serves the purpose of embodying and reflecting the spirit of the age and its desires. Buildings are ongoing assemblages attempting to stabilise place, always being 'assembled and reassembled in changing configurations (Sheller and Urry, 2006). The examples of composition and assemblages indicates that both psychical structures and our perceptions of them are in a continual process of progression

### **NETWORKS, MEMORY TRACE AND HOMOCALITY**

Just like with the previously explored questions of reproduction and authenticity in built objects, compositions are multidimensional entities, each modulating on the other in a network (Heidegger, 1927). As things made from multiple parts that change continually, they are far more accessible to deconstructivist readings allowing for a better understanding of what qualities are contained within their "memory trace" (Freud, 1953). They are temporary parts of a continual narrative that are defined contextually in relation to their surroundings. In this way we can start to think of ourselves and the interactions that we have with buildings forming part of their essence. It is this essentialist character that is the spectre that sits over all our engagement with history. Buildings, like glaciers, may seem frozen in place; but are rivers whose flow is outside of our temporal understanding. They become hyperobjects spread over so much time and space that we struggle to comprehend their aging narrative (Morton, 2013). Notional ideals of correct heritage are like Remora's small fish that hitch rides on to the central identity of an artifact and may someday overcome it even as the structure remains unchanged.

The fluidity of these multiple identities is a continual ongoing process of emergence. Taking the example of St Ann's church in England or Freiburg Minster of Germany we can see two buildings that are simultaneously destroyed and altered by the compound effects of usage, time and environment (Edensor, 2011). This means they require continual repair and maintenance of matter to stabilise their identity. (Jordan et al., 2016) They are assemblages that responding to their continuation are 'stitched into place by fragmented, multi-scaled and multi-sited networks of association' (Jacobs, 2006).

They outwardly claim to be examples of historical structures exemplifying correct heritage procedure but have, in fact, had their stonework changed with such regularity that large sections of them are composed of new alternate material. Both are originally composed of soft stones that are particularly susceptible to decay. They have never been abandoned or remade entirely and have always maintained a purpose; but both churches are regularly covered in scaffolding for so much of the year that it might almost be considered part of their structure (Byung-Chul Han, 2017).

### **CHANGING THE PARADIGM**

What if a change is directly and concisely inserted into the narrative?

What if we push the configuration of elements to their logical limit?

Can the new be absorbed by the old, allowing for an alternate continuation of the building's narrative identity? In the Andalusian region of Spain lives a building which I feel demonstrates the potential for the realisation of these questions, the medieval Castle of Matrera (Gómez & Guardiola, 2022). The project has generated an incredible array of impassioned responses with the Spanish heritage and conservation group, Hispania Nostra, stating that the "consolidation and restoration is truly lamentable and has left locals and foreigners deeply shocked". Some vocal locals have labelled it as the world's worst restoration project. The architectural community on the other hand has embraced it, awarding the undertaking with the 2016 Architizer A+ Award, in the Architecture Preservation category. (Cvetanović & Petronijević, 2021)

Given the complicated history of the region, accompanied by the subsequent resulting symbolism which manifests in the historical buildings, the local authority has legislation which prohibits memetic architectural designs. There must be a visible contrast in any intervention which is undertaken so as not to perpetuate false narratives.

An approach like this runs contrary to most people's preconceived ideas of how a buildings configuration should be preserved, introducing a unique and highly valuable set of conditions for the continuation of built heritage. Understanding this the architect Carlos Quevedo decided to fill in vanished parts of the volume with contemporary additions that support the vulnerable elements, reconfigure the structures mass and remain unique from the historic material (Cvetanović & Petronijević, 2021).

The plaster render and concrete were chosen for their ability to age in place taking on more of the tonality of the land scape while remaining distinct (Piotr, 2020).

How different and more gratifying is this response than that which we can see enacted through the reconfiguration of the Cathedral of Norte Dame in Paris where the decision was made to restore the building to how it was thought to be (Cvetanović & Petronijević, 2021). This includes an imitation of the 19th century spire designed by Eugene Viollet-le-Duc, which itself replaced a spire burnt down in the 18th century (Bruzelius, 1987). This project is an exemplar of all that is problematic about approaches towards heritage. Instead of speculating on the possibilities of what the building might become we attempt to fix it in place like the St Ann's church, the Freiburg Minster or the cathedral of York. Trying to stabilise the appearance of a structure leads to the perpetuation of a falsehood wherein we endeavour to deny the influence of entropy.

The concept of composition is the most difficult to distil in our approach towards heritage. All buildings continually are reconfigured through the fact of their existence.

The question is whether we struggle to freeze a structure in place as it slowly melts, or submerge ourselves in the potential opportunities offered by this constant progression as the adapting spirit of the building washes over us. Is it not more logical to work with the changing character of our built heritage adapting with what are its most crucial aspects. Understanding we cannot stop its progress and all the time knowing we can never step in the same river twice.

## APPROACHING HERITAGE

### WHAT I TALK ABOUT WHEN I TALK ABOUT THE PAST

Let us return to the statue of Laocoön and his sons, which so adequately demonstrates the dilemmas associated with attempting a concise and singular approach towards heritage set forth in this section. We cannot be certain about its exact origin, authenticity or configuration, yet it undoubtedly transmits a powerful semiotic message to its viewers. Beyond any associated narratives that individuals might have, it manages to function on a universal level as a signifier of what it means to exist in time.

The agency of objects is in their memory trace that signifies value and continuity in the face of temporality. The statue represents the past, its authenticity is embodied in form and its configuration allows for its continuation as a question about what has transpired.

The progressive networks of association built from the shadowy layers of what they have previously been granted, an authenticity distilled over time, are created by the development of iterations each a question about what it is we aim to preserve.

In the light of this, heritage becomes an assemblage in continual reconfiguration aiming at stability in the face of changing cognitive interpretations that justify our existence. It asks us about our own understanding of ourselves, acting as a mirror that manifest memory and negotiates identity. These are best embodied in artifacts which are part of a continuation, be they genuine or reproduction they attempt to stabilise and assemble our understanding of ourselves. Heritage is the manifest power of memory that prevents the world from "draining itself". I believe that through emergent technology we are better placed than ever before to get at the heart the difference between subjective and objective approaches to heritage and allow for the emergence of an even richer stronger past which acknowledges speculation.

In the next section I will explore how the elements I have discussed relate to emergent technologies and their resultant effects, which are becoming ever more present in the discourse; with particular emphasis on some of the most relevant case studies which exemplify the point.



Authors representation of Carquero Arquitectura restoration of an ancient Matreia Castle with new elements highlighted in white



Authors interpretation of Capparis spinosa as depicted in Richard Deakin's Flora of the Colosseum of Rome (1855)



3d printed model made by the author during design exploration 5. merging webscraping and digital sculpting to create statue reflecting on authenticity as it appears in artifacts.

# EMERGENT TECHNOLOGY AND HERITAGE

## NEW CONTRIVANCES AND THEIR APPLICATION

'My face is opened. My heart is in its place. My crown is with me. I will not die for the second time' (Zandee, 1960).

Is all subjective understanding of heritage simply an individualised cultural filter we overlay on top of our perception of history? The relativism of our perspectives on the past has for a long time been a matter which we struggle to express; but what if you could codify a simulacrum of your understanding into an application or template that other users could access and overlay on top of their own frame of reference? This would allow for a comment on the divergence in subjective approaches towards supposedly objective matters. We would better see the relativism that undermines objectivity.

The above spell from the Egyptian book of the dead prefaces the emergence of the Ka into its new reality. Digitisation offers a similar transfiguration of matter from one state to another wherein it can continue beyond its material form. These following examples explore the deployment of emergent technology from a heritage perspective critically considering what they bring to this discourse.

## TECHNOLOGY AND SPECULATIVE ART HERITAGE

The Ghent altarpiece is considered a masterwork of historical importance. It is a large polyptych painted by Hubert and Jan van Eyck made between approximately 1420 and 1430. In its colourful life, areas of the work have been stolen at different stages by the French, the Germans and various unknown thieves. Parts of it have never been recovered. It has been the subject of highly ingenuitive and important restorations.

The 1st of these involved the x-raying of the piece and its careful treatment to aid its preservation. Despite the best-efforts, large areas of the painting were damaged to an extent which no longer allowed for the recognition of their content. Once the content is lost from a piece, its preservation becomes increasingly fractured and difficult.

The most recent restoration used a method that has been described as a virtual restoration. Deep-learning-based methods were deployed to analyse the new and existing scan data and run them through a series of neural networks to visualise the appearance of the altarpiece, freed from cracks and damage. By using adaptive adversarial networks, it was possible to fill in the areas with predicted content. These neural networks were able to organise the scanned information and x-ray data to allow for the visualisation of the altarpiece's appearance at various stages in its development. They stacked potential formations of the tonal and form elements as intelligible from the layers of paint. This allowed for very informed decisions to be made in the restoration of the work (Sizyakin et al., 2021)



Figure 12 The Ghent altarpiece as restored

Expanding on the application of artificial intelligence is an exploration of how inpainting and out painting methods utilising AI could aid in the reconstruction of ancient mosaics, and helps to highlight the speculative potential that is now possible. Researchers from the north-eastern university of Boston used DALL-E2 to reconstruct void areas in ancient mosaics. A series of simple text-based prompts were used, and the results were variable, but all added to the discussion surrounding the works. There was a lack of usable context and detail in the results. The reconstructions, while flawed, had many qualities that indicate the emergent potential of this technology within a heritage context. The researchers failed to use an appropriate data set and do not seem to have had knowledge of the beneficial effects that correctly training a model specifically for the task would have had on the outcome. (Lombardi et al., 2022)



Figure 14 Mosaic repaired through AI

What if, instead of merely repairing a work, we could fully recreate a lost piece. Klimt vs Klimt was a project by Franz Smola, a Klimt expert, and Emil Wallner a data scientist. It aimed to recreate three lost works by Klimt called Medicine, Jurisprudence, and Philosophy which were destroyed during the Second World War. (Google Arts & Culture, 2021) All that remained of the paintings were a series of black and white photographs and written descriptions from the exhibition which originally launched them into the public eye. (Shirodkar, 2021) The art expert and data scientist worked together with a neural network to sample an approximation of the artist's style. They then combined this with a wide range of imagery from the period of the painting's creation. The paintings were virtually restored and put on display in an interactive online gallery space where visitors could engage with Klimt's back catalogue and view all the work in exquisite digital detail, while listening to explanations of the contextual emergence and influence of the work (Shirodkar, 2021).

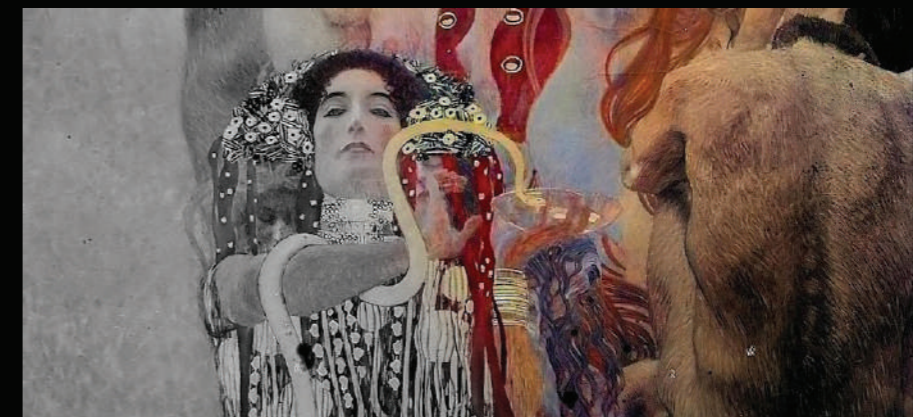


Figure 11 Klimt vs Klimt digitally restored painting

Another fascinating development in a similar vein is the ability to recreate and analyse underdrawings and ghost-paintings (Hanaphy, 2022). Since art conservationists first began to use x-rays to better comprehend paintings, we have been able to see more of the content and process attached to an artifact's creation. It has long been possible to see when specific layers of paint were applied as well as understanding the initial preliminary process work undertaken by the artist. This process results in the documentation of alterations to the painting during its creation. We can see if a canvas was flipped from landscape to portrait and if it was painted over or altered at any stage. (Bourached et al., 2020). This is particularly useful for gaining a better understanding of an individual artist's initial development during their first budding, before they became established.

Works by Van Gogh and Picasso have been explored through this process, leading to the discovery of never realised paintings under the surface of finished works. Unfortunately, establishing an understanding of the images beneath the surface has been highly expensive and time consuming until recently. With the emergence of general adversarial networks and the proliferation of accessible high-performance servers, it has become easier to build datasets of an artist's specific catalogue which could be run against the resultant scans to create a speculative visualisation. Which brings us closer than ever before to the unrealised works. These processes are like those used in the previously discussed Klimt vs Klimt experiment. (Quintero et al., 2022) This method has already been used to show that deep neural networks can be used to transfer style, colour and contoured from existing work and combine them with underdrawings and ghost-painting. The resultant ability to visualise never before seen art works adds to our understanding of an artist's development and is of evident interest to both the public and art historians.



Figure 16 Visual method of reconstructing the art hidden beneath The Old Guitarist

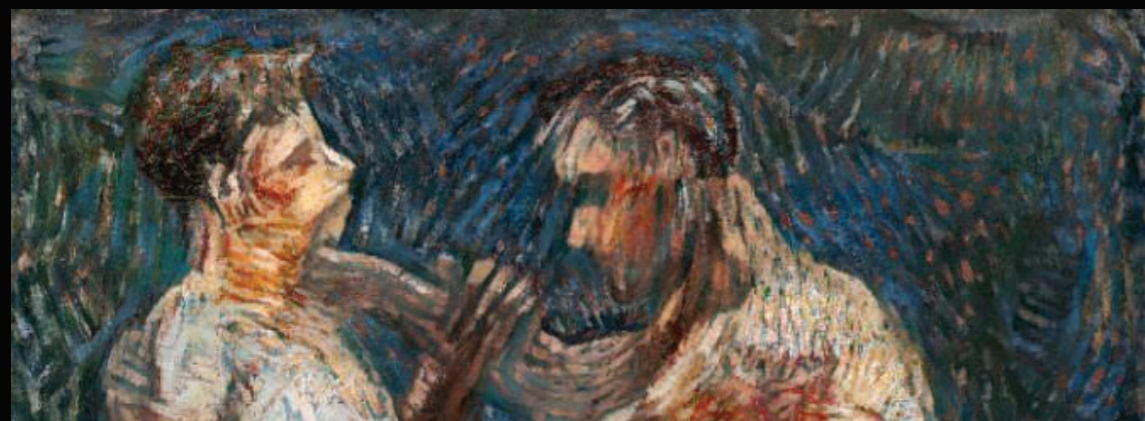


Figure 13 Reconstruction of Vincent Van Gogh, Two4 Wrestlers

In a number of cases this process has been taken a step further. (Hanaphy, 2022) Since 2019 researchers Jesper Eriksson, Anthony Bourached and George Cann have worked on developing methods of physically recreating non-existent artworks from the underdrawings and scan data. They have visualised these works and then used 3D printing to create the works in a format approximating how they might have appeared if ever realised.

These works go as far as simulating the effect of an artist's brush technique in their construction (Bourached et al., 2020). The questions that we are forced to ask by these three case studies are: what do we gain from these powerful tools; how biased are they; and, what influence they have on our understanding of heritage? Where do they fit in the previously discussed categories of replicas, remaking's and recombination? Initially they seem like reproductions in the main, but on further reflection they skirt the boundaries between the 3 categories. They are in part the remaking of non-existent works, in part reproductions inspired by original artifacts and even, to an extent, recompositions that take parts of the existent object and reconfigure them to generate a new work which is representative of a historical piece. These works bring us back to the questions initially inspired by the sculpture of Laocoön and his sons. To what extent do we perceive Walter Benjamin's concept of the "Aura" in these works. They are chimeras, presenting a critical challenge to how we understand the represented past we observe, and the elements of our heritage are subjectively embedded in the readings of objects, returning us to reflect on the Freudian "memory trace".

### SPECULATIVE HERITAGE

"Architecture has always represented the prototype of a work of art the reception of which is consummated by a collectivity in a state of distraction. The laws of its reception are most instructive. Buildings have been man's companions since primeval times. Many art forms have developed and perished." (Benjamin, 1936)

One of the main applications of technology to a heritage context is to slow the perishing of human constructs and so stop the world from "draining itself". We want to maintain and sustain the buildings that are our "companions" but risk zombifying them in an undead state (Comaroff & Ker-Shing, 2013). Whether it be through highlighting of narrative elements hidden in the soil (Galera-Rodríguez et al., 2022) or the documentation of alternate means of mapping special usage patterns to allow for active usage and preservation to coincide (Millán-Millán & Chacón-Carretón, 2022). Existent digital technology is already playing a significant role in aiding our understanding of heritage management and its representation.

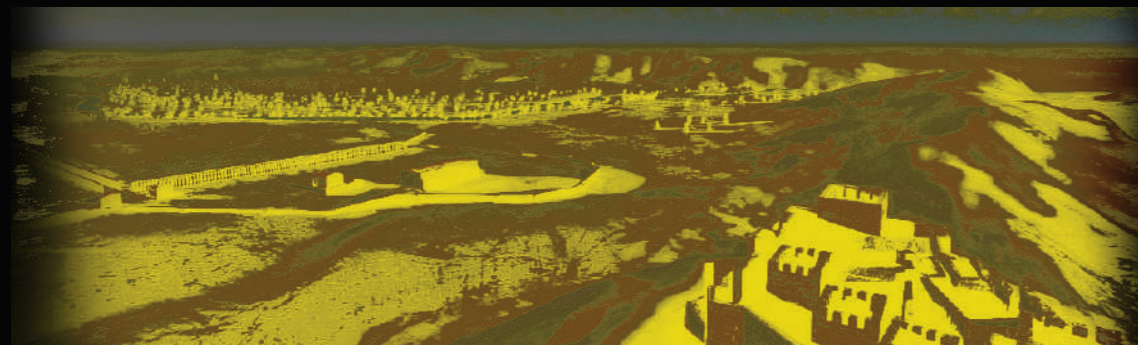
The established concept of digital twins is in ever more frequent use in cross disciplinary contexts spanning from manufacturing to built heritage and land management. It aims to allow for the simulation of how things are constructed and function, as well as allowing for analysis of the potential scenarios in a digital context devoid of any actual consequences (Elkins, 2022). Gothenburg City itself has a number of digital twins which aim to allow for historical comprehension alongside the development of future planning strategies. A model or digital twin is currently only as good as the data set that it receives. Yet they still act as interesting repositories of specific information.

How can we go further than showing currently existent material and represent vanished elements of the built environment allowing their legacy to continue (Galera-Rodríguez et al., 2022)? Acknowledging a convergence that accepts the concept of entropy in relation to preservation allowing for the continual living occupation of spaces (Millán-Millán & Chacón-Carretón, 2022). This must go in hand with making the technology and processes as easily comprehensible to as wide an audience as possible (Ferdani, 2020). In their work in Italy the team of Andrés Galera-Rodríguez, Francisco Pinto-Puerto, and Mario Algarín-Comino have explored ways of using digital modelling and twinning in exhibition-based context to realise awareness of buried historical elements which lie just beneath our feet every day. The Spanish architects Pablo Manuel Millán-Millán and Celia Chacón-Carretón have used digital twinning to allow for a careful scheduling of maintenance in relation to occupation in historical sites buildings which have to fulfil the requirements of their inhabitants, while also servicing and accommodating large numbers of visitors in the form of tourists.



The work of Iconem demonstrates a method of representing and preserving vanishing places while allowing for the dissemination of this material to the wider public leading to more engaged discussions on heritage. This is best shown in their undertaking to create a digital copy of the now unfortunately destroyed Palmira, the centre piece of this was a model of the Temple of Bel created through web scraped imagery. Iconem was also involved in a digital reconstruction of Notre Dame after its fire (Shein, 2019).

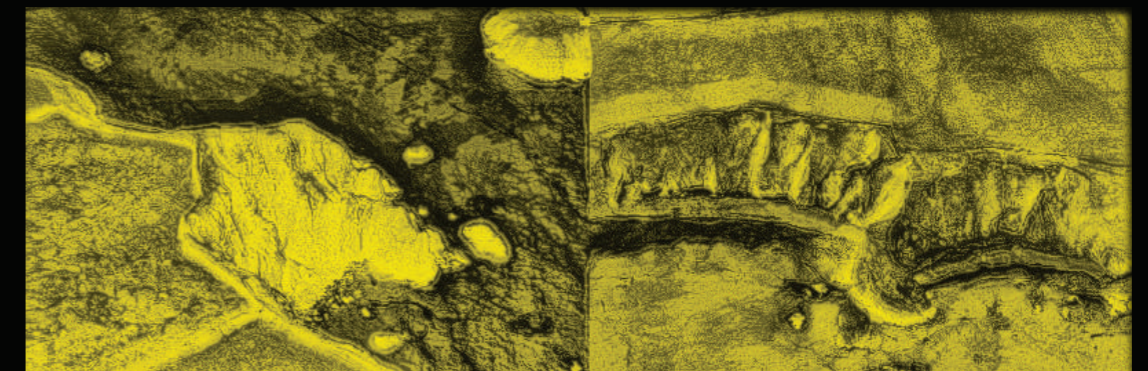
The Curious Travellers project is a cross disciplinary institutional undertaking which builds on this approach digitally documenting heritage sites that have been destroyed or are under immediate threat (Wilson et al., 2022). The project explored a data mining and crowd-sourced workflow approach which enabled the accurate digital documentation and 3D visualisation of buildings, archaeological sites, monuments and heritage at risk. When combined with donated content, image data is used to recreate 3D models of endangered and lost monuments and heritage sites. These can then become assets that both disseminate knowledge about the monument they capture and allow for wider reinterpretations and study of their elements.



Drawing of Digitally reconstructed fort in Palmyra

This form of data gathering, and its utilisation has only been possible since the mid 2000s when camera phones began to be broadly circulated, leading to an unprecedented build up in the generation of accessible image content that was stored on servers (Wilson et al., 2022). Given the value that is placed on data and content we rarely discard information it is stored, traded, exploited accumulated and deployed in ways we could not possibly have previously imagined (Bratton, 2016). For example, the LIBRISPEECH dataset which the author of this thesis is part of (Panayotov et al., 2015). This data set was created from public domain audio a large section of which was gathered from the charity Librivox a non-profit where members upload recordings of themselves reading out of copyright books. All the work on the site is in the public domain and aims to make the content as accessible as possible. The author has read and edited a number of recordings that appear on the site and was surprised to learn that they had been gathered into a dataset. LIBRISPEECH has been one of the primary repositories used since 2015 for research into voice recognition software and artificial voice modelling. To think that my voice is in some way part of the digital repository that creates speech patterns annunciations and articulations heard by unknown strangers around the world is a deeply surreal experience. A voice is one of the most recognisable and immediate defining characteristics an individual possesses. Speech represents the manifestation of our thoughts projected out into the world, bridging the gap between the entirely subjective interior space of our minds to the perceived objectivity of the public domain. Our words are the shadows of our thoughts allowing for the permeability of the membrane that separates individuals' cognitive procedures, they dance on the cave walls of our minds forming our reality (Plato, 2020). Having them amalgamated into a generative procedural process leads to the realisation of how every element of our identity which we put forth into the world is being gathered, adding to the ever more complicated nature of heritage in the age of digitisation. This is an example of how elements of our everyday engagement with the digital world can have inexplicable and unpredicted results.

