

The Photogrammetric Image and Black Boxed Mutative Automation considered through Philip K Dick's "The Preserving Machine".

Peter Ainsworth^{*}, Sam Plagerson^b and Tom Milnes^c

^a *Photography, University of the Arts London, LCC, London, UK;* ^b *Fine Art, Goldsmiths, London, UK,* ^c *Fine Art, Arts University Plymouth, UK*

Provide full correspondence details here including e-mail for the *corresponding author

University of the Arts London
London College of Communication
Elephant and Castle,
London
SE1 6SB
p.ainsworth@lcc.arts.ac.uk

Abstract

The multi-media research collective, *The Preserving Machine*, was initiated through collaborative discussion in response to Philip K. Dick's 1953 short story of the same name. The paper considers Dick's story in light of current forms of image making apparatus, specifically in relation to photogrammetry. Dick's protagonist, Doc. Labyrinth's design and ambitions of *The Preserving Machine* to safeguard cultural heritage in the light of ecological catastrophe resonates with the application of 3D imaging technologies in cultural heritage industries. However, his positionality is problematic as it both highlights the nature of preservation as being potentially extractive and does not account for the agency of the machine in the process.

The text foregrounds the ways in which current computational forms of photogrammetry are conceived in the humanities, with reference to the language of post-cinema, gaming and most importantly photography. The argument is structured to mirror the digital production pipeline of photogrammetric processes to highlight the problematic industry rhetoric claiming objectivity, accuracy, and automation. This methodology thus deals with issues surrounding the choice and capture of data input, consideration of the black-boxed processing and mutative automation and expectations surrounding reproducibility.

The authors propose that current forms of conceptualising photogrammetry are insufficient to account for these hybridised digital image forms solely through the language of index, likeness, and simulacrum associated with photographic theoretical dialogue. Instead, these 3D images need to be considered relationally to wider assemblages of meanings that are less readily understood through singular, coherent theoretical readings.

Keywords:

Photogrammetry; Photography; Philip K Dick; Computational Image; Cultural Heritage; Digital Reproduction

Introduction

In Philip K. Dick's short story, *The Preserving Machine* from 1953, set in a society in the near future ravished by ecological disaster and war, a scientist called Doc. Labyrinth becomes worried about the decline of humanity. Comparing his society's contemporary circumstances with the ruins of previous civilizations, he seeks a way of safeguarding (what he sees to be) the most ephemeral cultural artefacts of human achievement, classical music. His solution is to create the

Preserving Machine which transforms sheet music into organic living matter; a Mozart score becomes a small bird with peacock feathers, a Beethoven score emerges as a beetle, "stern and dignified"¹, whereas the Stravinsky bird is "made up of curious fragments and bits."²

We read Dick's story as resonating with attempts to capture and arrest the world through photography and now 3D imaging processes. There are important parallels between the technology of the *Preserving Machine* and the debates that surround current forms of imaging entangled with computational processes. The creation of the *Preserving Machine* therefore becomes a useful analogy to explore the increasing prominence of 3D photographic technologies particularly those used in the context of cultural heritage industries. It is especially relevant to current photogrammetric technologies, which appear anomalous, incoherent, and fragmented in their raw form just as Labyrinth's creatures are unexpected, strange, and alien in his opinion. The lesson learned from the utilisation of the automated imaging process is that a shift is signalled from the intentions of the creator to the operative agency of the machine.

Labyrinth, in the short story, embodies a particular kind of imperialist enlightened thinking that preferences certain ideas of culture over others, through processes and lenses of society that he sees as being eroded. This positionality stands in relation to the problem Donna Haraway seeks to address in her call for a feminist situated knowledge as a means to counter "the vantage point of the cyclopean, self-satiated eye of the master subject."³ This an accusation that could be levelled at Labyrinth in his flawed, unethical, and ultimately thwarted attempts at world building. Labyrinth's positionality notwithstanding, Dick's story remains a complex analogy as it points to multiple issues surrounding biological and genetic engineering. However, in the context of this paper we utilise the narrative to think through photogrammetric imaging processes as the story points to a number of problems in relation to preservation as a form of reproduction.