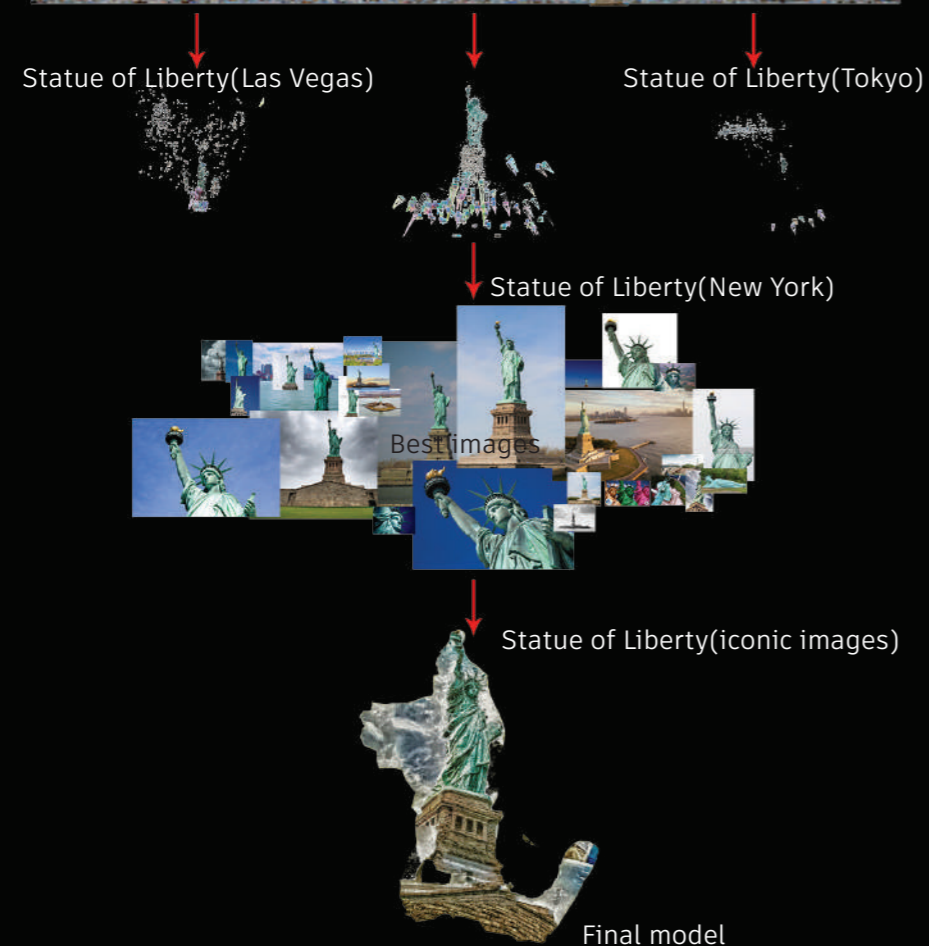
In Ireland the heritage council is using a mixed approach to record vanishing elements threatened by coastal erosion (Heritage council, 2020). This mainly takes the form of Lidar and photogrammetry-based scanning techniques that document vanishing promontories and their contents. This information is then compiled into a library that since 2017 has documented the changing appearance of the coastline. This allows for the revisitation of information relating to instance states during the erosion process. This is equally applicable to other elements of built heritage. What about instance states in the narrative of a city's development? Our urban environments can frequently belong to the domain of hyperobjects vastly distributed in both time and space and changing at a rate we cannot immediately perceive (Morton, 2013). As Patrick Geddes wrote, a city is 'more than a place in space, it is a drama in time' (Geddes, 1905). The Sydney rock project makes an accessible online interactive model that allows users to engage with the landscape of Sydney Australia and understand how it has formed from its foundation to the current day. The model and website aim to provide an interactive engagement with temporality in an urban context (Devine, 2021). The digital medium best facilitates this experiment, as users can control the rate at which time progresses. Sydney rock allows for a wider public to develop an understanding of temporality in relation to urbanicity. It comes from a tradition which has developed in Australia to try and represent time in a manner that can be inclusive of indigenous approaches to the concept, which are different from the linear representation which prevails in the western paradigm. The Deep Time project reconstructs the excavation sites from which aboriginal artifacts have been extracted. It aims to allow for a digital representation of how the elements originally existed within the earth, as well as permitting a greater spreading of these artifacts to a wider more distributed user group while allowing for better cultural sensitivity, as the physical relics do not need to be touched (Hardy et al., 2022). These three examples all demonstrate how digitisation is allowing for the transfiguration of matter from one state to another capturing elements and translating them between the physical and digital realms.



Drawing of The narrow promontory fort at the Faill na Smuite in Stradbally More and Corcoran's Island promontory fort in Annestown

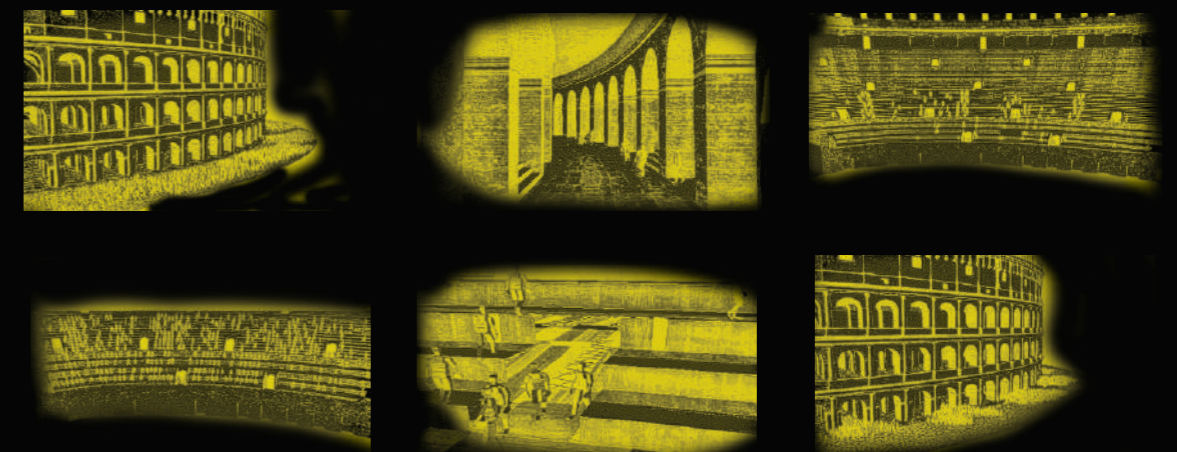
What would it mean to revisit ancient spaces at instance states in their narrative of occupation? Video games have for a while been allowing for an exploration of this question. This is probably most vividly and popularly represented in the Assassin's Creed series of video games which allows players to explore re-creations of worlds spanning from ancient Egypt to the modern day (El-Nasr et al., 2008). It presents a hybrid form of historical representation with existing buildings reimagined and represented as they might have appeared in the past. These sit alongside completely fabricated structures that manage to expand the narrative quality and impact of the world they build. There can be a tendency to dismiss the qualities and information contained within these worlds due in part possibly to biases in relation to gaming media, yet undoubtedly these have led to user groups who would not conventionally have engaged with heritage finding themselves drawn in unconsciously to wider discussions on the built environment (Balela & Mundy, 2011).

An anecdotal example of this is a friend of the author, who possessed no special interest in either architecture or history but after playing the Assassin's Creed series could competently name and describe historical landmarks and even go as far as to state opinions and preferences for elements of their designs in relation to context. This had been instilled through a digital interaction which presented a passing encounter with a subjective representation of the buildings. In many ways this is comparable to the previously mentioned Barcelona pavilion. Despite never having encountered the physical manifestation of the buildings, my friend had acquired opinions in relation to their presented forms and identities which were strengthened through digital interaction with a subjective reinterpretation of an actual building. To add to this, he had developed a personal understanding of the spaces' depictions by having explored them digitally.



Method developed by author to utilise web scraped data to create models used in design exploration 5. based on proposed method from building Rome in a day.

This recalls the projects Building Rome in a day (Agarwal et al., 2009) and Populating the Colosseum (Gutierrez et al., 2007) both of which aim to utilise existent data to explore, better understand and create greater accessible familiarity with heritage. The first uses easily available online photographs to reconstruct a digital model of an entire city in a single day. The researchers have developed a method of scraping and compiling 150k images in a workflow that can be easily replicated. This means it is becoming ever more possible to engage with digital reproductions of past instance states of heritage assets. This social aspect is furthered by simulations like that run in Populating the Colosseum where researchers used crowds modelled on NPCs (nonplayable characters) from video games to inform them about potential movement patterns and crowd circulation in the Colosseum during its first period of usage. Imagine the potential offered to engage with digital remaking's of historical persons, what would a speculative subjective and orchestrated conversation with an ancient Roman allow us to intuit about the lived experience of the people who the programmed avatar represents and the generalised subjective preconceptions of that past.



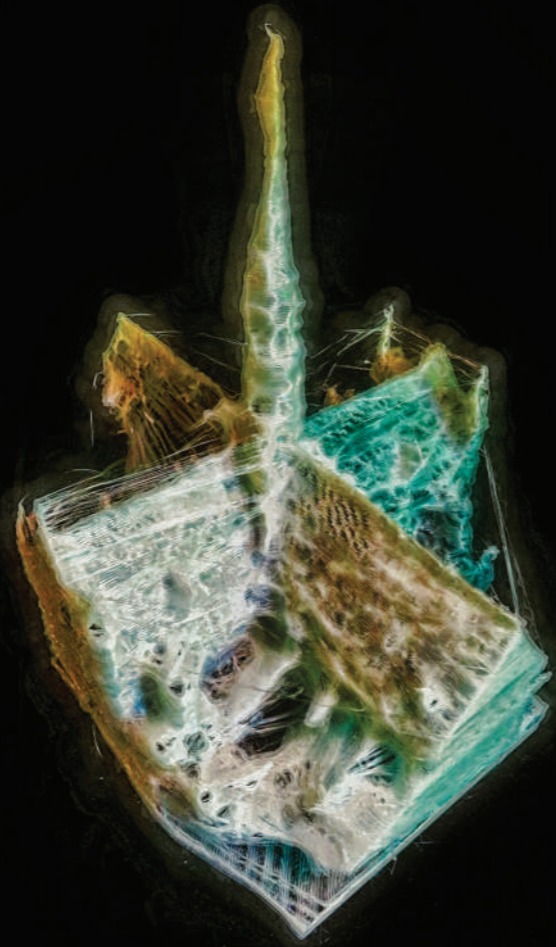
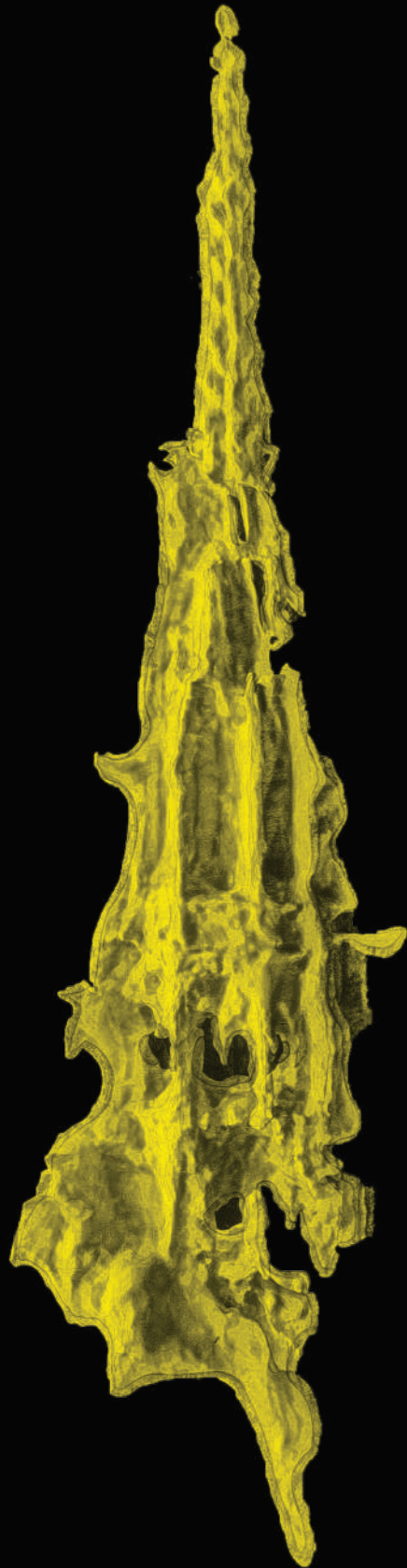
Drawings of Simulation of populating the colosseum

Outside of the virtual we are already seeing augmented reality interactions with heritage through locative technologies. Smart phones with their combination of GPS and accessible applications allow for users to quickly access site specific information. This is combined to allow tourism and heritage bodies to create easily overlaid, representations of realities merged with pertinent information that allows the tourists to interact with historical content in new and ingenuitive ways. This has been particularly inspired by location based interactive augmented reality games such as Pokémon go. There is an attempt to normalize the interactions and allow for a more generally consumable and accessible past. Much of this draws on the notion of gamification and commodification, both of which must be considered critically in relation to heritage as they prioritize particular narratives and lead to specific and sometimes overly linear engagement with the past.

The work of Mikaela Steby Stenfalk testifies to how digitisation can go beyond linearity to encompass and represent multiple simultaneous perspectives. In their work Fleeting Fragments of Notre Dame, they created a series of physical manifestations of instance states during the April 15, 2019, Notre Dame fire. These were made by using a web scraper which gathered 38,000 images shared on Instagram during the incident of the fire. The pictures were then brought together through a photogrammetry process allowing for the creation of representative 3D models that were then printed in PLA and painted in latex before being positioned on metal display units. The forms allow for the demonstration of a nonlinear temporally disjunctive narrative frozen in space. This work allows us to reflect on what opportunities are contained within emergent technology and how they can enrich the representative discourse and increase the potential for how we portray heritage.

What will the future of heritage look like, how will digitisation effect our understanding of narrative? When it is possible to digitally travel from a virtual encounter with our earliest ancestors on the savannah to a re-creation of the moon landing, and our surroundings are digitally augmented with ornaments of our own algorithmic preference, will we see an even greater splintering of perceptual narratives of heritage? Or instead, will it allow for a sharing of a communal dream wherein we all sleep eternal? We are surrounded by ghosts, things incapable of growth and change, that haunt us even as they disperse slowly reflecting the parts of ourselves that are ceasing to exist.

How real are the doors of the Baptistery of Florence? Do they convey the same impact to visitors? In 2019 they were replaced for 3D printed replications created through a mixture of photogrammetry and digital sculpting. Few visitors realise that they are in fact replicas and due to the qualities of homolocality give them the same agency as the originals.



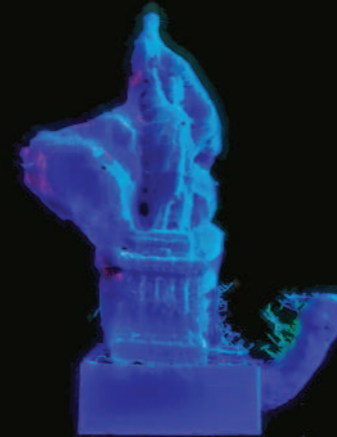
Drawing by author of Model made by Mikaela Steby Stenfolk from photos taken during the fire of Notre-Dame

3d print of Notre Dame made by Author through web scrapping

Google's street view updates on a regular basis, with its previous iterations still available to view. Users can choose the year with the ability to travel back as far as 2008, you are granted the uncanny ability to step outside of time and move between the years watching the surroundings change accordingly. Is that a kid on a flick scooter, is that a fidget spinner in the hand of a blurred faced pedestrian? These indications of passing socio cultural elements obtain a new novelty through their existence in a temporality that becomes only too tangible as we change the year and watch them vanish. Exploring the past in this way through street view is as close to the experience of being a ghost that we can achieve in our engagement with this reality. Like the Ka of an ancient Egyptian our reality is caught in a transitional phase between one plane of existence and another. Heritage and our built environment stand at a crossroads. In one direction lies the splintering of reality into ever more specific algorithmically curated visions of diversifying subjectivity. While on the other hand is an attempt to control the development of narrative and curtail it to an authoritarian sanctioned representation of objectivity. Is it possible that if we act now consciously and critically, we could travel a middle road. Using critical thinking and dialog could we allow for the overlay of personalised narratives on top of official history to give a more representative and inclusive aspect to the narrative of our past.

The filter offers an analogy at this point, they have become so prevalent that we scarcely think of what they represent; a method of altering content as it passes through them. Whether this be the clearing of particulate matter from water or the accentuation of my eyes and lips in a photograph, the effect in basis is the same, a change to the content that is conveyed. Reality has always been permeable with everything representing alternate permutations passing through relative subjective viewpoints be they cultural, societal or generational. The degree to which our own subjective engagement with the world has expanded is however unparalleled in the past. Digital technology offers a means of interoperating everything through an increasingly subjective filter. Could it allow us to share these subjectivities so as not to deny narratives and wallow in homogeneity but, instead, revel in a communal fantasy rather than languish in a personal hallucination. If we share our memory traces with all there attached hauntologies, could we better understand the distance that lies between subjective and objective approaches towards heritage and redefine our position accordingly, as objectivity is nothing if not the distillation of a mass subjectivity shared by consciousness. Might this allow us to speculate on and explore all courses of action in a manner that has never previously been possible.

This layering and overlaying of subjective understandings is one of the main topics explored in this thesis. In the upcoming workshops and design explorations, the objective was to try and comprehend how to manifest this subjectivity through emergent technology while critically reflecting on its role in shifting the paradigm of how we discuss and share our narrative past.

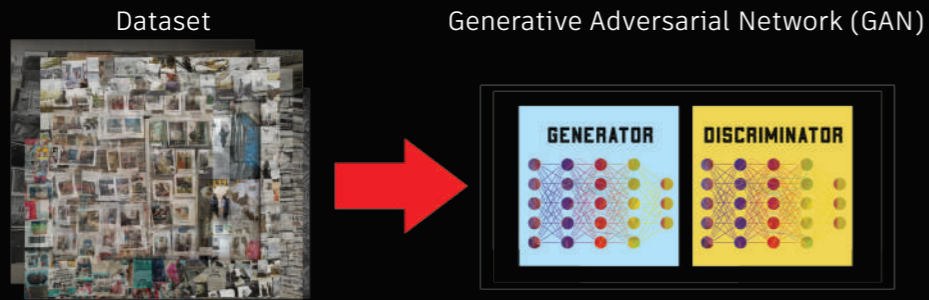


3d print of statue of liberty

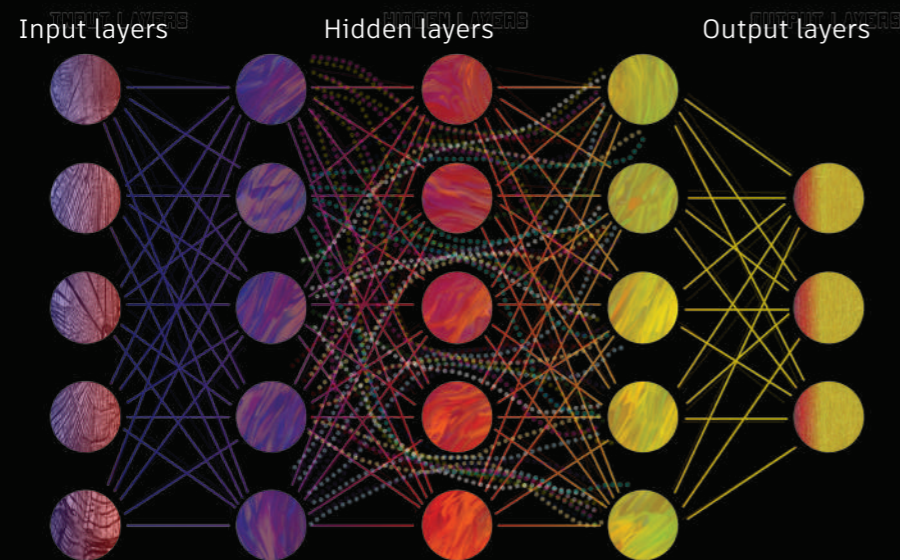
Drawing of the statue of allat-athena in the palmyra museum made by Author through web scrapping

# EXPLAINING GANS

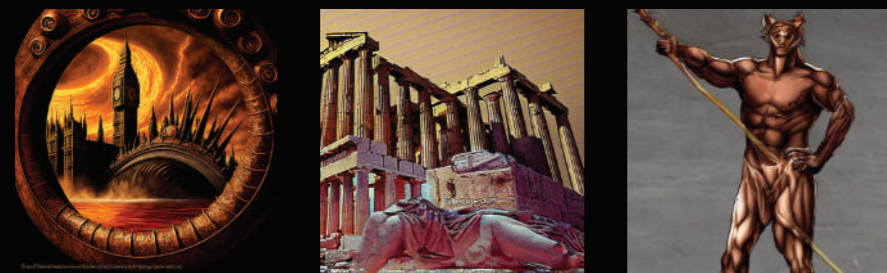
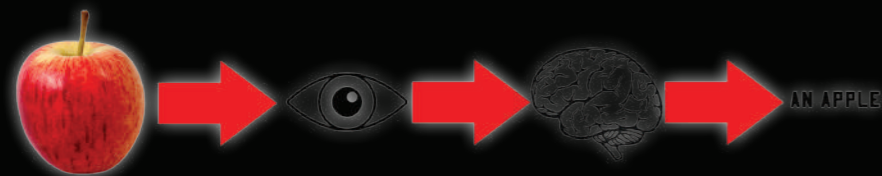
## NEW CONTRIVANCES AND THEIR CURRENT APPLICATION



Data set of images from open-source provider each of which is carefully captioned with a detailed description. Generative Adversarial Network (GAN) contains two neural networks which compete against one another.



Neural networks are ways of teaching artificial intelligence inspired by the human brain the neurons or nodes interlink with one another in a layered system of connections allowing for fast data transfer. This is the bases of deep learning for AI model training the degree to which it actually mimics organic process is highly contentious.



Images made during early GAN experimentation

Archaic Torso of Apollo  
Rainer Maria Rilke - 1875-1926

We cannot know his legendary head  
with eyes like ripening fruit. And yet his torso  
is still suffused with brilliance from inside,  
like a lamp, in which his gaze, now turned to low,

gleams in all its power. Otherwise  
the curved breast could not dazzle you so, nor could  
a smile run through the placid hips and thighs  
to that dark center where procreation flared.

Otherwise this stone would seem defaced  
beneath the translucent cascade of the shoulders  
and would not glisten like a wild beast's fur:

would not, from all the borders of itself,  
burst like a star: for here there is no place  
that does not see you. You must change your life.  
(Rilke, 1995)

The workflow adopted for this thesis is one of many parts at times seeming so disparate that it brings to mind the image of Rilke's Archaic Torso. A part seeming severed from its whole never to be made whole. In truth however it already contains essence of what it will become. It is through the details that all else is revealed. How technology is utilized for this thesis requires a series of steps which must be explained in some detail. First, the technical elements involved in the research will be laid out to define the tools and processes that were used. Secondly, the methods of integrating these assets into a speculative design will be clarified. The work is particularly dependent upon how opensource research and information distribution has come to function. A huge collective of contributors to publicly accessible online forms acting together and sharing resources in a cooperative manner that has allowed for the greater accessibility of this technology. There are links in the appendices to the bords used that allowed for the development of models utilized in this work. The necessity of collaboration and interdependence has never been clearer to me than when undertaking this proposal.