The ability to replicate with precision and detail indistinguishable from originals lies at the heart of the rhetoric surrounding how photogrammetric images are becoming conceptualised. This is increasingly determined as an operative concern in debates surrounding the digitisation of cultural artefacts and how they are conceived for dissemination. However, the ideological position of institutions and enterprises invested in cultural heritage, particularly the knowledge

claims made through photogrammetric technologies, needs to be questioned. The argument of the text thus directs attention towards the wider assemblage and processes of technologies that make these transformations of image data possible.

We suggest that there is something mysterious in what happens to the input data through these processes, which requires rethinking computational operations. This involves a shift away from the sole primacy of originality towards the incorporation of a broader conceptualisation of mechanical reproducibility. In this sense we are seeking to use Dick's story to consider photogrammetric processes produced through algorithms hidden behind black-boxes, to problematize knowledge claims and expectations of these emergent forms of image-making technology. The first section of the text foregrounds the ways in which current computational forms of photogrammetry are conceived in the humanities, with reference to the language of post-cinema, gaming and most importantly photography. The argument from this point is structured to mirror the digital production pipeline of photogrammetric processes to highlight the problematic industry rhetoric claiming objectivity, accuracy, and automation. The second section deals with issues surrounding the choice and capture of data input; the third section considers algorithmic processing as being a mutative form of automation. In the final section we conclude by considering expectations surrounding reproducibility returning the story's conflation of organic and mechanical reproducibility. This line of flight allows us to posit ways in which these images represent an important challenge to conventional visuality dictated by the expectations of industrial image processes.

Expanding the field through which Photogrammetry is conceived as Preserving Machine

Current forms of computational photogrammetry could be understood through multiple interlocking research areas, most closely theories surrounding photography, cinema, and gaming within the humanities. However, the conceptualisation of photogrammetry does not sit neatly into any one of these debates because of the complexity of these technologies that shift between different forms of visualisation, encounters, and materialities. Certainly, there are relations between the now extensive research areas surrounding computational images. However, 3D scanning created from electromagnetic sense data (inclusive of photographic images, light

detection and ranging (LiDAR) and computed tomography (CT) scans) is often confined to a technical understanding in disciplines such as computer science, forensic anthropology, or medical practice rather than onto-epistemological analysis.

In emergent forms of 'post-cinema' analysis, computation is seen as reshaping and irrevocably changing the field of the moving image. Lev Manovich's concept of "Photorealism" argues that CGI emulates not a perception of reality as seen through human eyes, but reality "as seen by the camera lens."⁴ Steve Shaviro, with reference to an extension of the Deleuzian "time image"⁵ suggests that "linear, progressive temporality has somehow come undone."⁶ This conceptualisation is developed by theorists such as Shane Denson as being "discorrelated"⁷ in that new forms of cinema break normative relations between time and space that order "spectorial subjectivity with cinematic images"⁸ Theorisations of post-cinema emphasise the inhabitation of non-human perspectival viewpoints through the utilisation of computerised technologies. This approach has changed the ways narrativity is established outside of this specific frame of reference including how photogrammetry is understood in the context of cultural heritage. However, post-cinematic theorisation often deals with the finalised synthetic and manipulated product of post-production neglecting the raw output produced through automated software.

Photogrammetric technologies need also to be considered in relation to navigable software interfaces such as the interface through which photogrammetry images are viewed intersects with gaming engines. The language of gaming becomes important to think about in contending with photogrammetry as it is unlike experiences of post-cinema or the still photographic image. The engagement with these forms of mediation through the ability to choose an experiential viewpoint, move between scales, and determine the duration of the encounter is more synonymous with a computationally created navigational environment. Alexander Galloway argues⁹ that computers, rather than recording our world, as we might attribute to historic forms of media, instead convert it, defining and modelling its behaviour using variables and functions. Galloway asserts that if there is a substance that emerges in this "mediatic form"¹⁰ it is one of complete simulation because "informatic machines do not *participate* in the worldly logic of essence and instances, they simulate it."¹¹

Considered through a post-cinema lens, the photogrammetric image is remediated in this context through the swooping virtual and weightless camera, perhaps emulating the view of drones, which are often used for creating source data. This navigable space of gaming is co-opted into the experience of cultural heritage through the simulated 3D space of Google Arts and Heritage and companies such as CyArk, ScanLab, and Factum Foundation in projects where navigable photogrammetric images are compiled and presented to be consumed through a particular defined experience. This is a problematic conceptualisation of photogrammetry because of the conditions established through frames of spectatorship. The implications of this, Thomas Elsasesser writes, is that “the technologies of imaging today are not means of assisting sight, whether of real or imagined things, but technologies of probing and penetration.”¹² In this sense they become more to do with “controlling territory, occupying space, monitoring a situation, and mining it for useful information or active intervention.”¹³

While navigation in photogrammetry owes much to 3D graphics, it is still the language more associated with photography’s relationships to capture processes, that becomes the benchmark from which it is judged and deemed effective. In this sense, photogrammetric imaging processes, created through computation, have been prefaced by “replication not of the phenomenal world, but rather the look of the photographic image.”¹⁴ These computerised technologies trade heavily on the currency and appearance of the photographic and on claims connected to the history of photography specifically in that what they capture is objective, truthful and accurate.

When thinking about photogrammetry, it is still important to consider how the mediation functions through terminology and theory surrounding photography. Photogrammetry may still be usefully considered through concepts such as presence or indexical relations. Similarly, imaging processes are still able to convey linguistic messages, pointing towards frames of reference, becoming illustrations of anthropological, archaeological, social, political, or visual theory. However, these concepts are now inextricably linked to the visualisation of sensor input, algorithmic processes, and computation in ways previous forms of photographic technology were not. Simultaneously, photogrammetric production pipelines constitute “networked images”¹⁵ in which files are created through the processing power of remote servers that align photographic source data, enabling the closest fit between images. So, in considering the relationship between

the extraction of source data and the agency of a computationally realised image it is important to recognise how photogrammetry is ideologically positioned as a direct or transparent translation from one form of materiality to another within the realm of digital space.

Input Data, Cultural Heritage, and Photogrammetry

In this section, we seek to draw a comparison between the motivations behind Labyrinth's decision to make the *Preserving Machine* and the power structures inherent in current forms of global cultural heritage that deploy imaging technologies. In this context, there is a substantial rise in the prevalence and application of photogrammetry used to preserve, archive, and reconstruct. The relevance of Dick's story is that it not only highlights problems surrounding how technology operates but also the choices, agency, and infrastructure that enable acts of cultural preservation. Doc.Labyrinth, is an agent of preservation who perpetuates a narrow understanding of what constitutes valuable culture. What the narrator of the story determines as Labyrinth's, "fine and tragic work"¹⁶ in the process of preserving chosen cultural artefacts, "for all eternity"¹⁷ simultaneously determines the parameters of what he sees to be, "all the fine and lovely things that would be lost in the reshuffling of societies."¹⁸

In this sense, we see his expectations of the *Preserving Machine* and the choices that he makes regarding what is to be conserved as being synonymous with other forms of extractive imperial processes that have their origins in colonial projects. This position does not contradict the real emergencies affecting sites across the world, and our argument here is not to negate instances where cultural sites are affected by war, industrialised tourism and climate change are being lost. We seek rather to pose a number of questions. Are these technologies preserving or producing cultural artefacts? Who determines what is important cultural heritage and therefore what will be "saved"? How is capital deployed by these technologies and who are the acts of preservation for?

In projects conducted by companies such as CyArk and Factum Foundation, which utilise languages of preservation through 3D imaging processes and knowledge transfer, local interlocutors are given skills in 3D scanning and software skills to document the artefacts of their precarious environment. However, the remit for these projects is determined by global understandings of human achievement within the framework of organisations that determine

“outstanding universal value.”¹⁹ The rhetoric of these tools is that they can be used to develop new ways of understanding or interacting with the sites that have been digitised through 3D capture. This material often purports to serve the communities rather than being intrinsically connected to corporate wealth and power to be shared on the platform of the benevolent Google Arts and Culture, who allow or deny access in accordance with their own governance.