The primary tool I am utilising in this investigative process is referred to as a General Adversarial Network, or GAN for short this is a type of deep learning algorithm that can produce information based on the data it has available to it. Deep learning in its simplest form is a type of machine learning based on neural networks that uses the information contained within its data base to fulfil the request of a prompt or task which is demanded of it.

### ALGORITHM

An algorithm is a set of steps that lead to a conclusion. Imagine for example the statement: if it rains today, I will go to the cinema but if the sun is shining, I will visit the beach. This statement is a highly simplified version of an algorithm which states that if a condition is met this will result in one output and if it is not there will be an alternate result. Algorithms within computation work in a similar manner that conditional instances will result in specific outcomes (Gurevich,2011). They can be interpreted as a set of rules that define a process (Yanofsky, 2010).



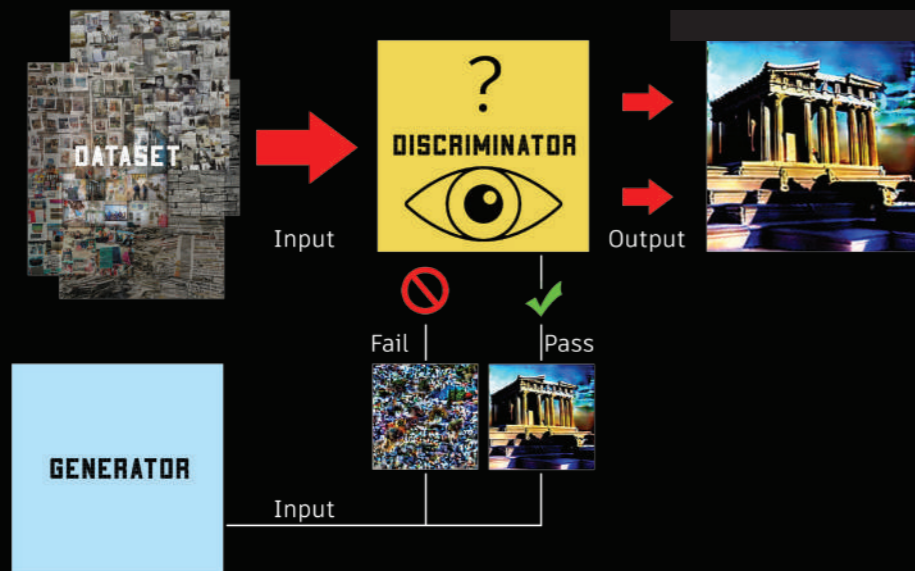
Images made during early GAN experimentation



The generator is a deconvolutional neural network DNN it uses an adjustable seed value to generate random noise which is used to form images. It up samples images composed of random noise in an iterative process creating results that can fool the discriminator.



The discriminator is a convolutional neural network it acts as a classifier inspecting images made by the generator against the dataset and judging whether the results are true or false.



## NEURAL NETWORK

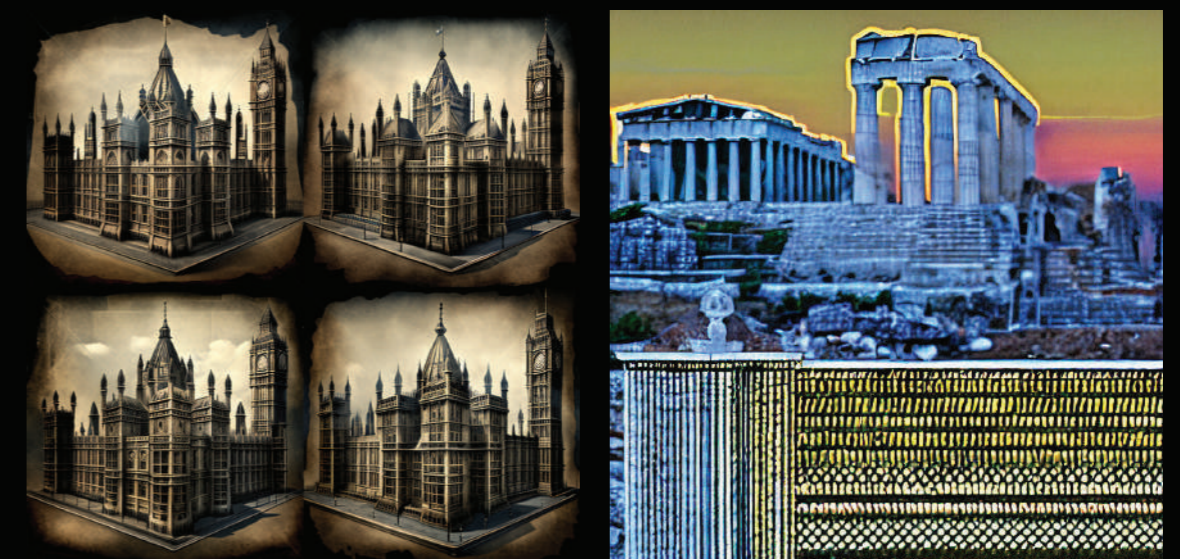
A neural network is a machine learning structure that is inspired by the architecture of the human brain. The network is divided into neurons which receive input that triggers them to fulfil a simple task and passing the signal along the chain of neurons.

Much like the brain these nodes work in concert each performing small scale computations that add up to a larger whole, allowing for relatively complex tasks and information to be dealt with in a dispersed manner that then concentrates the results.

Neurons in the network are separated into layers with input layers receiving data, hidden layers that process the information and finally output layers that give the final result (Sharkawy,2020). The computations that are performed by the neurons are determined by sets of weights which are classified during the training stages of the model's creation. The training of any model involves feeding the algorithm a large amount of data in the form of a dataset with set definitions of how it should interpret that information and generate results. The weighting or process that occurs within the model is adjusted during the training as output information is analysed and the hierarchy within the structure is altered to bring the end stage product into line with the desired outcome (Mijwel et al., 2019).

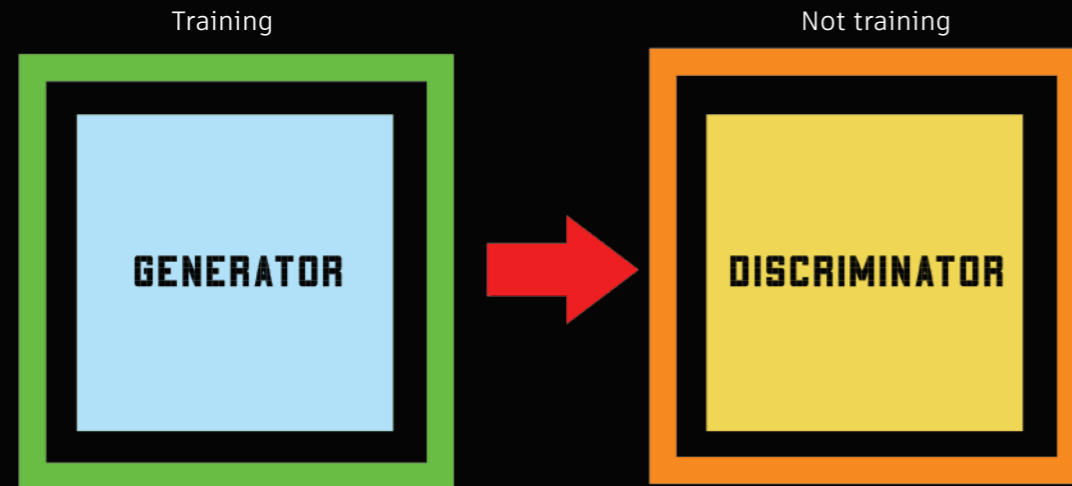
## DATASET

A dataset is probably best thought of as a library that contains lots of different books individually (Chapdelaine,2021). They may appear separate and unconnected but, through a process of cross comparison, the information within them can be stacked to allow for a richer whole. For example, imagine reading a book on the construction of the colosseum. In tandem with this you explore a novel on the roman emperors, an account of ancient festivals and a history of past civilizations. Each of these separate parts when analysed together can allow for a richer understanding of the whole. Another way of thinking about it is if you read the letters of Vincent van Gogh. Alongside this a third-party biography of his life, a book on the history of the art trade in the Netherlands and an analysis of painting techniques. While looking at the artist's catalogue you could make connections between the various elements that might not be immediately obvious (Rosli et al. , 2016).

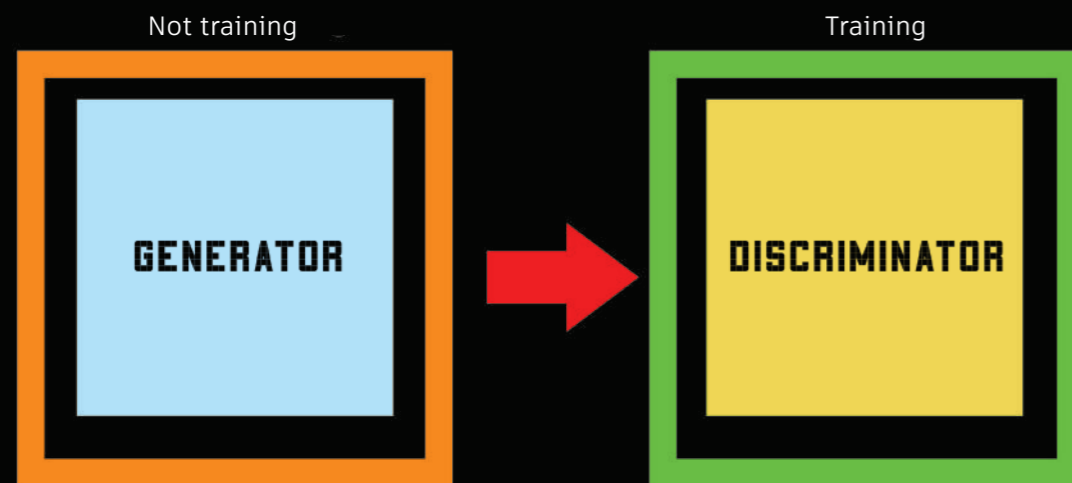


Images made during early GAN experimentation

Model training takes place in epochs only one of the neural networks is trained at a time. The training process is iterative with both networks learning from one another until the generator can trick the discriminator continually. Convergence is the term for this point.



In this epoch the generator makes images attempting to fool the discriminator into thinking they are part of the data set. The values of the discriminator remain constant it does not adapt which allows the generator to learn.



In this epoch the generator continues to generate imagery, but it does not adapt to its failures to deceive the discriminator. Instead, the discriminator improves at noticing the irregularities in the generators output that contrast with the dataset qualities.



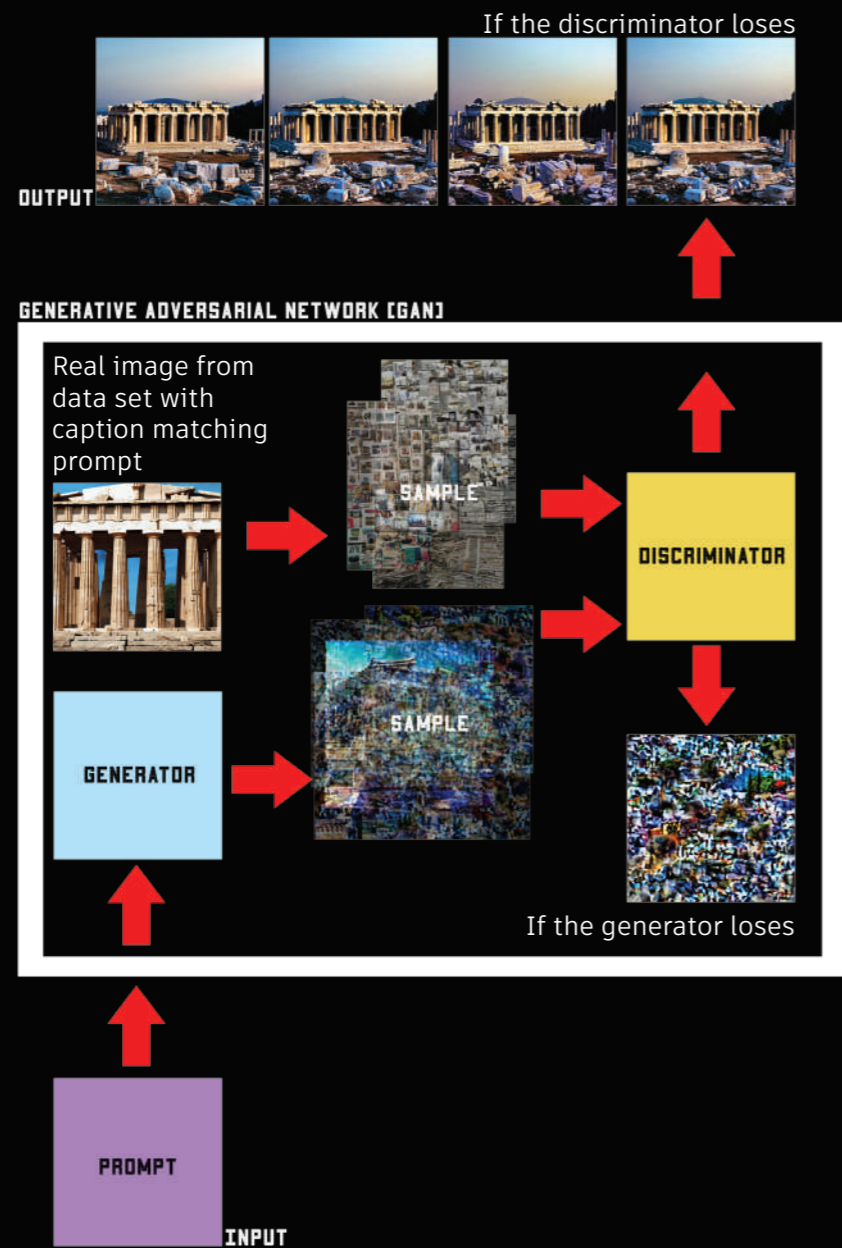
Image made during early GAN experimentation

## GAN MODEL

For the purposes of this thesis, I used a model of Stable Diffusion V1.5 which is an open-source publicly available General Adversarial Network (deep generative neural network) that has been trained on the open source publicly available data set LAION-5B that contains over 5 billion image and text pairs. A text image pair is a file that contains both an image and an annotated caption (this data set can be explored at <https://haveibeenentrained.com/> to gain an understanding of its contents). I then retrained this model iteratively on more specific open source, public domain, historical and architectural image content gathered from a number of websites (including <https://research.google/resources/datasets/>, <https://imerit.net/blog/22-free-image-datasets-for-computer-vision-all-pbm/>, <https://www.kaggle.com/datasets?search=image>.). This process was highly intense in its computational and time requirements. The training mainly took place on Google Colab which is a free server system that Google has put at the disposal of all users interested in running complex computations with a particular focus on researching artificial intelligence. I was limited to between 5-7 hours of server time every two days. This is the maximum time allocation available on the non-paid tiers of the platform. During the process I learnt how to retrain a model using DreamBooth (<https://github.com/TheLastBen/fast-stable-diffusion>). Which allowed for smaller and more specific content to be added to the dataset. This meant that instead of using thousands of images I could use a few dozen inserted into the model with specific captioning to tailor its output in a more process manner. This also substantially reduced the computation and time requirements that had previously slowed my explorations.

The modified version of stable diffusion that I used is a General Adversarial Network, or GAN a deep learning algorithm tailored for image creation. a General Adversarial Network contains two competing neural networks a generator and a discriminator. The two types of networks are a convolutional neural network (CNN) which forms the discriminator and a deconvolutional neural network (DNN) which is the generator. The generator makes information based on the dataset it has been trained on while the discriminator analyses the authenticity of the output in relation to the dataset. A convolutional neural network (CNN) is good at finding extracting and classifying images while a deconvolutional neural network (DNN) is good at generating content in its most basic form it can be thought of as performing a reversed version of the process taking place in a convolutional neural network (Su Wang, 2017).

The generator is a deconvolutional neural network (DNN) that is trained to generate new data that is based on the input information from its dataset. It does this by taking in a random noise vector as input and outputting a new data point. This means it uses a mixture of random noise generation to create an output that resembles its bass line content (Salehi et al., 2020). The discriminator is a convolutional neural network (CNN) that is trained to decern between information from the data set and false material made by the generator. The two networks are trained in epochs iteratively against one another. The generator uses the discriminator to get feedback on how convincing its images are, and the discriminator gets more data to train on from the generator. When the generator is training and learning, the discriminators values are fixed. The situation is reversed when the discriminator is training. This continues until eventually the discriminator is unable to distinguish between output content from the generator and the contents of the dataset (Su Wang, 2017). At this point there is no further value in training as the discriminator has only a 50% heads or tails probability of exposing an image made by the generator. This point is referred to as convergence. Further training can lead to a state referred to as mode collapse, that makes the model unstable. An analogy for this could be a scam artist, or trickster representing the generator and the mark or victim representing the discriminator. The trickster develops the plot in increasing levels of complexity until the unfortunate victim is drawn into the scheme.



Images made during early GAN experimentation

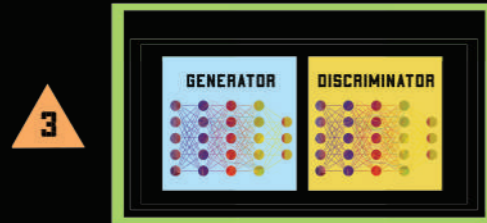
Stable diffusion, the General Adversarial Network that I am using, in essence works by receiving input data in a prompt that can consist of written text, imagery, video files or even audio data depending on how the model has been set up. This is then fed into the pre-trained model which has been adjusted by the user as they require it and results in the output (Dehouche, 2021). Think of a cake being baked, ideally you read the recipe, assemble the ingredients and the cooking utensils are prepared before you start. This can be compared to training the model by gathering the proper dataset and establishing the weighting and formatting requirements that will be needed for your desired objective. In the example of the cake, you then mix all the parts and place it in the oven. This equates to the stage of production where you fine tune the weights within the model and activate the model into its generative stage. You don't really have much control over the cake while it's in the oven, in the same way you can do very little once a model is running. Finally, you admire the well baked cake you take it from the oven and eat it. Maybe you think to yourself it could use a little more sugar in future. In the same way after your output has been generated from the model you examine it and note possible changes you might make.

The primary points of control that the user has within the model are first the two neural networks contained within the GAN. They have been trained on the same dataset and are put in competition against one another iteratively to build up the model. Secondly the model itself can be fine-tuned to bring it into alignment with your desired outcome. In this stage the dimensions and output type are set. You have control over the run time how closely the output will adhere to the prompt and dataset. The level of detail colour scheme and consistency are also set here. In the 3rd stage using dream booth which is a python Colab script it is possible to fine tune the imagery using small numbers of captioned photographs. This means you can add very specific imagery that might have been absent from the original dataset. The seed number is one of the most vital elements to maintain consistency in image output. If you have the seed number and prompt for an image it is possible to create iterations which adhere to the same baseline of representation. The scale number will determine how closely the model sticks to the input prompt and what degree of randomness is involved in the result.

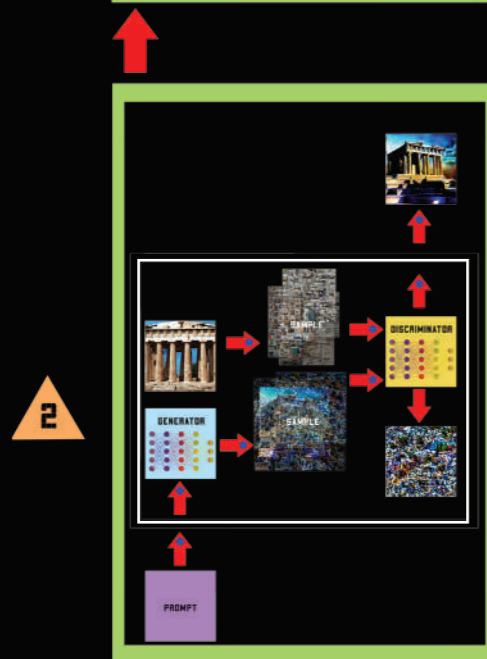
After generating content, it can be very useful to run a bootstrapping language image pre-training or BLIP model. This allows you to take the output of the stable diffusion model and run it into another form of GAN that is called a BLIP model which works backwards interpreting the input to determine the prompt. This is particularly useful for maintaining controlled consistencies between images (Li et al., 2022). This runs in tandem with a CLIP (Contrastive Language-Image Pre-training) model which allows for a better understanding of the effects of captioning in relation to data implementation. (Radford et al., 2021)

The final emergent technical elements that must be mentioned before moving on are first the concept of NeRFs (Neural Radiance Fields) which is a deep learning architecture for 3D scene reconstruction from 2D views. It was introduced in a research paper in 2020 (Mildenhall et al., 2020) and is capable of reconstructing high-quality 3D models of objects and scenes from a set of 2D images. It varies from regular photogrammetric methods in that it uses trained neural networks to recreate 3D space and, as a result of this, requires far less photographic input to make seamless models than traditional photogrammetry. The neural network can intuit the connections between the photographs and use its own data set to fill in the gaps meaning the models do not suffer from the fissures and holes that are commonly found in photogrammetric output with incomplete data. (Gao et al., 2022) The second is DreamFields (<https://github.com/shengyu-meng/dreamfields-3D>) Which is based on the concept of creating digital artificial 3d models from non-existent imagery. It uses the same basic set up as a NeRF but instead of interpreting photographs its neural network can create a 3D model approximating the information it perceives from a single image or text-based description. This means it is possible to generate a 3D asset from very little data. (Jain et al., 2022)

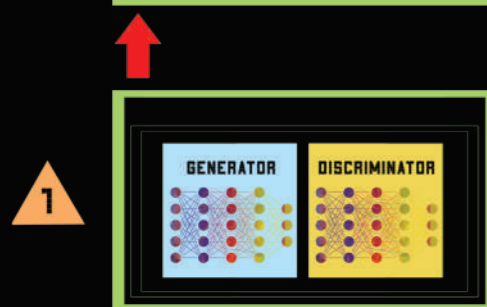
### Generative Adversarial Network (GAN)



In this end point it is possible to train in small alterations to the model. This is particularly useful if you want to add specific imagery to aid with your output it is a much faster and reliable method than retraining the model.



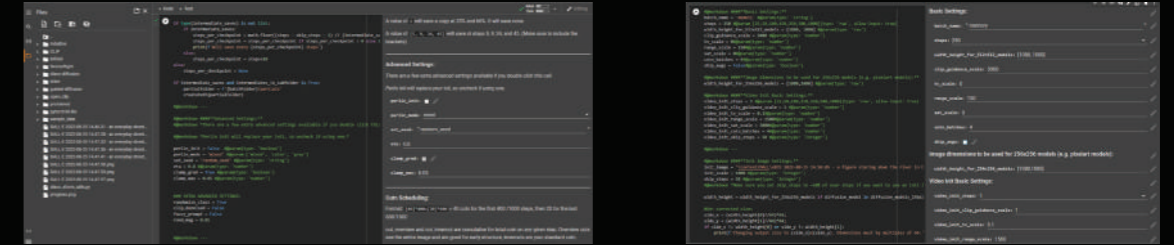
Active stage here you can control the weighting of the model to fine tune what it generates. The sample rate will affect the batch sampling from the data base. Steps control the quality of the image the higher the sample number the more detailed the image this tends to diminish after 500. The guidance scale controls the relationship between the prompt and generated content. Dimensions of the end stage image are set here they work in multiples of 8. The seed number is set at this point which controls the consistency between outputs. These are the primary elements that effect image creation at this stage



Training stage control over information being fed into the model forming its bases and how the generator and discriminator interact.