This methodology is part of the pitch of different cultural heritage companies. For example, Factum Foundation’s project, “Shared Skills and Technologies: Teaching photogrammetry in Alula,”²⁰ signals the way that the company is utilising source communities to continue the work of cultural preservation through education programmes designed to empower and support local actors privileged perspective on, and privileged access to, “heritage assets in their region.”²¹ These fledgling projects of empowerment seem in danger of replicating colonial gestures of the mid-19th and early 20th centuries and beyond, in which culture is defined through technologies that perpetuate western concepts of preservation, and patronage in this instance, through the lens of photogrammetric processes. It is these forms of positionality that Ariella Azoulay sees necessary to unlearn.²²

On the CyArk website, young male technicians, dressed in khaki safari suits, talk earnestly to the camera about the importance of 3D imaging processes in foregrounding the importance of historic sites. This is used to convince us how these technologies play “a critical role in building and defining cultural and community identity.”²³ CyArk describes how the company directs “local actors” in the context of computer labs and historic sites, guiding them in how to use photogrammetric apparatus and software. In images that picture their visible role in uniting community and technology, technicians are shown standing reverently amongst groups of people in sites such as Busanyin Shrine, Nigeria or the temples of Bagan, Myanmar in their work “creating more equitable and respectful access to places through digital technologies.”²⁴

The importance of this type of project is seen to be self-evident and to facilitate remote experience of access through the perception that “places play a critical role in building and defining cultural and community identity, yet often remain unknown or out of reach for many.”²⁵ This however is open to criticism in that the cultural riches, history, and universal understanding

of humanity are presented to be consumed and experienced from places that can afford and have access to technology - despite images of novice monks wearing CyArk Branded VR headsets. It brings the exotic to the homes and institutions that can afford to utilise the technology and, if speaking sceptically, enables those 'local actors' to commodify their cultural heritage for this specific lens.

Photogrammetry with its application to cultural heritage has become tied up with misconceived understandings that like photography it appears to objectively record the world. Hito Steyerl argues that while these processes stake claims to objectivity about half of the surfaces are "pure estimation, deliberate abstractions"²⁶ effectively "leaps of faith through the void between measurements and the aesthetic interpretations of data."²⁷ However what is recognised within the terminology associated with the apparatus are intrinsically linked to tropes of documentary evidence and associated with objectivity and truth.²⁸

Steyerl's position raises further concerns as to the implications of photogrammetric images as an archive of knowledge developed to map, rip, and tear cultural items from places of origin to the structure of computation determined by technoscientific worldbuilding, either through foregrounding the agency of storytelling or that of forensic accuracy. These examples of cultural heritage projects highlight the complexities and entanglements of work that uses photogrammetry. Daston and Galison in their categorisation of photographic history²⁹ stress how the automatism of the photographic process promised images that were free of interpretation, and these came to be understood as objective images made through a machine. The machine, in this instance was perceived as something, "patient, indefatigable, alert" and beyond "the limits of the human senses."³⁰ Importantly they emphasise the most significant aspect of machine images is that they seemed to offer viewpoints that were "uncontaminated by interpretation."³¹ In this sense the promise of objectivity has never been actually fulfilled, either through photography or through current advanced imaging technologies, but these desires represent a continued search for pure and judgement-free representation.

These demands for scientific objectivity in the utilisation of photogrammetric technology have become associated with absolute technical mastery over automated imaging processes to avoid

distortions or errors in output images produced from sensor data. Mario Carpo stresses that this involves the rise in usage of computational “form searching”³², contending that algorithmic programming is now designed with such complexity that results are often beyond comprehension. Exhaustive processes of searching through algorithmically determined technology are so complex, in modern automated programming, that why the input of one image data set appears to work, and another does not, is completely black-boxed and inaccessible to the human spectator.