Image made during early GAN experimentation



COLABs set up for image and animation generation

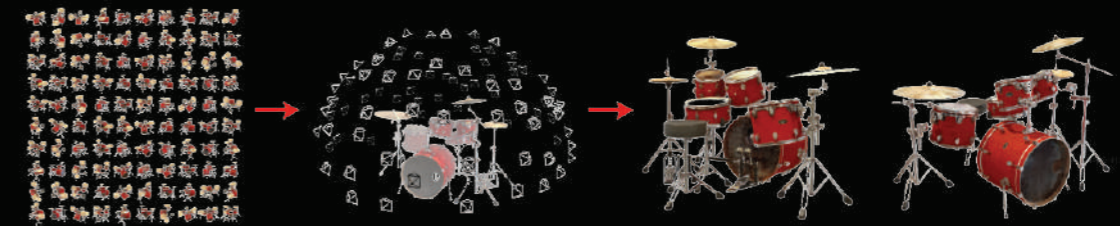


Figure 15 Visual explanation of NeRF



Noise generated in early stages of image creation



Images created during random seed test to explore the default content of a dataset



### BUILDING AN UNDERSTANDING OF SUBJECTIVE APPROACHES TO HERITAGE

Ozymandias  
BY PERCY BYSSHE SHELLEY

I met a traveller from an antique land,  
Who said—"Two vast and trunkless legs of stone  
Stand in the desert. . . . Near them, on the sand,  
Half sunk a shattered visage lies, whose frown,  
And wrinkled lip, and sneer of cold command,  
Tell that its sculptor well those passions read  
Which yet survive, stamped on these lifeless things,  
The hand that mocked them, and the heart that fed;  
And on the pedestal, these words appear:  
My name is Ozymandias, King of Kings;  
Look on my Works, ye Mighty, and despair!  
Nothing beside remains. Round the decay  
Of that colossal Wreck, boundless and bare  
The lone and level sands stretch far away."

(Shelley, 1994)

The poem Ozymandias by Shelley offers an allegory for the comprehension of a narrative past that emerged over the course of conducting the workshops which are documented in this section. It emphasizes the story telling aspect of a shared past while contextualising it in the advancing vastness of the desert representing the all-consuming flow of entropy in the boundless unfolding of time. The Statue is representative of transience and how it is not possible to control the development of a narrative that is passed down. Instead of symbolizing the might of the ruler, the sculpture instead exemplifies the dissolution and collapse of that once mighty power and the inevitability of entropy. In the end the desert is all consuming and its shifting sands will eventually reclaim anything sitting on its surface.

In the context of the workshops documented in this section, the allegory of Ozymandias highlights the importance of storytelling and the role that narrative plays in shaping our understanding of the past. The poem suggests that the story of Ozymandias, and indeed of all historical figures, is not a fixed entity but rather a constantly evolving narrative shaped by the perspectives of those who come after. By recognizing this, we can appreciate the importance of engaging with multiple perspectives and exploring the nuances of history to gain a more complete understanding of the past. With this approach towards a narrative past established we can place it within a larger context, gaining a sense of perspective on our own place in history and appreciate the fleeting nature of all human endeavours. This temporality should not discourage us, instead it clarifies the exceptional splendour and value of how we see the world through anecdotes. Allowing us to deepen our understanding of the past and gain a more nuanced appreciation of the complexities of the human experience.

During the previous section the technical aspects required for this research were discussed. This part will now expound upon a series of workshops. These discussions were run to better clarify a generalised comprehension of themes relating to heritage as they exist among the public. In particular, they reference the topics discussed in the previous sections of this thesis and help influence and develop the design-based explorations dealt within the next section. The gap that lies between individual subjective interpretations of built history and supposedly objective official narratives is a fascinating vastness. It raises an important question which is becoming ever more pertinent, that of how to achieve consensus and representative discourse in the face of manifest subjectivity. This has been one of the primary focuses of the research. The most straightforward way to explore this contrast between the individual interpretation and the official narrative was to conduct a series of workshops.

A total of three workshops were run. The first was a generalised survey and discussion on heritage focusing on individual understandings of embodiment, objects and nostalgia. It was aimed to start to understand how people attached value and memory to their surroundings focusing on the language they used to discuss it. The second workshop investigated how participants comprehended Replicas, Authenticity, Composition in relation to artifact-based history. The final workshop explored individual subjectivity with reference to built infrastructure, to shine a light on shifting perceptions of how we share and describe our built environment.

The workshops were conducted over the period from January 2023 to May of the same year a total of 27 subjects were interviewed. 27 took part in the first workshop; this fell to 14 for the second and 7 for the final discussion. The subjects selected for the research come from a wide range of disciplines and backgrounds. In the main there was an attempt to find participants who had no previous experience in or specific knowledge of the construction and architecture fields. This was to record the language used more commonly in conversations on Nostalgia, Replicas, Authenticity, Composition of memory and the subjective understanding of heritage. It allowed for the creation of an archive of referential terms used by non-practitioners to discuss built works. All participants signed consent forms which informed them of the purpose of the research they were involved in and the aims of the thesis. In addition, all those interviewed were informed that they could withdraw any information they had given at any stage without explanation.

These workshops proved an invaluable tool allowing for an understanding of how others discuss and view the topics dealt with in this thesis. They also helped structure and inform the design explorations that emerged from them that are dealt with during the next section.

#### WORKSHOP 1 – MEMORY, NOSTALGIA AND EMBEDDEDNESS:

The first workshop conducted was with individuals on a one-to-one level in the form of a survey. It attempted to explore understandings of objects and the narratives contained within them. Alongside this there was also a resultant insight into personal understandings of "memory traces" (Freud, 1953) as they are embedded in objects. It was an invaluable first step in building up a dictionary of terms in common usage by the public when discussing objects significance and their comprehension of them. It consisted of 26 questions with a mixture of drawing and general interest queries. The results were compiled from the 27 surveys conducted and the salient generalities that were contained within them were extracted. A summarised interpretation of the survey results is presented here:

The results indicated how people view, evaluate and interact with objects in a very general sense. It started to give an insight about the language that people use when discussing things of importance and nostalgia. Many participants claimed that they had a good sense of the space they inhabited but it was rarely attached to any constructed element. Most people considered that small and relatively innocuous artifacts contained the greatest degree of personal value. This helps give greater credence to the previously expressed theory that people's relationship with heritage is a largely subjective affair. Contained within contextual artifacts that act as signifiers to subjective narratives. It is underwritten by the "memory trace" (Freud, 1953) as a means of justifying and comprehending a current reality. Unsurprisingly another result that the surveys returned was that most participants struggled to define, discuss and put into words why they felt the way they did about things. Actively exerting themselves to clarify their position. They did not have overly descriptive abilities when it came to explaining their sense of entanglement with things and clearly creating a representation of an entity in words or through drawing was difficult for them. The results highlighted the need for more tools that can expand our abilities for communication than are currently at our disposal. The loose actuality of attachments was something that became increasingly evident over the course of these workshops.

It was surprising to what extent participants' understandings of their realities were so richly subjective and the ease with which this could be quickly discerned by analysing their answers. The huge variation between the amounts of information given by candidates was another manifestation of this individuality. There was no correlation between the illustrative ability of those interviewed and their actual willingness to draw which was also intriguing. Most felt uncomfortable with their drawings, stating that they did not adequately represent what they had been describing. This deficiency of communicative ability was also present in written and spoken engagement with those taking part, many of whom stated that they could only know a thing through engagement with it. A description or representation would convey little to none of the actual information provided by tactile or close physical interaction with artifacts. The findings supported and bolstered this thesis's understandings of Replicas, Authenticity and Composition in addition to moulding a comprehension of nostalgia in relation to embeddedness. Contextualisation of objects within a setting granted them their authority or they acted purely as conduits. Devices which helped invoke the narratives individuals associated with them.

The results brought home the consideration of how we might preserve, represent and propagate the personalised qualities associated with these forms of artifact. It allowed the author to consider the basic nature of attachments and narrative creation in relation to material structures, when understandings of engagement with artifacts appear to be entangled and nonlinear as a process. How do we ensure the preservation of the qualities associated with the original in a manner that makes comprehensible exactly what it is that was important about it in the first place. How is value perpetuated? The results seemed to point towards this being the product of narrative engagement which would be in keeping with long held Kantian views of the self in relation to memory and the subsequent formation of lived reality (Kraus, 2020).

These narratives of centredness eventually returned to a singular place. The place that most people stated they knew best and would recognise without fail was their bed. "The bed is the individual space par excellence, the elementary space of the body" (Perec, 1959. p18). It allows for a massing of the subjective within a single item which is fascinating. All of us like Odysseus eventually return to our beds and are centred by them (Homer, 2003). Sleep is one of the few completely universal activities that we as a species undertake for approximately a 3rd of our lives. In dreams we can start to consider the subjective situatedness that emerges and is shared from this condition and understand its connection to the moulding of nostalgia (Yi-Fu Tuan, 2001). We can start to understand how this helps create and maintain the previously discussed "memory trace" (Freud, 1953) that forms the sense of ourselves and the past which we share, allowing for a heritage speculation as it mixes with dreams of the unconscious mind.

More than anything, what this workshop confirmed was the centredness of narrative creation and the subsequent formation of homolocality through the process of storytelling that forms our worlds or as Proust says 'For a long time I went to bed in writing' (1981, p1) This workshop was vital to start to comprehend how participants understand nostalgia, embeddedness and value in relation to objects and heritage.



Drawings made by participants



In my current house, the dog we share our house with and the vines growing on the wall outside.  
 My family  
 The sound of my dog Lizzy's nails on the floor as she says hello  
 The birch tree in the back garden  
 Fire  
 My room mates fighting  
 Door  
 My bed  
 Dropping my bag and coat at the coat rack  
 A lion statue an ornamental knife a sheep shears and a spice box  
 Cherry blossom trees  
 Dave and Betty the dogs  
 Tea leaves and tea pot  
 Remembering special moments, soft edges, 100-year-old piano bought as a gift so could go into photos of family reunion  
 The sound dampening panels I built for the spare room/ music room  
 I live in four walls  
 Rainy, Rainy red brick  
 Nice  
 2 bed apartment  
 In a house in Dublin  
 Suburbs of city  
 A quiet suburban area - village type atmosphere  
 A little tiny house located in a very posh area  
 A sprawling mass of urbanisation  
 A small town with lots of pubs, fills, churches and commuters  
 3-bedroom house in housing estate in second ring of suburbs

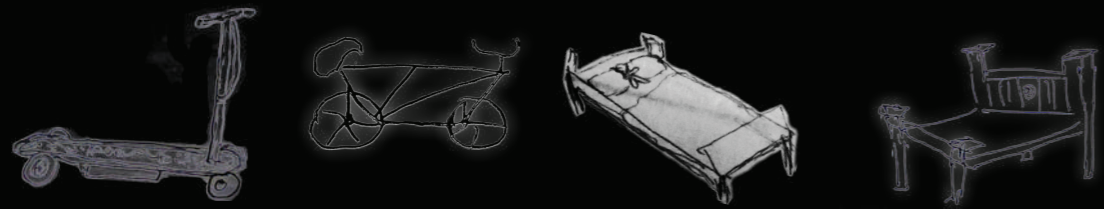
Sample of answers and keywords



AI generated images resulting from conversations on nostalgia and the domestic

Piano, Gritty rough, Phone, Remembering special moments, 100-year-old, soft edges, Photos, Tea leaves and tea pot, Greenery, Trees, nice village, Nice, Less traffic, Narrow streets, Wood, Paint, Smooth wood, Tactile, Cottage soil urban cosy, Urban dirty but quiet, More space!, Ornamental, Childhood, influential figure, Bed, awful street signage, Passions, Local, Ingrained, Sprawling, Urbanism, Clutter, family, Grass, Years, four walls, Dampness, walls, colours, Floor, Cucumber, Dogs, Kitchen, Bedroom, Garden, Cherry blossom, Village, county council, property developers, Footpaths, shopping centres, housing estates outside the town, fake leather sofas, cotton wool, touch screens, enamel bath, cold marble of the mantelpiece, Wallpaper, old wooden box, Books, Dogs, Velour, Sandpaper, Grey walls on houses, Detached house in the suburbs, gravelled garden, Garage, Summer, birch tree, Wool, Streetlights, Suburbs, Fire, stone, Traffic lights, Rainy, Brick, roommates, housing estate, coat rack, China, Old, lighting and ventilation, Childhood, Memories, tiny house

Sample of answers and keywords



Drawings made by participants



Over the course of the research the available applications advanced at an exceedingly rapid rate. In the initial phases of the project the disco diffusion notebooks were by far the best until they were surpassed by stable diffusion models. The accuracy and control offered within emergent models continually progressed allowing for ever more precise controlled output to be generated. For the purposes of this thesis, it was decided to stay with the stable diffusion 1.5 model which was released in late 2022. At the time this asset had the greatest amount of supporting documentation relating to its utilization.

AI generated image from conversations on nostalgia



AI generated images from conversations on nostalgia



AI generated images resulting from conversations on nostalgia and the domestic

## WORKSHOP 2-REPLICAS, AUTHENTICITY AND COMPOSITION:

The next workshop consisted of developing a more heritage-based approach towards the subject. It helped ensure a better understanding of what people think about as they discuss the past and built artifacts more generally. It complemented the exploration of nostalgia and entanglement which were examined in the first workshop. The exercise was formulated for the purposes of exploring how people understand the ideas of Replicas, Authenticity and Composition that have been previously explored. 14 people have participated in this survey. It consisted of 24 questions:

1. What is heritage?
2. What is preservation?
3. What is conservation?
4. What is a reproduction?
5. Do you think it is important to preserve the past and why?
6. What is an artifact?
7. What is an original?
8. Do you think there is a difference between an artifact/original and a perfect copy?
9. How important is the context of a display?
10. Can you receive the same information from an original and a reproduction?
11. When you think of a historical building what is the first building that comes to mind?
12. When you think of an ancient building what's the first thing that comes to mind?
13. Please describe a historical building of your choosing?
14. Please describe a space or place you consider to be socially or culturally important?
15. What historical building do you think you know the best?
16. Are there any spaces you have never visited but feel you know?
17. If a building is remade overtime, is it the same buildings, what changes?
18. If the discarded elements of a building are discarded and reconfigured into there original compostion is it the same building?
19. What is the difference between a structure and a building?
20. Has a artifact ever made a lasting imprestion on you?
21. Has an exhibition ever made a lasting impact on you?
22. If you could visit any space or place in time or space what would it be?



AI generated image resulting from descriptions of ornamental elements



AI generated image resulting from descriptions of culturally important space

In the main, respondents agreed that heritage was a link to the past which allowed for a form of continuity to be achieved. The concept of situatedness or homolocality was also almost universal with most respondents concurring on the importance of context to convey value and meaning. On continual questioning most interviewed agreed that the authenticity of an object was of secondary importance to its contextual presentation. One other interesting occurrence in the discussions was that most younger participants aged between 19 and 28 stated that what represented the term historical buildings for them were in the main neoclassical examples from their local context. While ancient buildings conjured visions of Rome and Greece, with the Parthenon and the Colosseum being clear front runners as idealised postcard representatives of the past. Most felt that modern buildings began in the 20th century and were as a result of less value in the hierarchy of perceived historical evaluation. Beyond this there was little that candidates agreed on. Some believing in the importance of material being conserved in its current form with as little change as possible. While others advocated for the transience of all things in a progression, allowing for the continuation of important traditions in an adaptive manner appropriate to emergent conditions, rather than remaining static.

People did not agree on any of the three categories of Replicas, Authenticity and Composition. These varied widely depending on the class, status, age, background, social position and personal understandings of those interviewed. For me this highlighted the extent to which subjectivity effects our discussions of heritage. This becomes particularly evident on the level of an individual conversation. Without communal objectivity created through the popularisation of established and enforced conventions, people feel free to express their own subjective narratives and individual understandings. It seems that, in a group the dynamics of opinion are moulded into a form of objectivity which can vanish on the level of a one-to-one engagement. The question that this raised for this thesis was how emergent technology and the new forms of representation that it puts at our disposal could best transform this form of expression in a manner which is easily communicable to others and allows for a sharing of subjective perspectives. What is the best means of communicating subjectivity and allowing for discourse? What started to become clearer was the almost impossible task of achieving any form of objectivity. This helped inform the highly subjective nature of the design explorations.

The similarities in terms of how people evaluated the past despite relatively different perspectives was fascinating. Once again there was a difficulty when it came to describing or narrating the forms of structures, but as opposed to the first workshop there was a more established tradition of social conventions in place governing what candidates felt were the appropriate responses to the questioner. These were particularly subject to the cultural background of the participants 90% of whom came from a white European perspective. Resulting in the favouring of structures that emerged from colonial militaristic regimes which used their resources and built forms to reinforce very simplistic ideas of social importance in relation to built form. These hierarchical and stratified narratives directly precluded others both ostracizing and denying the agency of contradictory narratives. The most common occurrence of this was in ideas about the righteousness of regimes such as Rome and the British empire. Many participants stated that there were important moralistic and national narratives associated with artifacts relating to those administrations that should be preserved but when questioned closer on exactly what aspect of the exploitative establishments were beneficial to preserve participants struggled to give coherent answers.



AI generated image resulting from descriptions of historical buildings

More than anything, what this workshop proved was the failings of our linguistic tools to adequately represent and communicate specific individual understandings of heritage. Many of those interviewed were all too willing to be led, which was difficult to avoid at times. On continual prompting most returned general answers and frequently contradicted themselves, particularly in relation to expressions of how they understood value to be embedded in items and the importance and actuality of original authenticity. What narratives should be carried on and how this is enacted through constructed artifacts was a point of continual confusion. It made clear the permeability of individual subjective understanding. Underlining how in the main the consensus manifest in general conventions is frequently the result of a few particularly opinionated individuals. This highlights the need for a reconsideration of how we engage in these forms of discussions and the tools we utilise to do so. It suggests that more expressive generative mediums finely tuned specifically to the participants involved could enrich the discussion with others, allowing for a more precise and expressive clarification of a candidate's understandings and positions. Opening the way for greater transparency and definitive discussions on heritage.

Arch de triumph, St Pauls, Pyramids, Greek or Roman type stuff, Big steady long lasting, grey colour arch, gathering social underneath a roof, Shared storied and space, My home the place I live, the roaring 20s style, natural state non-interference, An accurate copy of something, The flat iron building in New York, The acropolis , a big hill, the Parthenon, Doric, continues freeze, British museum, pitched roof, memorial in berlin, the Eifel tower, Woodstock, the easter island heads, preserve things, cultural environmental and social importance, Conservation, test of the time inherit, personal feeling, classical Greek architectural, Scaffolding, The city of Florance, Trafalgar square, Newgrange, like real old stuff, St Pauls cathedral, Domes built from stone ornate paintings column, Finsbury park, ports grounds, picnics concerts, Allotment, ancient burial site, maintain some level of coherence, government building, the pub, the holocaust museum, Indiana johns Petra holy grail, 19th century, Jail, Cathedral, Community, 911 memorial, The essence of a thing, psychical hierarchy, archaeological value, 20th century, Saint Patricks cathedral , A theatre, Cinema, Egypt, the 17th century, Rome, Egyptian hieroglyphs, the Rosetta Stone, Bauhaus, Library of Alexandria, sensory information, personal taste, comfort, or practicality, Sistine Chapel in Vatican City, Tower of London, the Great Wall of China, Machu Picchu, The Smithsonian National Museum of African American History, the Taj Mahal in India, Stonehenge in the UK, past societies, Central Park, Musee d'Orsay, Palace of Versailles in France, Dublin castle, Tintern abbey, Kilkenny castle

AI generated image resulting from descriptions of historical buildings



AI generated image resulting from descriptions of historical buildings

### WORKSHOP 3-SUBJECTIVITY:

The third and final workshop was developed from the previous surveys which proved invaluable in the construction of this undertaking, particularly in understanding the buildings which people were aware of and how they discussed them. It started by choosing several specific historical buildings that have a degree of prestige, which would mean most people would at the very least possess a passing awareness of their structure and appearance. The architectural edifices that were chosen could be described as postcard buildings historical cultural social fusions that have significant symbolism associated with them.

These monuments also needed to have been the subject of substantial and continual previous research that would mean they would have been documented throughout time in varying fashions. This would mean that there are written descriptions, photographs, drawings, surveys and other analytical material from different instances documenting the buildings. This would allow for an understanding of the structure's official narrative development. While simultaneously aiding the tailoring of GAN models to represent and create explorations of them.

In total 9 buildings were chosen: the Pyramids of Giza, the Parthenon in Athens, the Colosseum in Rome, Notre Dame Cathedral, The Palace of Westminster, the Great Wall of China, the Statue of Liberty, the Eiffel Tower and the Taj Mahal. This resulted mostly from the public profile of these structures and the available data on them.

Discussions with those being interviewed started with them being presented with a choice of 3 buildings to choose from based on the list above. This then led to a general discussion on the appearance of the building and its qualities. There was then a slow descent in scale from the macro to the micro zooming in on elements of ornamentation. By moving between discussions of the building as a whole and its specific elements an understanding of participants individual interpretations of the monuments began to emerge. After we had discussed form, we talked about more specific personalised semiotic interpretations of the edifices. This was to allow for a documentation of their understanding of the building on an emotional level with the aim of possibly overlaying this on their previous descriptions to highlight their subjective understandings.

In total three main scales were dealt with: the first being that of the building as a whole, the second a specific notable element, and finally an ornamental detail. It was not expected that participants would be able to provide exact analytical information instead the goal was to record their subjective mental image of the monument.

After this we briefly discussed a building that they felt comfortable describing. This was of the participant's own choosing and was usually either their place of work or accommodation. This was to explore the linguistic difference between how people discussed official and personal structures.



AI generated image resulting from descriptions of a space or place conceded to be socially or culturally important

The main purpose of this workshop was to gain an understanding of individuals' subjective comprehensions of existing buildings. It was structured around conversations allowing participants to express themselves as best they could. This progressed to discussions about the buildings, describing their features and subjective understandings of them in ever more detail. The resulting dialog and portraits were input into the GAN to create imagery which I would represent to those being interviewed. The participants would respond and comment on the results giving positive or negative feedback on how the image related to their mental pictures of what had been discussed. The results were then tuned through this dialog to bring the output images closer to the candidate's uniquely personal vision. After generating imagery that the participants felt satisfactorily represented their idealised comprehensions the resulting output was run through a BLIP model. This analysed the content and gave text-based feedback on how the model interpreted the imagery. The results were contrasted against the initial prompts from the discussions that had been used to generate the created visualisations. After that all the results from this stage of the investigation were added to those from the previous workshops to form a dictionary of terms. The emergent consistencies from these discussions on heritage were closely tracked. Noting what words and phrase structures seemed to return the best results and to what degree they reoccurred. In total, this workshop was run with 7 participants.