This positionality resonates with the way Ruha Benjamin determines how historic systems of inequality, particularly pertaining to racial bias, are present in new forms of technology. Despite the promise of objectivity and progressive ideals inherent in the rhetoric surrounding the latest technological innovations they still reflect and reproduce existing inequalities and, “discriminatory systems of a previous era.”³³ This is further highlighted in the work of Joy Buolamwini, who emphasises the relationship between computer vision processes and racial bias, as encapsulated in her performance poem, “AI, Ain't I a Woman,”³⁴ which riffs on the title of Sojourner Truth's 1863 speech through reference to image search processes that yield racist results. The problem thus resides not only in the decisions surrounding what to capture but also in the technology itself.

Black-Box Processes and Mutative Automation:

From the Fordist conception of the assembly line to current post-Fordist mass manufacture, automation is embedded in factory methods, ensuring a standardisation and uniformity of object production. Similarly, the photogrammetric image in its current form created through computational processes, supposes the abstracted perfection of the automatic associated with the photographic image. The caveat being that the finalised image consumed is often heavily enhanced through post-production. Much has historically been made of the automatic properties of the camera, how photographs are formed without “the creative intervention of man”³⁵ bestowing on the photograph a “transference of reality from the thing to its reproduction.”³⁶ The promise of current 3D technologies, that use photographic input data in their creation, appears to be that they too represent a mechanical transcription of the world.

However, there is something fundamentally metamorphic about the process of changing two-dimensional information through software into 3D. The finalised computational image extracts information³⁷ from data inputs, but also contains the residue of the algorithm's automated commands. The software produces not the integrity of a structure but instead a form both comprising "successful" alignments of points as well as unresolved sections manifesting a cluster of polygons (spikes and blocks) that fill in holes where data is missing. This is not, in the current state of the technology, the embodiment of automation as industrial perfection, but rather a mutative automation, a Frankenstein conjuring of its subject replete with flaws. These formulations, much like Labyrinth's musical creatures, retain and embody distortions of the input. Software, like the *Preserving Machine*, is simply doing what it has been designed to do, but these aberrations also signal the discontinuity of the algorithm fulfilling its programming in contrast to the expected image output. Supposed momentous technological innovations in imaging, exemplified by current 3D photogrammetric processes, have manifested a chaotic version of the world where textures and forms do not match, where the hard surfaces of mass production are rendered as misshapen structures. The mutative appendages that are present from the finalised software commands leave the resultant form appearing morphologically fragile to expectations of completeness. Just as Labyrinth cannot reconcile what emerges from his *Preserving Machine*, the 3D entities that the software produces are a hypnotic mix of high-definition intricate detail along with cubist protrusions and growths.

Labyrinth's *Preserving Machine*, perceived as a transmogrifying black boxed process, highlights a control system that resides outside direct intentionality. His misunderstanding of the machine as a form of complete automation is deeply problematic and needs to be conceived in different terms. Gilbert Simondon provides a useful entry point to this discussion by pointing out problematic conceptions of what he terms "technical objects."³⁸ He argues culture has developed two contradictory ways of viewing the agency of technology. On the one hand machines are considered to be completely inert, on the other they are considered to threaten humankind. Certain positions of dominance in culture therefore judge it better to view the machine as purely a form of utility rather than having agency that needs to be subjugated. He stresses that worshipers of technology "commonly present the degree of perfection of a machine as proportional to the degree of automatism."³⁹ Automation, through this perspective, appears to

promise that a machine can carry out actions better than humans, that they can remove the margin of error, to surpass our own fallibility. However, Simondon states the “progressive perfecting of these machines”⁴⁰ is actually dependent on a level of indeterminacy, a certain margin of control of the human over the machine.

Whereas Simondon accounts for problematic expectations of automated mechanical processes suppressed by human systems of control, how the apparatus is accounted for needs further consideration. To draw this discussion back to automated photogrammetric processes, emphasis needs to be placed on the agency of programming and the entanglement of humans with different forms of technical apparatus. Vilém Flusser, in his exploration of what he terms the “technical image”⁴¹ draws a parallel between the program inherent in the camera’s design and how an output image is determined. In his discussion of photography, he argues that photographers are caught up in a game with the camera, trying to discover and play with its given properties. Flusser conceives photographers as functionaries, that know how to “feed the camera”⁴² and know how to get it “to spit out photographs.”⁴³ Contrary to Simondon’s notion that machines require calibration through human usage Flusser retains that the functionary constitutes a new kind of relationship with the apparatus. In his conceptualisation, human beings, and apparatus merge into a unity. The photographer as functionary only can control aspects of the exterior of the camera. He further states that functionaries are controlled by the apparatus “thanks to the impenetrability of its interior”, contending that they “control a game over which they have no competence.”⁴⁴

What Flusser highlights is a complicated equation between the automatic properties of the camera and how the functionary controls data input into the black-box. This mirrors the position of Asko Lehmuskallio⁴⁵ who encourages the reconceptualization of cameras from producing pictures of the world, to capturing sensory input data through computational means. What therefore becomes important to account for is that there remains a level of inaccessibility to the inner workings of the technology. As Flusser states, no specific photographer nor all photographers as a whole “can entirely get to the bottom of what a correctly programmed camera is up to. It is a black box.”⁴⁶ The impenetrable black box that Flusser refers to parallels what Wendy Chun describes as the “invisibly visible.”⁴⁷ She writes that processes of computation are

staged as “a provocative, indeed magical, model”⁴⁸ containing a tantalising combination of “what can be seen and not seen, can be known and not known.”⁴⁹ Chun states the computer’s separation of “interface from algorithm; software from hardware-makes it a powerful metaphor for everything we believe is invisible yet generates visible effects.”⁵⁰ Therefore, every usage of these forms of technological interface, she argues, is also “an act of faith.”⁵¹ In this capacity we stake particular ideological investment in “effective procedures” and believe that any problem “can be solved in a number of steps.”⁵²

Machine-to-machine communication lies at the heart of the agential black-box process. It is the inaccessibility that accounts for the aberrations in the resultant images in the context of photogrammetry and necessitates inclusion of the agency of the programme in the knowledge created through these forms of imaging medium. This is notwithstanding the problematic nature of training data and the inequitable ways machines are made to see, though this is an urgent and necessary part of understanding new forms of imaging apparatus. Trevor Paglin asserts that the agency of machines and the automated visioning process have produced a form of concealed sight that is "detached from human eyes" and largely now "invisible." In Paglin's conceptualization of the "Invisible Images" that now surround computational processes, it is not only the problem of the input data and the discontinuity between what and who can be pictured that represents the crisis of the medium. Understanding of this interior, computationally networked, codified process conducted machine-to-machine is not compatible with understanding of visioning processes that emerge as representative in human terms. Rather, according to Paglin, they are constituted "by active, performative relations much more than classically representational ones."⁵³

The paradox of these technological innovations, that push the planar into three-dimensions, is that they produce discordant images. Images that in their raw state differentiate themselves from perceived standards of mass production. It only becomes ‘acceptable’ through the intensive labour of post-production to remove its unsightly protrusions. Joseph Schumpeter characterised the replacement of one capitalist form with another as symptomatic of industrial mutation⁵⁴ and we might too see these images as emerging and in some capacity mutating from their older image selves: cinema, photography manifesting a form of the monstrous underside of

automation. And yet it is this monstrosity (that Labyrinth is unsettled by with his swarm of creatures) that with these new technologies is perhaps giving birth to a new image, one in contrast to a stabilised image with new conditions of morphology and visibility. Rosi Braidotti emphasises the monstrous contains a considerable charge “Metamorphic creatures are uncomfortable ‘body-doubles’ or simulacra that simultaneously attract and repel, comfort and unsettle: they are objects of adoration and aberration.”⁵⁵ Braidotti states that the monstrous is perceived as a re-assembly of organic parts and that technological incarnations are a similar “collage or montage of pieces.”⁵⁶ Here the composite relational aspect of the photogrammetric image reconstitutes the inputted photographs into distorted textures and forms resembles Labyrinth’s hybrid creatures, themselves “liminal borderline figures”⁵⁷ between “music” and “animal.”