AI generated images resulting from discussions of ornament in the palace of Westminster  
[https://www.youtube.com/watch?v=n\\_WeCk\\_LXtA&ab\\_channel=TadhgCharles](https://www.youtube.com/watch?v=n_WeCk_LXtA&ab_channel=TadhgCharles)

During this workshop it became particularly apparent how easily participants could be influenced in their descriptions. Visuals generated by the GANs were regularly accepted by participants without an excessive amount of tweaking. It could be posited that these findings highlight the generalised willingness to believe in narrative and representation by the public when it comes to amalgamated representations of heritage. This emphasises the importance of making inclusivity a fundamental aspect of any dataset as the greater its specificity the higher potential for exclusion becomes.



AI generated image resulting from discussion on the Acropolis of Athens  
[https://www.youtube.com/watch?v=1BDB6hw7DdA&ab\\_channel=TadhgCharles](https://www.youtube.com/watch?v=1BDB6hw7DdA&ab_channel=TadhgCharles)



AI generated images Resulting from discussions of columns from the Parthenon

Prompt: A highly detailed close-up depiction of the columns on the Parthenon in Athens, cinematic lighting, material massing, carved stone, marble, overlaid style Seed:9-378 Scale:3-15 Steps:90 width:512 height:512



AI generated images Resulting from discussions of the Palace of Westminster

Prompt: A highly detailed close-up stylised depiction of ornamentation found in the Palace of Westminster, cinematic lighting, material massing, carved stone, marble, overlaid style, flat on view Seed:9-378 Scale:3-15 Steps:90 width:512 height:512



AI generated images Resulting from discussions of columns from the Taj Mahal

Prompt: A highly detailed close-up depiction of exotic columns that exist in the Taj Mahal, cinematic lighting, material massing, carved stone, marble, overlaid style Seed:9-378 Scale:3-15 Steps:90 width:512 height:512



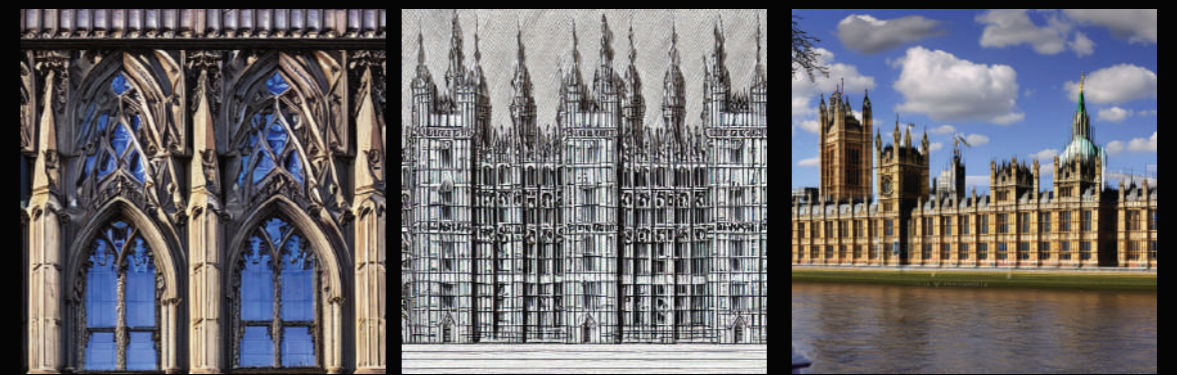
AI generated images Resulting from discussions of the Pyramids of Giza

Prompt: A highly detailed photograph of the material/ structure/ entirety of the great pyramid of Giza, digital camera, high quality, carved stone, weathering, realism Seed:9-378 Scale:3-15 Steps:90 width:512 height:512



AI generated images Resulting from discussions of Notre Dame Cathedral

Prompt: A close-up flat on view matt/oil depiction of the ornamentation appearing on the walls of Notre Dame, cinematic lighting, material massing, carved stone, stonework, flat Seed:9-378 Scale:3-15 Steps:90 width:512 height:512



AI generated images Resulting from discussions of the Palace of Westminster

Prompt: an artistic depiction of the Palace of Westminster, Detailed, artistic, handmade, gothic style, camera angle, ornamentation Seed:9-378 Scale:3-15 Steps:90 width:512 height:512

## DESIGN EXPLORATION

### BRINGING IT ALL BACK HOME

For the design exploration stage, all the previously discussed elements were drawn together in a critical analytical manner that allowed for a manifestation of these concepts in visual and physical mediums that would enrich the discourse laid out in this thesis. The aim was to structure these undertakings in a fashion which would allow for a wide range of interesting mediums to be utilized; and, to explore what tools were best suited for the purposes of demonstrating the potentialities offered by these emergent tools as analytical reflective methods that can augment our understandings and discussions about heritage. While clearly representing the applicability and suitability of these apparatus for utilization within the field of design.

A total of five design-based investigations were undertaken, this allowed for an expansive and full demonstration of the potentialities offered by the suggested methods that have been previously cited.

The first exploration used imagery and animation to highlight the potential of these tools as devices for the consideration of how we reflect on changes to the built environment and the representation of heritage. In essence, it tried to conceive of a way to demonstrate the emergence of narrative in relation to temporality, giving the opportunity for ways of demonstrating and communicating centred subjective ideas on time and objects.

The second set of explorations aimed to highlight the subjectivity of participants in the workshops by making hybrid two dimensional drawings that combined artificially generated content with official records in a mixed media of pictorial representations. This blurring of the parts highlighted the subjective nature of our understandings of authenticity and value in relation to historical edifices.

The third exploration investigated different ways of making digital 3D models that represented the designed work. This was a series of speculative processes that tested a few new workflows developed by the author for the purposes of this thesis.

The fourth study looked at testing different ways of making physical models of the resultant content to explore how to move between the digital to the physical and then back iteratively. Reflecting on the permeability of different domains of existence.

The fifth and final experiment aimed to create media that could be described as generative in how it could be interpreted subjectively. These works aimed to be post biased objects which would act as critical tools asking viewers to reflect on their own subjective approaches towards engagements with artifacts.

All the design explorations utilise emergent technology which has been developed so recently that it would not have been possible to conduct the undertakings in the same manner a year ago. The generated content utilised and expounded on the themes explored in the initial research and the information that arose while conducting the workshops. The tests were carefully structured to allow them to be as impactful and explorative as possible. The potential for these tools to be utilised for critically evaluating and visualising comprehensions of heritage, in relation to narrative aspects of objectivity while questioning the subjective nature of approaches resulting from their application is explored here.



AI generated animation exploring model variations  
[https://www.youtube.com/watch?v=U6zc0n59FgE&ab\\_channel=TadhgCharles](https://www.youtube.com/watch?v=U6zc0n59FgE&ab_channel=TadhgCharles)

### DESIGN EXPLORATION 1 – MOVING IMAGE- SPECULATIVE TOOLS

The first design undertaking was commenced by working sequentially to develop material which could accentuate the speculative possibilities offered by this workflow while highlighting the subjectivity that lies at the centre of our comprehensions of heritage and the built environment.

Reoccurring phrases, imagery and descriptions were gathered from the workshop stage of the research. Then run through the GAN to create videos that explored them as animations. This switched between highly subjective and objective inputs particularly in relation to the structural phrases that ordered their creation. Meaning that the GAN would attempt to create videos that transitioned between detailed descriptions of objects and individual, personal, emotional interpretations of the archetypal monuments that were discussed during the workshop. The desire was that this could be a manifested visual representation of an abstracted stream of consciousness, while also allowing for a visual depiction of how the GANs function. Animations allow for a clearer representation of the iterative process of generation resulting from the use of this algorithmic process and resultantly permit more open and inclusive discourse to take place.

Two inspirations for this exploration were the Coop Himmelblau project - Deep Himmelblau which takes the companies previous output and analyses it in detail using GANs ( dPrix, et al., 2021). This iteratively spirals through and exchanges details, styles and forms from the firm's developed projects. It emphasises the organisation's progression creating amalgams, that at their core showcase what is perceived to be the essence of their creations while also providing a reservoir of inspiration that can be drawn on for future work. The second inspiration was the concept of Freuds memory traces which I previously discussed as applied to subjective object material manifestations in literature. Finnegans Wake by James Joyce offers an exemplar of this (Joyce, 2016). In essence this is an idea of manifesting a simulation of the subjective interpretation of artifacts form through the videos generated by GANs. This thesis posits that, because of these materials visual appeal and interest, it provides a means of engaging a wider audience in discussions about heritage.

This first exploration allowed for the fine tuning of skills relating to model training and deployment. It also permitted for the development of a greater comprehension about the requirements for running machine learning algorithms specialised for content generation. One of the most significant technical aspects discovered during this time was how small numerical changes in the dimensions of content could affect the results of a model's functioning. This had largely to do with the fact that the majority of the captioned images used to train the generative model had dimensions of 512x512 pixels.

Other discoveries were made about seed number in relation to scale and filter set up.

In effect all this information permitted the fine tuning of the models, meaning their output could be optimised and controlled ensuring that the operator had as much agency as possible in the utilisation of the tool. This allowed for the avoidance of the unfortunately regular position where users are guided by applications rather than their own creative intent due to a lack of personal knowledge and technical understanding.



AI generated animation exploring model variations  
[https://www.youtube.com/watch?v=U6zc0n59FgE&ab\\_channel=TadhgCharles](https://www.youtube.com/watch?v=U6zc0n59FgE&ab_channel=TadhgCharles)



AI generated animation exploring model variations  
[https://www.youtube.com/watch?v=U6zc0n59FgE&ab\\_channel=TadhgCharles](https://www.youtube.com/watch?v=U6zc0n59FgE&ab_channel=TadhgCharles)



Animation exploring columns emerging from discussions of Notre Dame  
[https://www.youtube.com/watch?v=mGJth49EmYI&ab\\_channel=TadhgCharles](https://www.youtube.com/watch?v=mGJth49EmYI&ab_channel=TadhgCharles)



Animation exploring colosseum

[https://www.youtube.com/watch?v=njNMvts7ZUc&ab\\_channel=TadhgCharles](https://www.youtube.com/watch?v=njNMvts7ZUc&ab_channel=TadhgCharles)

While undertaking this design exploration over a million images were created through the utilisation of general adversarial networks. They were then resolved into stable animations varying between 6 and 36 frames per second. This massive generation of content would not have been possible with in the same time frame by a single individual equipped with conventional workflow processes.

The results were combined into a series of films and uploaded on to YouTube so as to make them accessible. They can be seen in their entirety at the web address: [https://youtube.com/playlist?list=PLfT\\_rJaH-g8AzF16tgNIBa6FLw\\_xrmeQwx](https://youtube.com/playlist?list=PLfT_rJaH-g8AzF16tgNIBa6FLw_xrmeQwx)

All visual content created for this phase of the design exploration was uploaded the same YouTube channel which can be found by searching at @tadhgcharles or [https://www.youtube.com/channel/UC\\_q62GP3av-v8nSTWMqpQNvw](https://www.youtube.com/channel/UC_q62GP3av-v8nSTWMqpQNvw)

The end stage results were combined into super reels of varying lent that conveyed the intent of the exercise.



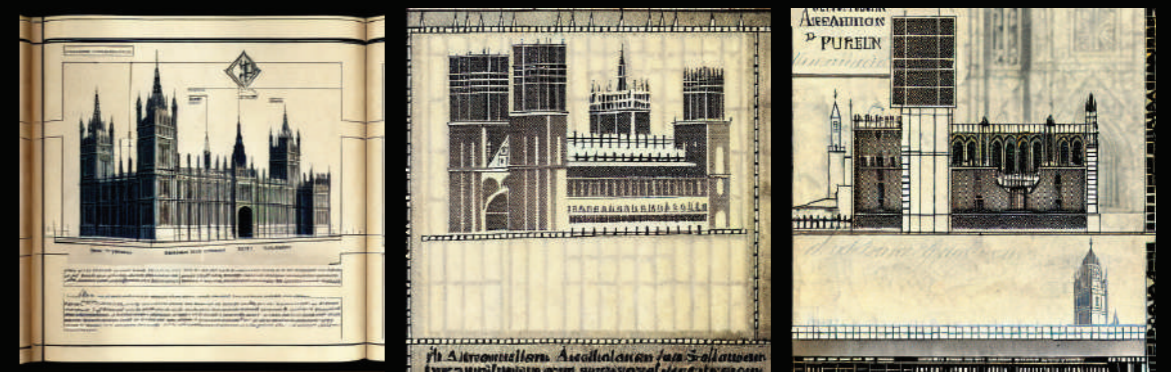
Animation exploring the generation of gothic ornamentation  
[https://www.youtube.com/watch?v=n\\_WeCk\\_LXtA&ab\\_channel=TadhgCharles](https://www.youtube.com/watch?v=n_WeCk_LXtA&ab_channel=TadhgCharles)



Animation exploring the generation of classical ornamentation  
[https://www.youtube.com/watch?v=njNMvts7ZUc&list=PLfT\\_rJaH-g8AzF16tgNIBa6FLw\\_xrmeQwx&index=34&ab\\_channel=TadhgCharles](https://www.youtube.com/watch?v=njNMvts7ZUc&list=PLfT_rJaH-g8AzF16tgNIBa6FLw_xrmeQwx&index=34&ab_channel=TadhgCharles)



Animation exploring the generation of gothic building elements  
[https://www.youtube.com/watch?v=tJLsIMfGPL8&list=PLfT\\_rJaH-g8AzF16tgNIBa6FLw\\_xrmeQwx&index=19&ab\\_channel=TadhgCharles](https://www.youtube.com/watch?v=tJLsIMfGPL8&list=PLfT_rJaH-g8AzF16tgNIBa6FLw_xrmeQwx&index=19&ab_channel=TadhgCharles)



Animation exploring the generation of gothic style drawings  
[https://www.youtube.com/watch?v=Jp4H7seH2Ko&ab\\_channel=TadhgCharles](https://www.youtube.com/watch?v=Jp4H7seH2Ko&ab_channel=TadhgCharles)



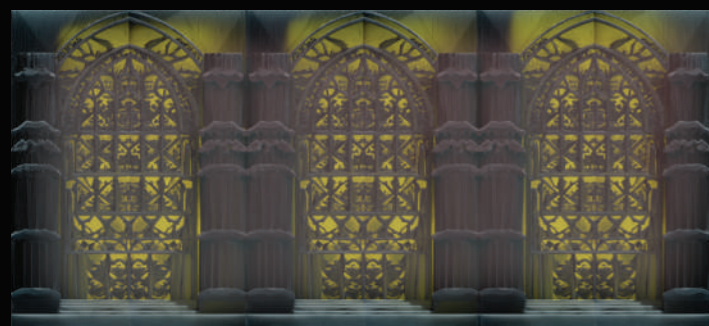
## DESIGN EXPLORATION 2 – 2D REPRESENTATION-LAYERED NARRATIVES

In the second exploration the objective was to explore ways of layering supposedly objective representations with subjective pieces, that would lead to a questioning of official narratives as they are manifest in built forms. The 3rd workshop proved particularly helpful for this stage of design.

Digital visualisations were made that distilled the content output of the workshops into specific representations, to show the move from dialogs about the building as a hole to discussions of specific ornamental details. These were made through a process that mixed collage postproduction and the GANs to create images that could be contrasted against official historical records and representations of the building. This serves to highlight the difference between individualised interpretations of the form and its official structure. In essence this investigation highlighted the subjective nature of all aspects that are regularly purposed to represent our shared past.

Specific seed numbers and prompts for images that participants from the workshops had found to produce satisfactory results were taken and developed. By doing this it was possible to allow for consistency to be maintained with in the output. There was a particular focus on 3 levels of scale; the building, an element of that edifice, and finally ornamentation. The resultant images are displayed here. They act as tools of provocation, asking the viewer to engage their critical faculties and question the veracity and content of the information presented to them. This highlights the contrast between subjective and objective approaches to design based heritage narratives.

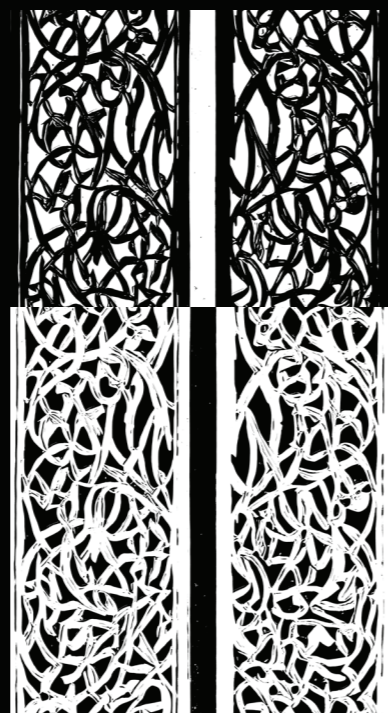
The main skills deployed in this phase were those of subjective visual analyses. In combination with computer-based design programs, this allowed for the creation of hybrid content asking the question 'what elements of a things character can be conveyed through a representation?' When reflecting on that query the previously discussed topics of Replicas, Authenticity and Composition arise and are evidenced in the resulting compositions. That emphasizes the intently subjective nature of how we disseminate heritage. The case studies of Newgrange and the Barcelona pavilion both offer physical manifestations of this interpretive approach to the management of historical built form.



Early mixed media collage image



Early stage collage drawing



Ealy stage drawing



Study creating hybrid images combining drawing and historical photography



Hybrid drawings imagining potential scenarios



Hybrid visual merging scenario-based explorations



Hybrid visual merging scenario-based explorations



Hybrid visual merging scenario-based explorations



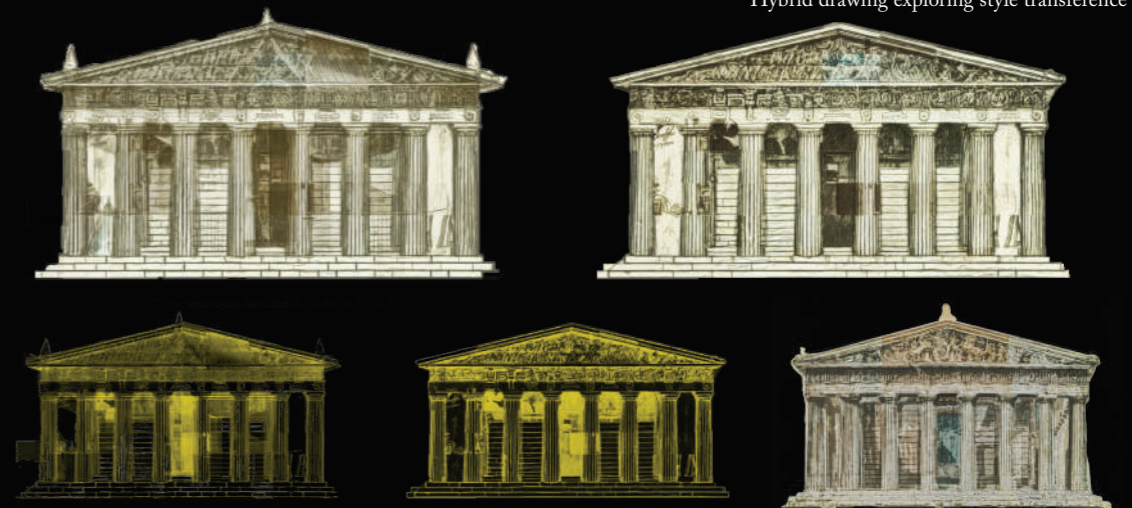
Exploring displacement to separate elements



Exploring displacement and style

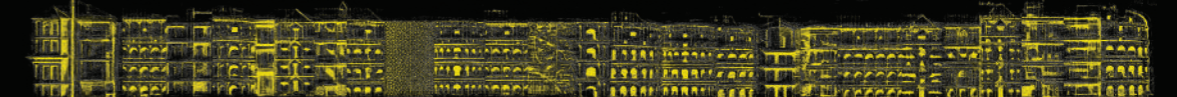


Hybrid drawing exploring style transference



Hybrid drawings combining depictions and descriptions of the front of the Parthenon

Some of the clearest works produced in this exploration were hybrid drawings combining archival representations of the Parthenon's frontal elevation in concert with AI generated content resulting from the workshops. These develop from inspiration taken from the exhibition of Chinese paintings imagined by Chang Dai-chien. It has never been clearer how important it is to have a precise understanding and plan of objectives in relation to content creation. While the material produced may be made at a more rapid rate it is crucial to understand how it is produced. A considerable amount of time was spent on internet forms and experimenting with BLIP models to develop a comprehension of how to engage with GANs as productive tools. It became apparent despite the differences between models that the sentence structure of inserted prompts could be maintained to ensure consistency. In basic form this meant commencing a prompt with the subject of the desired content then add a descriptor to that followed by any augmentations or sub modifiers that might be required. This is a process that could be infinitely refined to reach ever greater levels of coherence and specificity.



Hybrid drawing of official elevations of the Colosseum combined with AI generated content resulting from workshop discussions

### DESIGN EXPLORATION 3 – 3D MODELS- MANIFESTING SUBJECTIVITY

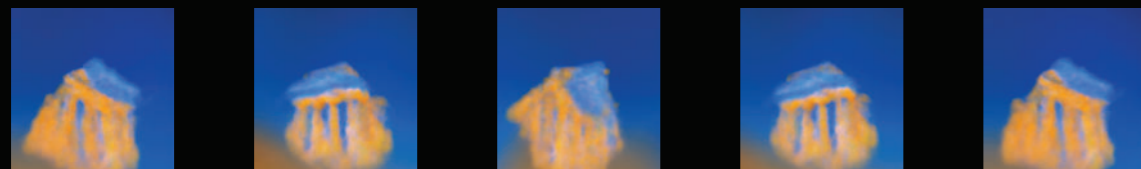
In the third design exploration the focus shifted to a 3-dimensional context. It was desirable to explore how best to make physical manifestations of the subjective interpretations of artifacts and the content from the discussions. Transitioning between the digital and physical realms of representation and manifestation is a constant point of interest. There are more methods than ever at our disposal for moving between alternate means of representation. These can greatly increase our communicative abilities augmenting them and thereby enrich understanding and discourse. Making us reflect on Replicas, Authenticity and Composition and the application of technology to heritage. There are several alternate methods presented here for ways of approaching this process.

The 1st method utilizes general adversarial networks trained on image-based matter. These models use a text to image-based approach towards content generation. The rate at which they produce imagery has accelerated to an extent where it is now possible to create animations at a rapid pace. For the purposes of this exploration, a series of animations from text prompts were created that were then run through a photogrammetry process to form 3D objects which could be printed in the real world.

The 2nd method used was a controlled direction application of seed numbers in combination with alternate prompts to create a series of individual images that represented different sides of a singular artifact. That process proved to be particularly effective for the creation of symmetrical objects. This procedure was deployed in combination with a photogrammetry process to make printable models.

The 3rd method discussed here worked with an emergent form of technology using Zero-Shot Text-Guided Object Generation. Instead of converting a text prompt into an image this network converts it directly into a mesh-based object through a process like that used in neural radiance fields. This can then be easily converted into a real-world object through 3D printing. DreamFields-3D was used as the application to create a series of basic digital mesh-based models. In the main these were of a low quality so they had to be augmented with content modelled from the 2-dimensional output of the previous stage. That outcome was achieved by converting 2-dimensional images into 3-dimensional models using a mixture of Photoshop's 3D features and Houdini's visual programming. The results were then compiled, correlated and finished in Blender.

The 4th method was to create a texture displacement workflow where artificially generated imagery from the GAN was applied to rudimentary geometry and then displaced to create ornamentation. The concept for this emerged from working between Houdini and Blender for the purposes of animation. During time spent exploring these programs, it became evident how quickly displacement operations could replace conventional 3D workflows. Instead of having to fully model an object and its details, it was possible to take a simple geometry and apply a texture to its surface which could then be displaced in order to create detail and form. Starting with 2D imagery made through general adversarial networks train on specifically historical and architectural content to generate tailored assets. These results could then be applied to simple plane surfaces and displaced. The outcome allowed for the rapid creation of highly detailed ornamental elements. Working with this process iteratively, it was developed for application on other geometries and then applied to combine the resulting forms to create representations of ever more complexity.



Early 3d model generated through animation and NeRF applications

The process drew on the knowledge of UV and texture mapping in Blender which had been acquired from previous projects. It presented one of the fastest means of going from 2D to 3D and allowed for the maximum maintenance of character and detail between the two mediums. The process is highly subjective to both the abilities of the modeler and the content at their disposal. One of the greatest's benefits of this modelling approach is that unlike other methods of creating 3D representations from 2D content it can be relatively light on computational requirements. This is because procedural geometry can be used in the initial phases, which is far lighter on the operational requirements of any system than more conventional mesh-based approaches. When you are satisfied with the visible results it is possible to convert the geometry into a mesh and there by transform it into a usable asset for 3D printing or any other potential requirements the model could serve.

All the discussed methods resulted in usable 3D digital assets that could represent the subjective viewpoints of users. They were of varying quality and applicability, with both the 2nd and 4th approaches offering by far the most conventionally pleasing results. In addition to this the investigation laid the groundwork for explorations of how to transition between the physical and digital realms. The experiment proved to be a particularly effective workflow for making 3D representations of the content produced that focused on ornamentation. By increasing the permeability between the digital and physical domains it seems possible to accelerate the dissemination of shared meaning and allow for richer communication which is vital in this time of burgeoning catastrophes. In effect the method discussed here can offer artifacts a new and greater degree of resilience within their relationship to entropy.

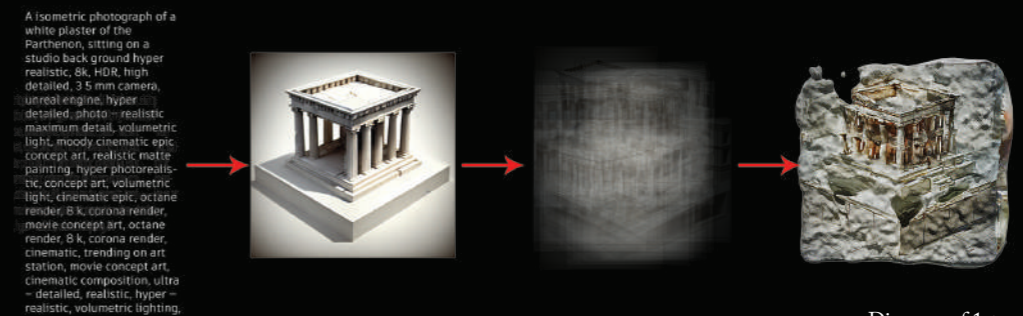


Diagram of 1st method



Diagram of 2nd method

Each of the methods developed for these processes had distinct qualities associated with both its application and results. The more automated processes required a higher degree of post-production to make them reach a satisfactory standard where they could be deployed as potential digital assets.

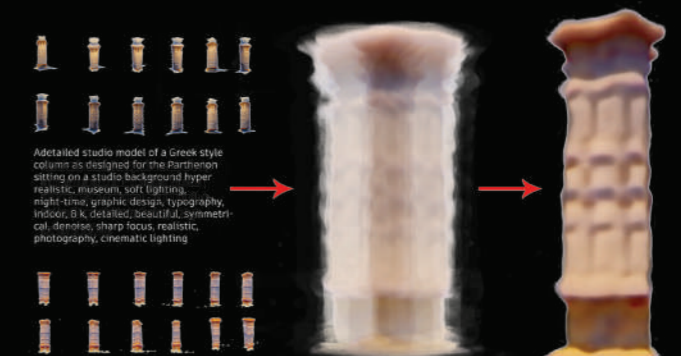


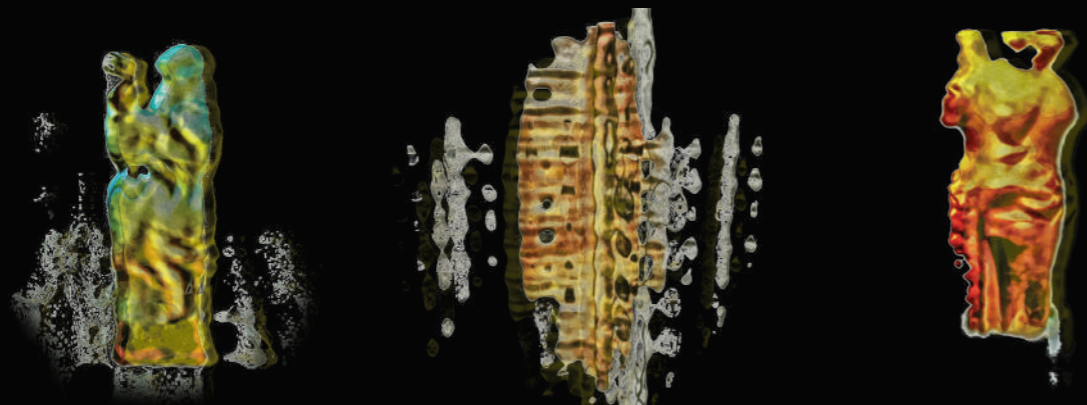
Diagram of 3rd method



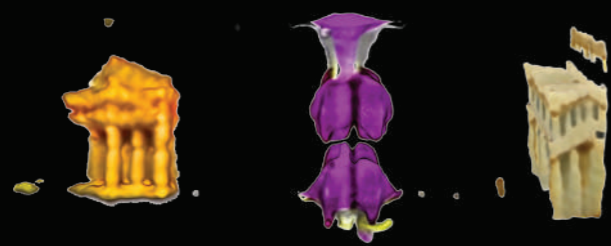
Digital models of columns generated through mixture of methods



3d model generated through image displacement



3d models with textures generated from DreamFields

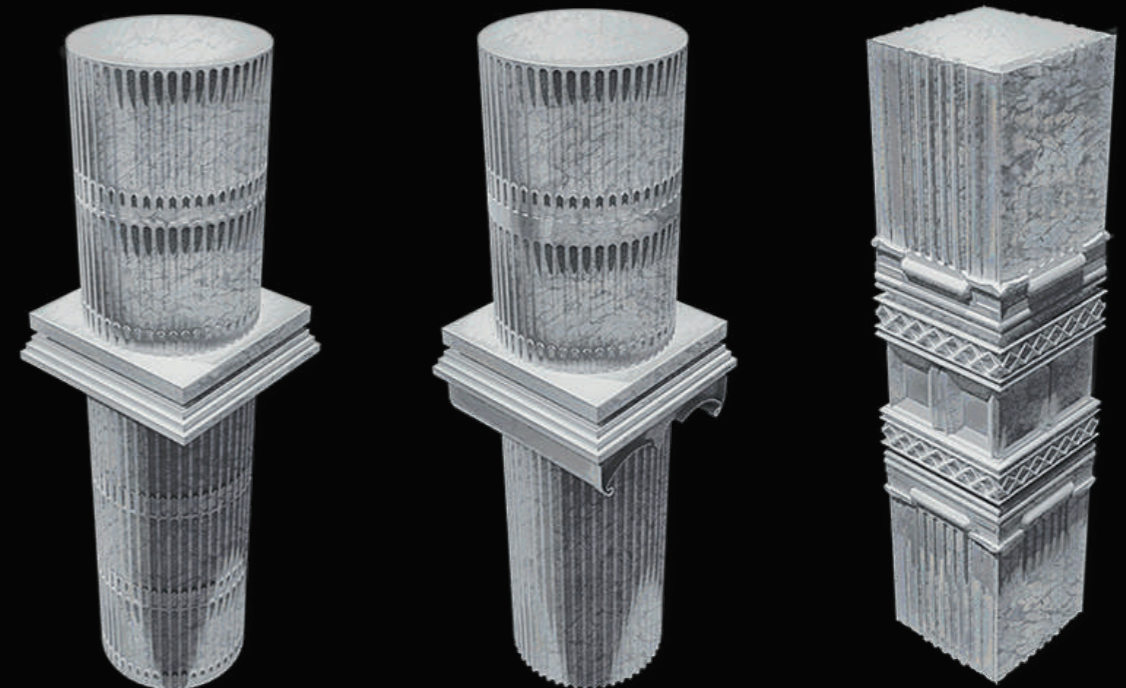


3d models with textures generated from DreamFields

A fascinating realisation was a late-stage discovery of how to use existent images with DreamFields directional NeRF capabilities. This meant that specific shapes and textures could be carried over into the generative stage of the model.



End stage digital models made manifold and ready for deployment as assets



End stage digital models made manifold and ready for deployment as assets



End stage digital models made manifold and ready for deployment as assets

#### DESIGN EXPLORATION 4 – PHYSICAL MODELS-PERMEABLE REALITIES

After making digital models of the subjective interpretations of objects it was important to make a few of the elements physically manifest in real world form. This was done through a process of 3D printing where the digital models created in the previous step were fine-tuned made completely manifold and printed.

For a long time now, the application of 3D printing has offered fascinating possibilities. It seems that it presents one of the best means for the creation of fully customised elements that can be inspired by and respond to their material and surroundings. 3D printing also gives one of the most tangible examples of the increasing permeability of our world as assets transition from representations viewed on screens to corporal creations. This exploration attempted to evaluate the possibilities offered by printing in a wide range of materials to analyse the capacity offered by each.

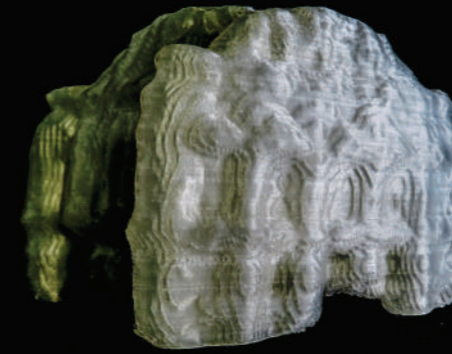
The enterprise also developed methods of introducing changes within the g-code that allowed for variations in the speed, extrusion rate and heat of a 3D printer's operation. Meaning that it was possible to specifically tailor print jobs for desired forms and textures. Through this, understandings were gained of how to maximise the efficiency of any potential 3D print, a skill which is evidenced throughout the work presented here. The application of custom tool paths and experimental g-code structures were the main technical aspects developed during this experiment, while the effort's main objectives were the creation of models. These could physically represent the previously discussed topics of subjectivity in relation to Replicas, Authenticity and Composition with reference to their manifestation through emergent technology.

There were several 3D printers located in the master's studio that were not in use. They provided an excellent opportunity as their utilization would allow for the exploration of more materials than could be tested in the workshop, where it was not possible to deviate from the provided material and setup. Unfortunately, all the 3D printers were broken and fixing one took 3 days to rewire the circuit board, exchange the heating element and reconfigure the motors (all of which was done by the author). In addition to this only 1 nozzle was available, it had a diameter of 0.8mm. This allowed for a printing range between 0.05mm-0.65mm with reference to the possible range in printed layer height. During the printing process, it was feasible to explore the extent to which the printer set up could determine the final output, exploring qualities such as layer height and tool paths alongside the material used in the printer itself.

Presented here are the examples of the finished experiments in transitioning between the digital and physical realms of existence. This investigation was particularly relevant to ideas of replication and the authenticity of the information contained within the resultant production. It explored how much content it is viable to reproduce within a material simulacrum of an artifact. In addition to this it explored the actual manifestation of the subjective interpretation of heritage that emerged from the workshops. Allowing for the development of conversations about what it means when a personalised understanding of an artifact is made materially manifold.



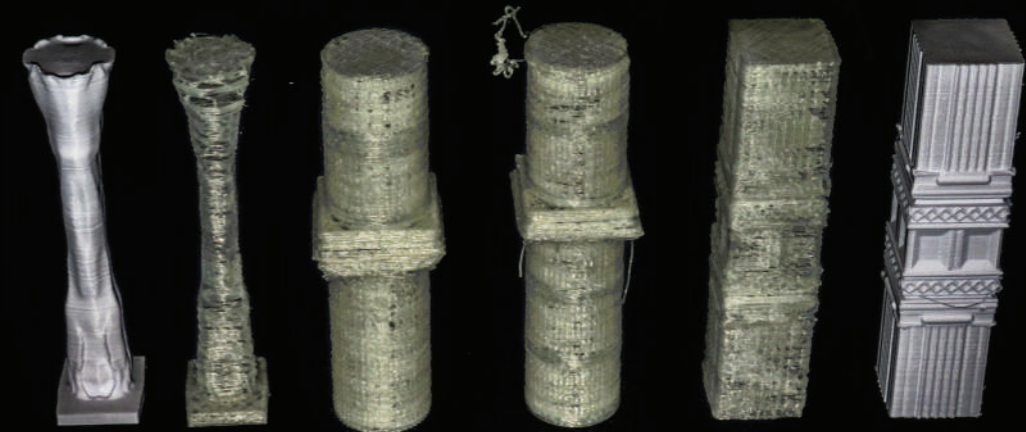
3d prints of AI generated columns



3d print of AI interpretation of the colosseum



Mixed displacement print



3d print exploring custom g-code application

The aim of the output in terms of objects that were manifested through this process was formed through the discussions undertaken during the workshop stage of the research. That approach holds true for all the design explorations being a factor that maintained a coherence between the emergent products, forming a visible line of progression as the end stage articles became continually more expressive of subjective qualities.



3d prints made from texture displacement method



3d printed model made through texture wrapping and displacement process



3d printed model made through texture wrapping and displacement process



3d printed model made through texture wrapping and displacement process



3d printed model made through mixed process

## DESIGN EXPLORATION 5 – GENERATIVE SUBJECTIVITY

For the final exploration, it was desirable to push the skills and abilities gained throughout this research and move beyond the workshops into a more personal reflective end stage comprehension of subjectivity, where all the elements could be drawn together.

The aim was to generate pieces that would be inspired by the various approaches to subjectivity previously discussed. With the end stage objective being that these works, when finished, would act as cognitive tools that could imbue a sense of intrigue in potential viewers, making them question the personal way they interacted with media and how they communicated their understandings of these perceived constructs.

Focuses on how to switch between media and best allow for the demonstrations of this particularly intimate ephemeral and fleeting sense of understanding were continually questioned during this period.

On examining what had been done so far it seemed appropriate to return to the work of Mikaela Steby Stenfalk, whose process proved to be particularly inspirational. The web scrapers deployed in this example seemed to provide an interesting method of exploring subjectivity in relation to mass representation of artifacts. After some analysis it was possible to replicate this workflow, which could gather images from the internet. This is an algorithm which crawls over predetermined web domains, automatically downloading any content which meets the parameters established by its creator. It was tuned to accumulate public domain images in both jpg and png formats with dimensions between 1080x1080 and 512x512 that were captioned with terms relating to famous historical buildings appearing in their titles. This was then limited to 1500 images per monument.

It seemed that this process would allow for the representation of objective approaches towards heritage. The gathered datasets would reflect on the depiction of an edifice and by a combination of the parts represent its relative comprehension. This information was combined into 3D models through a process of photogrammetry. It took a not insubstantial amount of time to understand how best to manipulate the software for the generation of functional meshes from the non-uniform content that was being run through it. During this investigation several approaches were refined for working with non-manifold or incomplete digital models. These procedures meant that it was possible to produce 3D printed models, even from the most disparate web scraped information. At times the process proved to be quite difficult, as conventional photogrammetry software requires similarities between its image content to determine their relation to one another and so make a usable model. Through experimentation, ways of disabling point of field and image aware content within photogrammetry software and making it falsely consider the relation between the resultant points were developed. Meaning the program could generate models from a widely varying set of images. After that the output was then used to generate a point cloud, from which meshes, and textures were extracted. Giving the opportunity to resolve the content into a model which could be printed in physical form. It is crucial to be able to create physical simulacra of artifacts and, given the scarcity of data which is sometimes available for this process, the approach presented here seemed to offer a clear means of utilising computation and design in unison. The approach also showed how we can comment on and explore ways of transitioning between the digital and physical realms of existence with a focus on subjective understandings of our narrative history.

The ambition of this stage was to see how viable it was to create assets that combined multiple diverse sources into a singular representative medium. While developing an understanding of data gathering and scraping methods with all their possible applications.

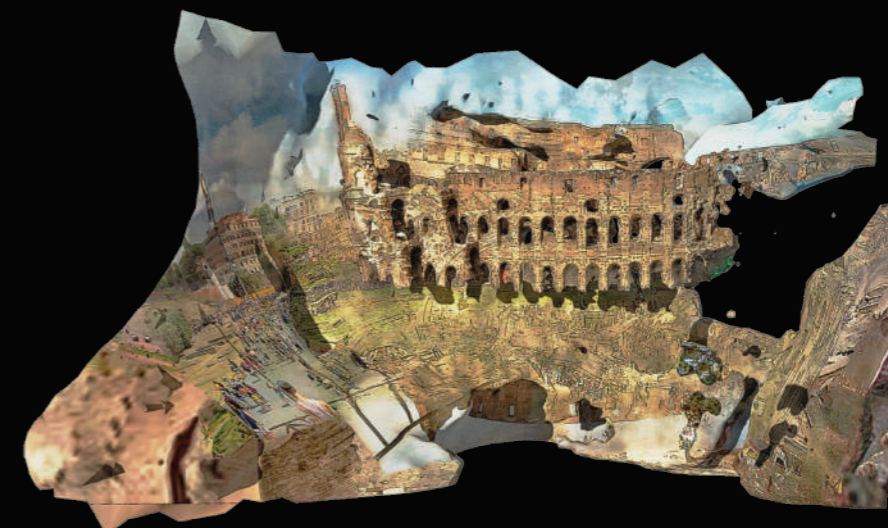
The conclusions were reworked through the GAN mainly in the form of animation creation to demonstrate how easily instance states could become part of the greater narrative of process development and so allow for a richer discussion on subjectivity within our understanding of heritage.

Animation proved to be a very important tool to reflect on and demonstrate this approach, easily communicating concepts of temporality and narrative that otherwise might be lost in more conventional archetypical precedents. The author also began to experiment with spectrograms as means of turning generated visual images into audible compositions, to both complement the work made and explore the permeability of mediums offered by emergent technology.

By far this experimentation undertaken during the aforementioned section was the most fun and interesting. It brought together all the material previously discussed in the thesis for the purposes of manifesting subjectivity and reflecting on our speculative heritage. It also highlighted the residual embedded qualities that are materialised within processes of fabrication and representation. Through the iterative workflow utilised it became increasingly possible to comment on and understand this latent and seemingly continual form of change in an artifact as it transitioned between the physical and digital worlds. This offered an analogy meditating on how we comprehend and communicate representative artifact-based accounts of heritage over time. Both steadily alter containing fragments of the original but gradually variegating as result of entropy and their means of conveyance. The resultant essence reflects on this temporal shift within the conveyance of an entity, which allows for the issuing forth of highly subjective content that underlines the speculative nature of how heritage functions and develops.



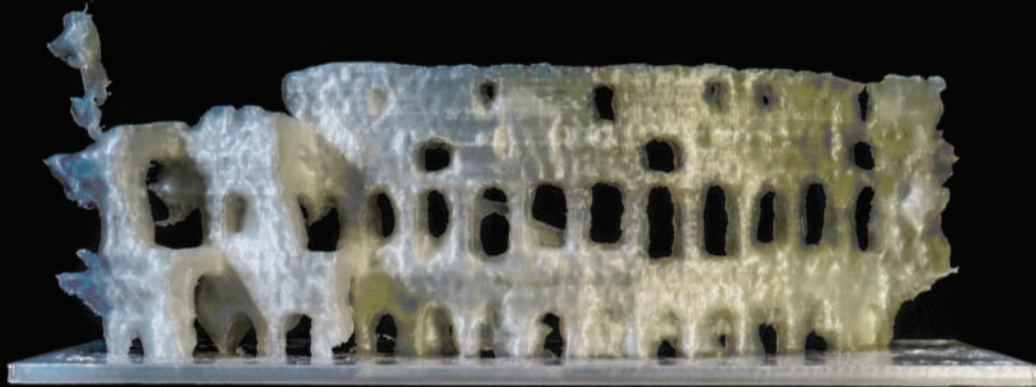
Workflow for Web scrapping to model creation



Model made from web scrapped imagery



Plaster printed model of the colosseum made through web scrapping



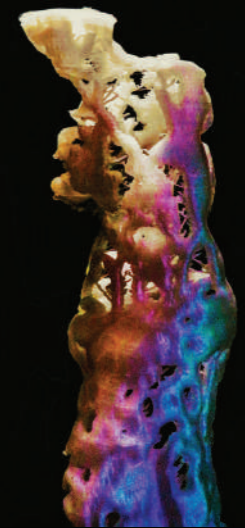
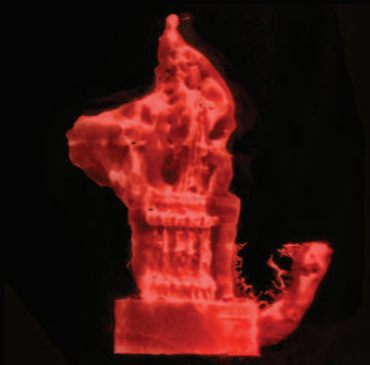
3d printed model made from web scrapped imagery



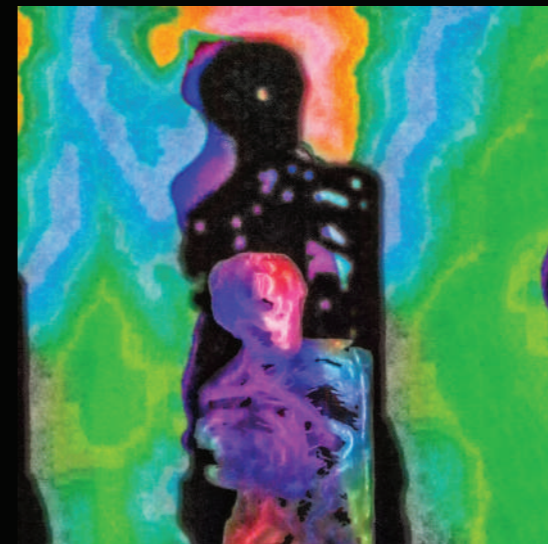
Digital model made through web scraping



3d print of statue of liberty



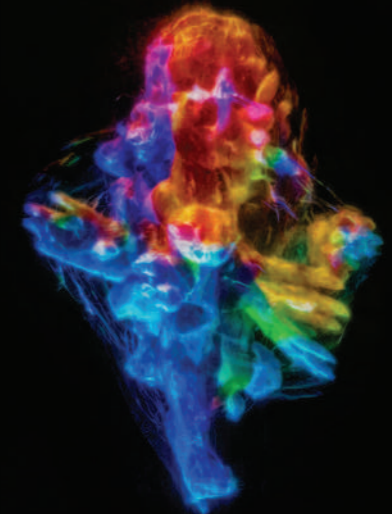
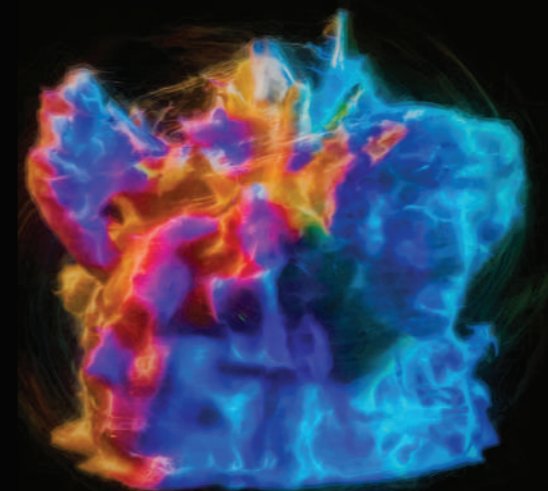
3d printed sculpture exploring how to offset space point clouds to make a printable models



Still from filmed design experiment in projection and narrative



Still from film exploring projection and narrative



3d printed model exploring composition, authenticity, fostering subjectivity





3d printed model exploring composition, authenticity, fostering subjectivity

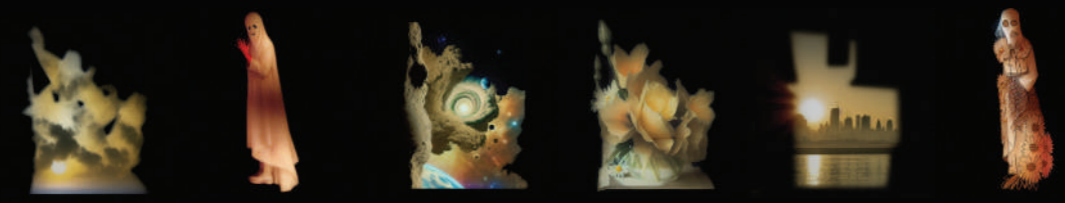
Animations proved a highly valuable method for developing narratives, while highlighting the potentials for subjective interpretation that are offered by the workflow process. A huge amount of material was produced this can be viewed on YouTube on the playlist @tadhgcharles - [https://youtube.com/playlist?list=PLfT\\_rJaHg8AzufJUyIeLUDM4BN6csomiC](https://youtube.com/playlist?list=PLfT_rJaHg8AzufJUyIeLUDM4BN6csomiC).

This way of working allowed for a speculative reflection on how pieces could potentially develop and what elements it was desirable to embed with in them.



Still from film

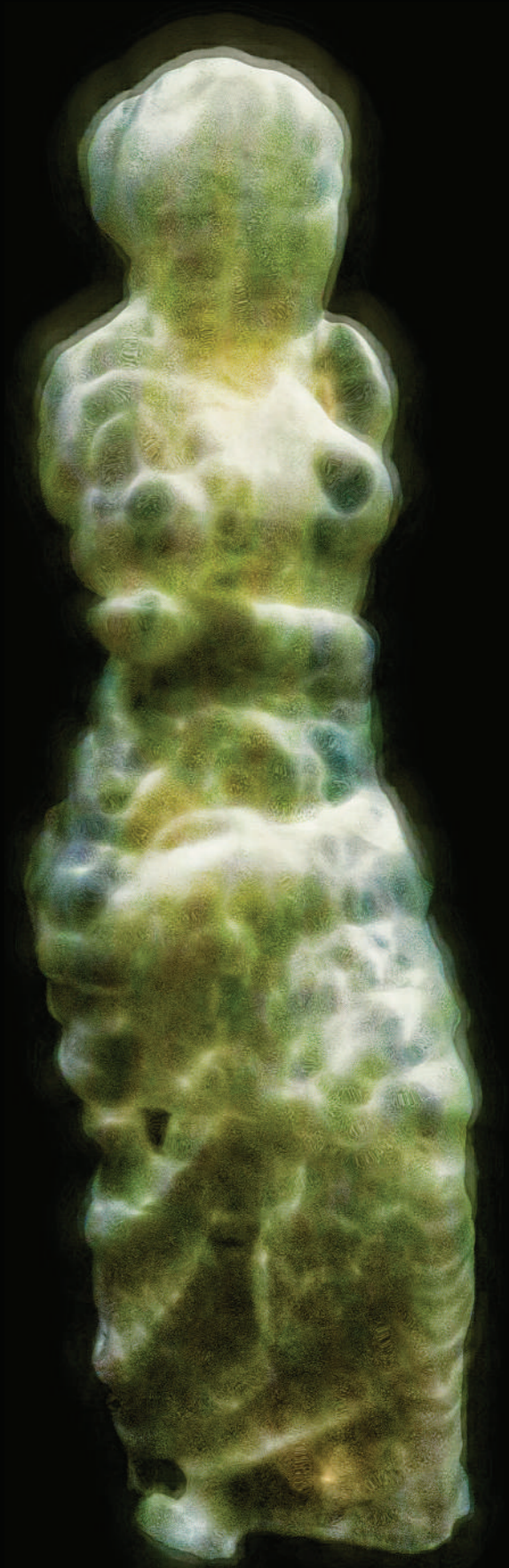
[https://www.youtube.com/watch?v=g-1XLHVYuUk&ab\\_channel=TadhgCharles](https://www.youtube.com/watch?v=g-1XLHVYuUk&ab_channel=TadhgCharles)



Stills from films exploring how to reintegrate printed models as narrative devices  
[https://www.youtube.com/watch?v=Gu\\_aYaSfC-4&ab\\_channel=TadhgCharles](https://www.youtube.com/watch?v=Gu_aYaSfC-4&ab_channel=TadhgCharles)



Diagram considering model composition



Photograph of large 3d print

## DESIGN OUTCOME AND ANALYSIS

The design explorations proved to be an invaluable stage in condensing all the aims and hypotheses of this thesis allowing for reflection on the objectives of the work and how best to communicate them to others. One of the unintended realizations resulting from these investigations was the degree to which the barrier between the physical and digital realms has become permeable. The ease with which media can go from being manifest within the planes moving endlessly from the physical to the digital and back as necessitated by any requirements for their deployment as recorded assets. This, combined with the continual improvements in the fidelity of recording mechanisms that allow for ever more materially accurate documentation and storage of a artifacts character, means that seemingly accurate simulacra can easily be generated. These replicas can be composed with such a high degree of faithfulness as to have little to no physical content that separates them from their originators to any onlookers other than experts and their creators. A frightening discovery emerged from sharing analysis of the works results and outcomes with interested participants. This was expressed in the application of an illusory concept of self-determination being applied to the generative models. It brings us back to the problem which was carefully avoided throughout the thesis, the opinion where users are guided by applications rather than their own creative intent. All too regularly users blame tools, stating a programme is not good at a particular function or that the application won't let them enact a task. This grants a non-existent agency to instruments that require users in order to generate any output. The concept of an application driven approach towards heritage and information should induce a cautious and critical approach towards the implementation of these appliances.

The more complex the apparatus at our disposal, the higher the probability of applying some false notion of autonomy to its functioning. This is to be avoided at all costs, as it leads to subpar end products and a stifling of creativity. It would seem strange if someone were to state that a pencil drew a drawing, or a hammer made a house so. We need to apply a universal approach to our definition of self-governance in relation to tools, lest we lose sight of our own objectives within their functioning. This is particularly relevant when we are deploying applications that utilise machine learning. These are systems that are honed on content that permits a seeming degree of awareness resulting from the vast datasets at their disposal. What must be remembered is that access to information and its critical application are two very different things. An artificial intelligence does not reflect on a task during its undertaking. It can be made ever more precise iteratively through tuning. The problem in its simplest form is one of semantics and critical thinking, terms like intelligence, training, learning and neural networks are applied to silicon-based conveyances. Alternate, less natural and more utilitarian language should be deployed to help minimize the anthropomorphising of machinery lest we forget it is not human. The end stage products of the explorations highlighted the tenuous understanding that most individuals seem to possess in relation to heritage and its perpetuation and communication. In combination with this, they explored ways of communicating and commenting on that relative subjectivity to create embodied depictions of individual understanding. These emergent digital technologies can be used as a critical tool to speculate on alternate approaches towards future projects while simultaneously allowing for a broadening of the range of people involved in the dialogue. But they must be carefully deployed with a focus on discussion and shared representation both in the utilized datasets and the trained application of the models. If they are not carefully established and deployed with conscious intent, they can lead to a strengthening of conventional norms which results in greater repetitive discrimination. This is because they can let us create almost instantaneous visuals and models that reimagine a structure we can play through scenarios in simulations that expand upon options which in the past might not have been explored. In their most ideal application these tools become imaginative communicative devices for the sharing and perpetuation of a communal past. At their worst they can become stagnant enforcers of hard-line authoritarian doctrine.

## DISCUSSION

Throughout this thesis there has been a continual objective to reflect on how we comprehend, maintain and disseminate heritage. One of its aims has been to highlight the subjectivity of discourse and understanding regarding the manifestation of the past through artefacts. The work presented here endeavours to suggest the latent potentiality for a more inclusive and representative form of preservation, through the application of emergent technologies that permit individuals to consider the relative subjectivity of their understandings about how we preserve and discuss our cultural inheritance.

We have moved from initial stages which reflect on the basic idiosyncrasies associated with approaches towards heritage and preservation. These form the foundations for what are regularly considered objective positions that allow for analysis of the past, primarily dealt with in the section entitled Replicas, Authenticity and Composition. That section introduced the major critical analysis of how subjective our approach is to time gone by, acting as a vehicle to highlight the eccentricities of culturally normative approaches towards heritage. New technological means and conveyances were the next topic that was dealt with. During that section the possibilities offered by the practical application of these tools was explored in detail with reference to their current usage. Building on this, we then considered more experimental means of deploying these devices to unlock a vast expanse of new potentialities. It was then necessary to provide the reader with an overview of the more experimental assets used for the purposes of the research presented here. Doing so would permit a greater comprehension about the role which technology plays and allow a more informed engagement with the subsequent work.

Workshops were a vital part of this study allowing for the accumulation of information about more general comprehensions of nostalgia, authenticity, history, valuation and our narrative past. The resultant data helped inform and shape the subsequent design explorations. These explorations aimed to highlight the subjective nature of how we understand history, while exploring speculative methods of representing heritage. A basic theme that has run throughout this research is the fundamental importance of criticality and speculation in how we deal with narratives as they are presented to us during their consumption, and in what way they are then disseminated and transmitted through us. This ties in the idea that our heritage is a living entity, dwelling in our minds feeding and reproducing through our engagement with it and its subsequent depiction, slowly evolving over time and becoming a creature that contains only part of its original self.

Just like the cells in our bodies are replaced until we are composed of entirely new corporal matter, the elements of our narrative past change and rearrange themselves. They become harmonies in a flowing composition that holds together a central theme composed of disparate fragments. We rarely ask ourselves if we are the same person as we transition between decades of our existence. What we once were may only be an echo, a residual lingering note underlying and complementing the progression of our current melody even as it fades out. In the end, much like a song our heritage can be realized in an infinite number of ways, but always contain a refrain that permits its recognition. We never question the genuine authenticity of a song but fundamentally comprehend the qualities it contains that bring it within the remit of our understanding.

This work argues that the past has always been like a ballad or an epic poem. Its medium of presentation may have changed and its composition might sound slightly different being augmented and adapted for each performance. The question is how we recognize it as itself? When we travel to ever more subjective means of engaging with the past, just like music, how do we explore ways of representing and discussing this individuality? Emergent technology if applied correctly and critically seems to offer an unparalleled vehicle for enabling communication and representation of the personal to the communal. This permits us to follow back the entangled web of memory traces to a common space we can all understand and share with one another.

## CONCLUSION

“It matters what matters we use to think other matters with; it matters what stories we tell to tell other stories with; it matters what knots knot knots, what thoughts think thoughts, what descriptions describe descriptions, what ties tie ties. It matters what stories make worlds, what worlds make stories.” (Haraway,2016)

This quote from Haraway’s 2016 book ‘Staying with the Trouble’ embodies the main aspects of my thoughts resulting from undertaking this research. The authenticity of our physical material constructed world is in actuality of little importance. Artefacts act as touchstones, vehicles that frame subjective narratives allowing us to stare into the mirror reflecting our constructed reality. What matters is the contextual anecdotal nature of our engagement with this entangled network. The scale and situatedness of acting objects within this structure is regulated by concepts of homolocality and hauntology all of which on closer scrutiny dissolve letting us trace the tributary of our subjective existence. This emphasis on narrative comprehension makes clear to me the importance of storytelling and sharing our worlds with one another. It seems to me that emergent technologies such as generative networks offer an unprecedented opportunity for deployment as narrative devices. Letting us better reflect on how existence is objectively inhabited in a time of unprecedented algorithmic subjectivity. In our post truth age, we must be critical and analytical of all accounts. Understanding that it has never been easier to be presented with seemingly factual information, that is in fact a biased illusory fabrication. The role of big data and existent power structures to influence the development of narratives and the resultant lived reality has never been more pervasive.

Think about groups like Iconem who recreate vanished places through a variety of methods. They have continually and deliberately omitted any information relating to historical narratives that are at odds with the ideologies of their sponsors. The recording and dissemination of historical narratives has always been proscribed and restricted. What has changed is the scale and method of recording information. When we continually unconsciously record and back up the corpus of our persona’s chronicles to clouds, we are giving part of ourselves and bifurcating that existence. Duality of self is intrinsic to the human experience as creatures of body and mind closed away from one another. We use devices to communicate and structure a shared experience which manifests as a multiplicity of transitional continuations. Whether these tools are language, narrative stories, clothing or technology each exists in a hierarchical relationship structuring how we understand our world.

The clearest example of this can be seen in the funeral practices of religions, where the individual transitions from the world of the flesh to that of the spirit. The information that comprises their character is converted and transferred from one plane of existence to another. This has a striking parallel with the digital, where information is moved from one realm of being to another. Unlike the divine, the digital has far more accelerated means of manifesting across platforms of existence. Digital transubstantiation means that through emergent technology aspects of the cybernated existence can take on forms in the physical world, undertaking dualistic experiences reminiscent of our own human condition. The digital actuality is controlled by a very small user group who can regulate its application. Much like the divine or the self we must be careful and introspective of the digital. How we access its domain, what we take with us and leave there, what returns from that space and who controls it, are means of transitioning between realms of being. It is crucial we critically reflect on and discuss the conceptual application of our tools so as not to be subject to them.



3d print model texture

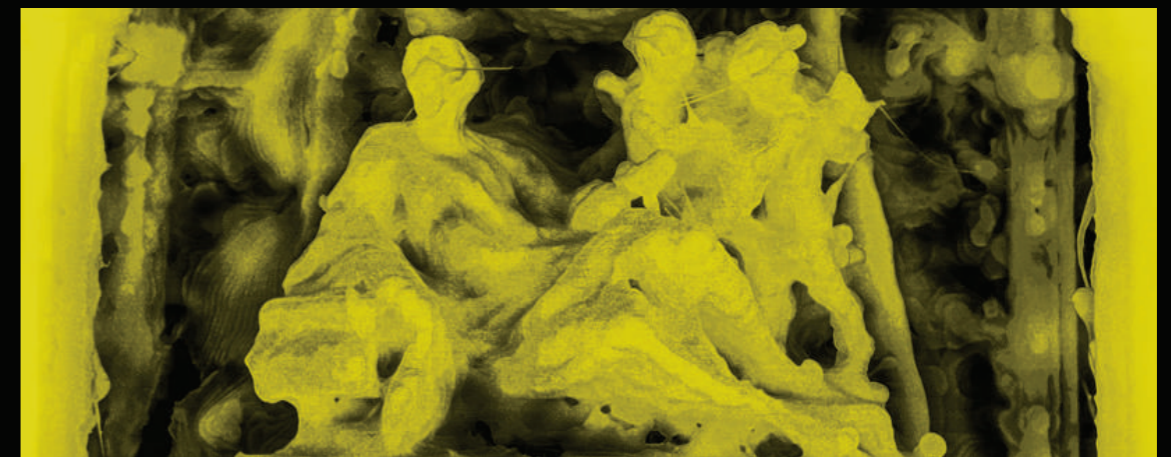
Lived reality has always been a permeable structure. Everything changes, but current approaches towards heritage attempt to deny entropy and secure a type of coherence that provides a stability, which is so badly desired in our fracturing world.

This approach is filled with the dangers of stagnation. The possibility of the establishment of parametric heritage, based on data driven approaches towards preservation, will only exacerbate the problems associated with this path. Nothing new can emerge from the contents of a dataset, only a perceived novelty which is an amalgamation from what has already been made. If artificial intelligence was fed on its own output this would accelerate a process of convergence, leading to ever more heteronormativity and eventual model collapse. The manifestation of originality through sampling and remixing gives a clear example of how individual involvement and curation can allow for the emergence of new and ingenuitive expressions. We need to critically maintain data lest it stagnate. Like any entity it requires care and maintenance to flourish. In the words of Everest Pipkin “To work with generative systems is to be a curator.....to curate a corpus is to value the contributions inside of it.....they are still artworks individually, and the people who make them are still artists. Curating your own corporea is to be able to deal with the original creators of your corpora as humans and as collaborators, not as datapoints.” We must take the same approach towards our heritage, understanding that it is the embodied manifestation of subjectivity containing multiple diverse aspects and never a singularly objective fixed node, it is water and not stone.

All things are process, the steady flow of a river. If we cross over its body, we must except the transit, knowing we will never feel the same caress twice. In cases when we cannot except this passage, we may decide to go the course and drift downstream.

We might prefer to sink beneath the surface, to sit in the depths, admiring the echoes from a world above, while slowly being worn away by the current. But supposing, that we never wet our feet, but instead remained stationary, watching everything pass. How much poorer are we for never having known the touch of the water on our skin?

A glacier is a frozen body of water seemingly fixed in place, and architecture was described as frozen music by the German poet Goethe (Eckermann, 2022). But even glaciers move, imperceptibly surging forward. Nothing is forever stationary; all we can do is choose our course in the presence of the cascade and bask in the hymn of the deluge. We like to present fictions of the original, of individual genius, of fixity and stability in order to deny the transitory nature of our own and all existence while attempting to maintain systems that collapse in the certainty of change. Through the speculative methods proposed in this thesis, we can explore the most appropriate line of action while acknowledging and preserving the alternate tributaries that never came to be. We can share stories acknowledging and understanding the relative subjectivity embodied within them. Binding ourselves ever closer together in a shared entanglement of cosmogonic myths. We can grok one another, comprehending and creating a richer more inclusive and diverse future built on our collective Speculative Heritage.



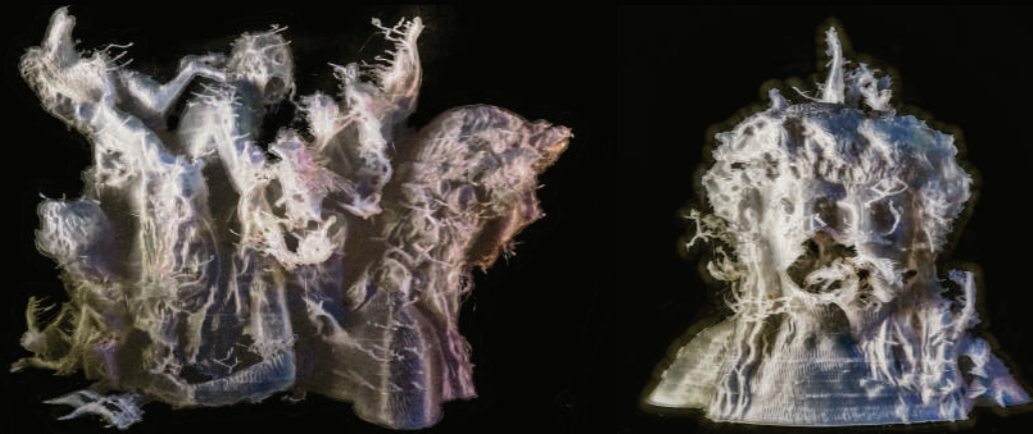
Yellow print exploring how to display model

## REFLECTION AND SUMMARY

During the research I continually returned to Jean Baudrillard's work *Simulacra and Simulation* particularly the terrifying quote "Illusion is no longer possible, because the real is no longer possible." (Baudrillard, 1994, p19). More than any other thinker I have recently engaged with Baudrillard has informed and challenged my comprehension of reality. I wanted to understand how it might be possible to communicate and share commonalities in a post truth age where reality seems to be splintering at an ever-accelerated rate.

This made me reflect on narrative and stories that form the base of how we understand and engage with the world. One of my primary reasons for studying architecture is a fascination with the constructs that we build around ourselves and how they shape us. Dwelling places and their associated personal narratives are intrinsic to the human condition, forming the embedded nature of narrative engagement with material that allows for a through line connecting us to one another across time immemorial. Initially I was interested in using emergent technology as a means of exploring ingrained signs of usage within built structures. This would act as a way of highlighting the intimate individual interactions that are represented in engagement over time reflecting on temporality and the interplay of actors influencing one another. The significance of steps worn down by many feet, the feel of a familiar door handle to your fingers, the sound of a lived-in room. These phenomenological semiotic constructs seemed to offer a way of structuring a base line for discussions about our shared reality.

Upon further research however, it became apparent that current approaches towards preservation all too frequently obliterate traces of this individual usage that allows for simple human understanding to be preserved and communicated. It seemed more appropriate at this point to see if the ever-accelerating range of new digital contrivances, that all too frequently increase our separation from one another, might be applied as critical analytical tools for communicating and preserving subjectivity while allowing for representative coherent discourse on the past. For this reason, I undertook the work that has been presented here as means of deploying new applications in an experimental manner, that would allow for a critical evaluation of how we understand heritage and what these new tools can bring to the conversation that fosters resilience, representation and adaptability. All the time trying to speculate on how we can allow for multiple simultaneous readings of a construct that highlight subjectivity, challenging traditional positions of correct intelligibility of an edifice's essential character. I have demonstrated the possibility for the manifestation of subjectivity through emergent technology. This thesis offers a means of speculating on potential means of representing and disseminating our past in a new and experimental manner.



3d printed model exploring composition and authenticity

## GLOSSARY

GAN - Generative adversarial networks / a digital model that can generate content.

CLIP - Contrastive Language-Image Pre-training / It can be instructed in natural language to predict the most relevant text snippet, given an image, without directly optimizing for the task.

Blip - Bootstrapping language image pre-training / an alternate means of model training and improvement.

NeRFs - Neural Radiance Fields / generates 3D representations from 2D images by using machine learning.

Memory trace - The intangible narrative connection that defines our understanding of reality.

DNN - Deconvolutional neural network / networks that work in a reversed process from convolutional neural networks.

CNN - Convolutional neural network / a class of artificial neural network uses a mathematical operation called convolution in place of general matrix multiplication.

Dataset - A dataset is a collection of data it can be comprised of any amalgamated media.

Neural network - A series of algorithms that try to determine connections in a dataset through a process inspired by how the human brain works.

Algorithm - A set of rules to be followed to reach an outcome.

Deep learning - Trying to create algorithmic constructs that function in a manner inspired by human cognition.

Ka - The spiritual part of an individual which survived after death and could reside in a statue.

Digital twin - A digital representation of an intended or actual real-world physical product, system, or process.

Deconstructivist - A approach to understanding the relationship between Object and meaning.

Object - Anything which cannot be added to or subtracted from without losing the essential understanding of its identity.

Embodiment - To be contained within.

Identity - The understanding of a relational entity in the contexts of its situation.

Homolocality - The understanding of something in relation to the contextual spatial location.

Original - The first instance of something.

Counter-memory - A false imagined occurrence resulting from engagement with external media.

Iteration - A new version of something with noticeable differences from the original.

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## IMAGES

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Figure 2 - Francesco Primaticcio, Laocoon, bronze copy, 1543 Fontainebleau, Musee National du Chateau, since 1968 in storage in the Louvre, inv MR 3290 Photograph Bernard Frischer From Boardman, John. 1993. The Oxford History of Classical Art. Oxford University Press

Figure 3 - Filippo Magi’s restoration of the “Laocoon” with the father’s right arm found by Pollak by Filippo Magi, 1960. Photograph by Bernard Frischer. From Barkan, Leonard. 20 March 2001. Unearthing the Past: Archeology and Aesthetics in the Making of Renaissance Culture. Yale University Press.

Figure 4 - Late 19th century photograph of the Laocoon showing Canova’s restoration with Montorsoli’s right arm of the father and Cornacchini’s right arm of the younger son. From Barkan, Leonard. 20 March 2001. Unearthing the Past: Archeology and Aesthetics in the Making of Renaissance Culture. Yale University Press.

Figure 5 - Barcelona Pavilion, 1929, From Hosey, Lance. 2018. The Ship of Theseus: Identity and the Barcelona Pavilion(s). Journal of Architectural Education; Vol. 72 Issue 2, p230-247, 18p.

Figure 7 - Barcelona Pavilion, 1986, From Hosey, Lance. 2018. The Ship of Theseus: Identity and the Barcelona Pavilion(s). Journal of Architectural Education; Vol. 72 Issue 2, p230-247, 18p.

Figure 8 - Barcelona Pavilion, 1929, From Hosey, Lance. 2018. The Ship of Theseus: Identity and the Barcelona Pavilion(s). Journal of Architectural Education; Vol. 72 Issue 2, p230-247, 18p.

Figure 9 - Barcelona Pavilion, 1986, From Hosey, Lance. 2018. The Ship of Theseus: Identity and the Barcelona Pavilion(s). Journal of Architectural Education; Vol. 72 Issue 2, p230-247, 18p.

Figure 10 - Barcelona Pavilion, 1929, From Hosey, Lance. 2018. The Ship of Theseus: Identity and the Barcelona Pavilion(s). Journal of Architectural Education; Vol. 72 Issue 2, p230-247, 18p.

Figure 11 - Klimt vs Klimt digitally restored painting, Google Arts & Culture.2021, <https://artsandculture.google.com/project/klimt-vs-klimt>. Shirodkar, Suhita. 2021. Can AI Truly Give Us a Glimpse of Lost Masterpieces?. <https://www.wired.com/story/artificial-intelligence-reviving-lost-art/>.

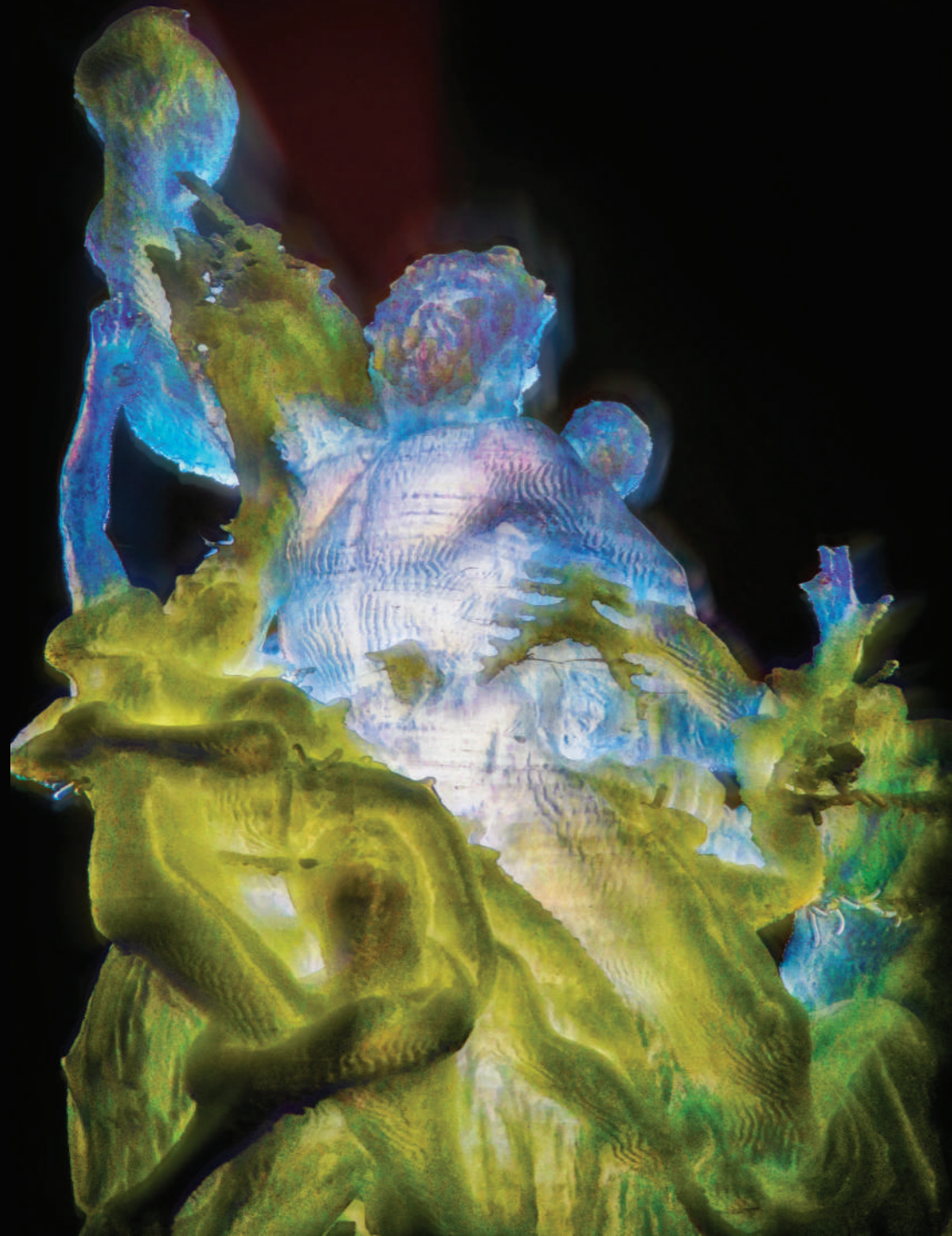
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Figure 13 - Reconstruction of Vincent Van Gogh, Two Wrestlers, Bourached, Anthony. Cann, George H. Griffiths, Ryan-Rhys and Stork, David G. 2020. Recovery of underdrawings and ghost-paintings via style transfer by deep convolutional neural networks: A digital tool for art scholars. Computer Science Department, University College London, London, UK

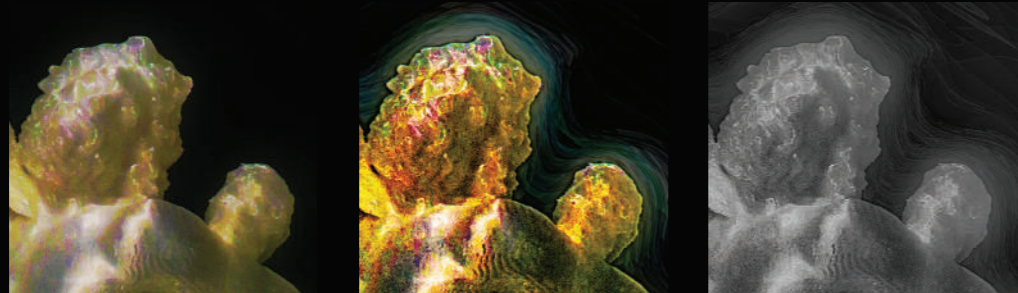
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Figure 15 - Visual explanation of NeRF, Gao, Kyle (Yilin) Gao, Yina. He, Hongjie. Lu, Dening. Xu, Linlin. Li, Jonathan. 2022. NeRF: Neural Radiance Field in 3D Vision, A Comprehensive Review. University of Waterloo

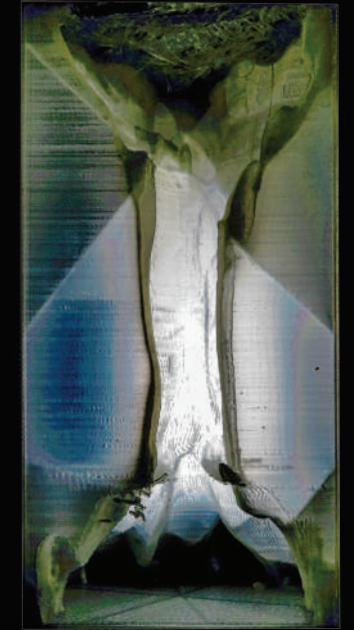
Figure 16 - Visual method of reconstructing the art hidden beneath The Old Guitarist, Pablo Picasso. The old guitarist. The Art Institute of Chicago, 1903-1904. Bourached, Anthony. 2019. Raiders of the Lost Art, University College London. Hanaphy, Paul. 2022. AI and 3d printing used to recreate lost van Gogh artwork in UCL initiative. <https://3dprintingindustry.com/news/ai-and-3d-printing-used-to-recreate-lost-van-gogh-artwork-in-ucl-initiative-215454/>



Photograph of 3d print exploring lighting



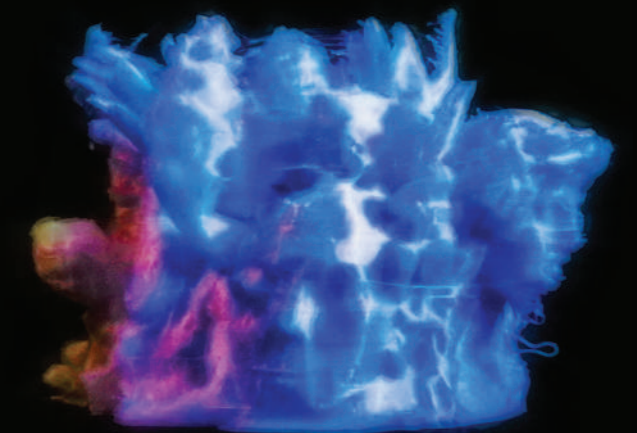
Editing photos to highlight subjectivity



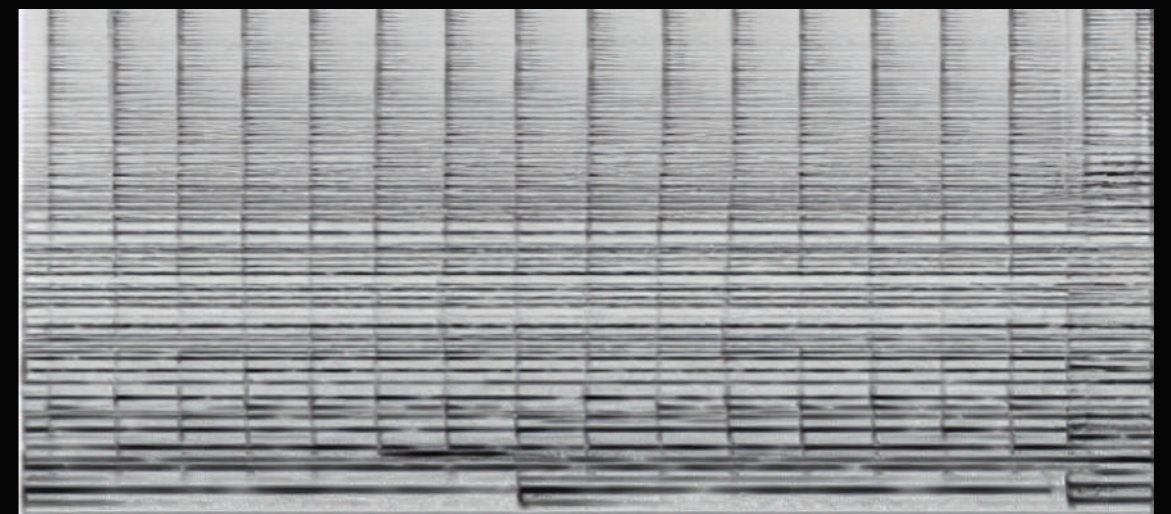
Inverted models made to explore lighting and subjectivity



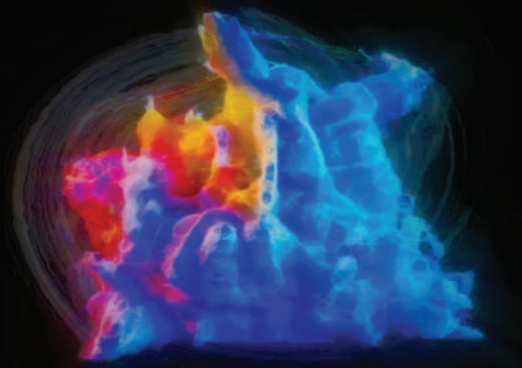
Model exploring light



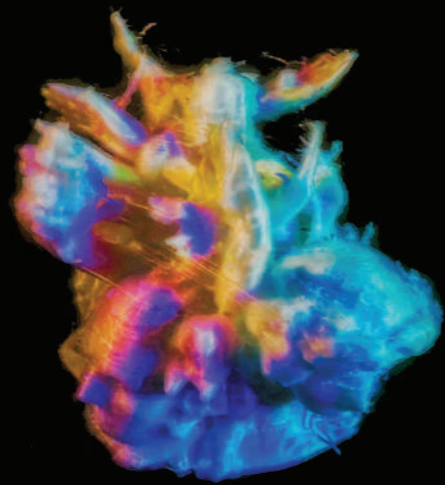
Model exploring material illumination



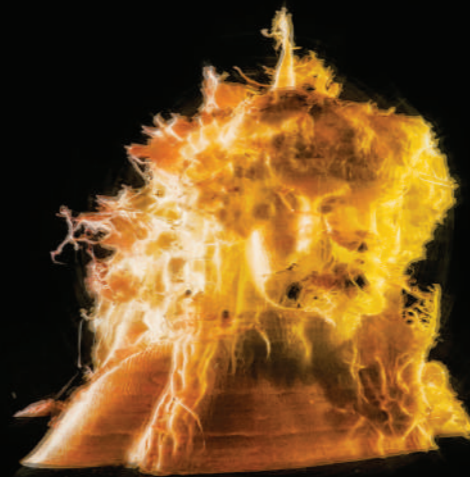
Spectrogram showing sound generated from image analyses using AI



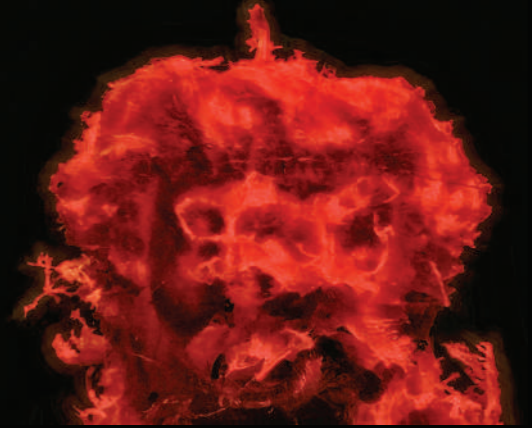
3d printed model exploring light and narrative



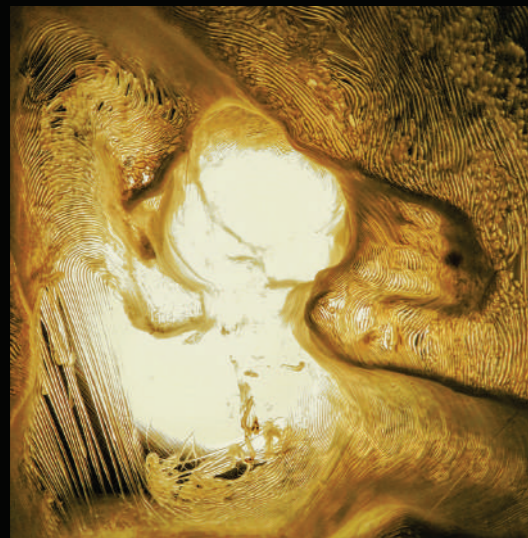
3d printed model



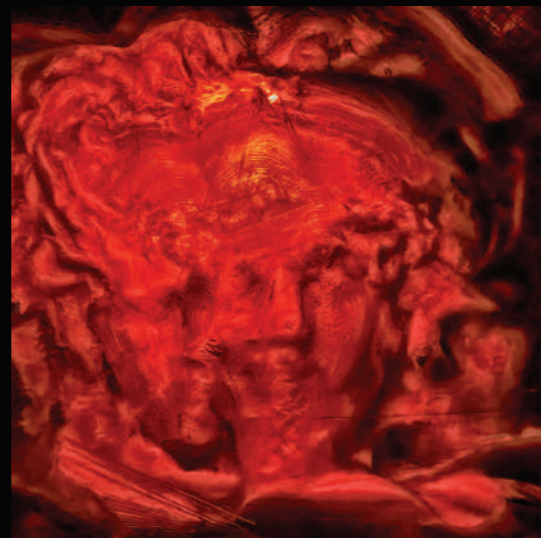
3d printed model



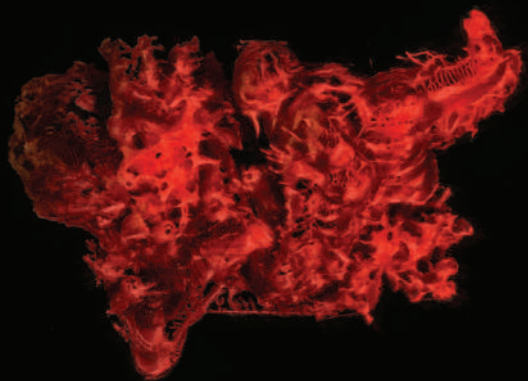
3d printed model



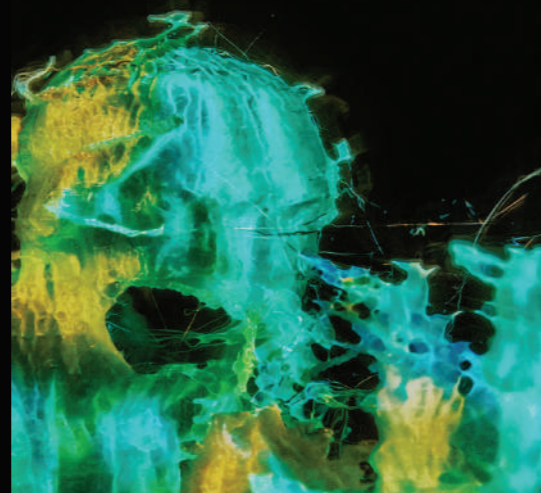
3d printed mold exploring composition



3d printed mold exploring composition



3d printed model exploring composition and replication

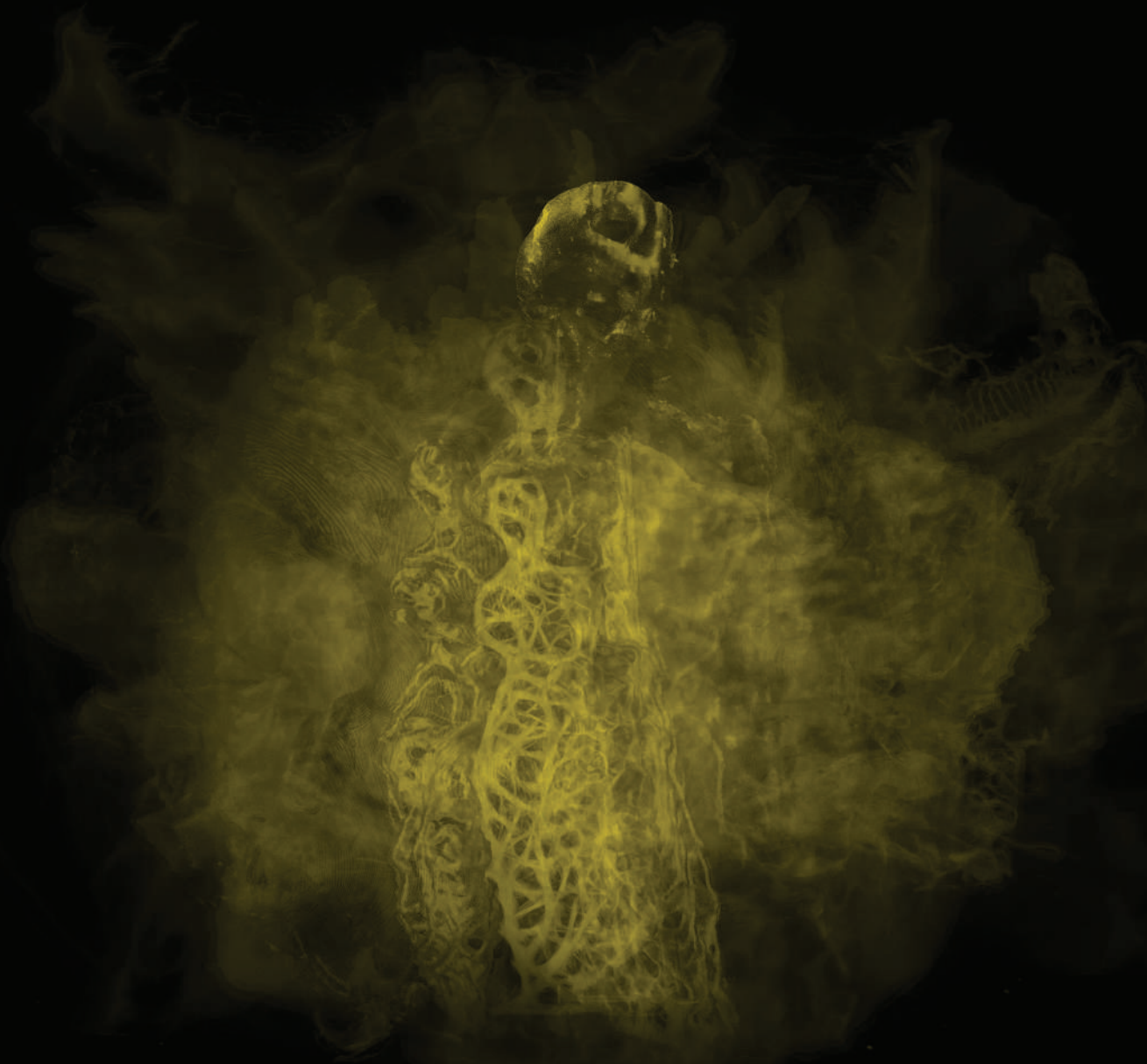


3d printed model exploring composition and replication



3d printed model





## FROM HERITAGE TO TECHNOLOGY AND THE END OF OBJECTIVITY

Heritage technology and the death of objectivity, this thesis questions the potential redundancy and impossibility of conventional approaches towards preservation. It suggests that instead of despairing in the fracturing of our realities we should embrace the narrative, representative, possibilities offered by emergent technology to allow for richer more entangled subjective realities to manifest. With references spanning from the Egyptian Book of the Dead to Freudian theories of “the memory trace” it will take you on an exploration of what it is we in fact desire from our past and how best we can actualise this in a manner that fosters resilience, representation and adaptability.