The Preserving Machine’s Conflation of Biological with Mechanical Reproduction

It is clear from Dick’s writing that there is a consistent meditation on the destruction of mankind through narratives that portray apocalyptic societies, often in which solutions to the loss of cultural heritage lie in forms of duplication. His conceptualisation of reproduction in his writing links technology with outputs that are invariably flawed. What emerges through forms of mechanical processes described are either mutated, imperfect replicas or at the very least conceived to be abhorrent through the prism of how they are expected to appear, function, and act. Dick appears to be implying that, regardless of technological advancement, forms of reproducibility can only be perceived as problematic if judged through the rubric and language normatively associated with replication.

One of the riddles at the heart of the *Preserving Machine* is Dick’s weird idea that music can be transmogrified into living matter. His worldbuilding prompts questions as to what is meant to be interpreted through this conceit as well as why Labyrinth has chosen this method of preservation. An answer may be posited in Dick’s perceptual blurring of the relation between human and the machinic and vice versa. In Dick’s writing objects that appear to reside outside of human productive methods are also conflated with the language of electronic hardware, such as transmitters or satellites which “may be cloaks for authentic living reality.”⁵⁸ According to this

schema Dick contends that everything is “equally alive, equally free, equally sentient, because everything is not alive or half-alive or dead but rather lived through.”⁵⁹ In his perception of current forms of human society he sees a proliferation under globalised systems of capitalism that encompasses, “the momentum of the living toward reification, and at the same time a reciprocal entry into animation by the mechanical.”⁶⁰ To this end he believes that we, “hold now no pure categories of the living versus the non-living”⁶¹ an eventuality he sees to be an inevitable “paradigm.”⁶²

While the complexities of organic living systems are not directly comparable to the understanding of computational photogrammetry, and we acknowledge Dick’s statement has implications surrounding genetic engineering that lie outside of the remit of this text, it is still useful to think through biological systems when accounting for anomalies in the process. Thomas Elsaesser suggests that what is made possible by the digital fundamentally is “no longer based on perception.”⁶³ Rather according to Elsaesser this new form of visuality is of the order of the “*vegetal*: comparable to the growing, harvesting, extraction and manipulation of genetic or molecular material in the processes of bio-genetics or micro-engineering.”⁶⁴ What Elsaesser alludes to here is that there is something almost alchemical about the methods of spatializing photography, that these forms are molecularly produced from photographic data.

Dick’s story represents a strange but significant conflation of organic reproduction with mechanical promises of duplication found in industrial processes. What can thus be posited from Labyrinth’s consternation is not only the inconceivability of determining exact results from the transmogrification of sheet music into animate matter, but also a lack of understanding of the machine as an operative⁶⁵ agent. However, this begs the question as to what exactly was expected to migrate in this complicated process? If we think about this problem in terms of Walter Benjamin’s concept of “technological reproducibility”⁶⁶ we can think in terms of what constitutes the “aura” of the sheet music transferred into living creatures through machine processing. In Benjamin’s schematisation the auratic function of the artwork is essentially destroyed or at least considerably diluted through multiplication. While this loss is frequently lamented in the context of art production, it opens new possibilities in the context of digital

reproduction, not least in relation to Steyerl's poor image that represents an "afterlife" of originary artefacts of visual culture, "expelled from the sheltered paradise."⁶⁷

In the context of Cultural Heritage Bruno Latour applies Benjamin's concept of the aura to consider facsimiles produced by the non-profit organisation Factum Foundation for Digital Technology in Preservation. Here he contends, it is not the case of considering what is produced in terms of the original but rather the "distinction between good and bad reproduction."⁶⁸ Referring to music and theatre to illustrate his point, Latour argues that the idea of having an original production of a Shakespeare play, for example, is problematic because performance involves interpretation. While the text or sheet music may be, in some senses, considered an original or at least a referent, even in its multiple forms, a more fruitful way of looking at facsimiles is to consider how the original is explored "to help redefine what originality actually is."⁶⁹ In this suggested change in thinking, attention is taken away from auratic or memetic functionality of the copy. Instead, Latour foregrounds how forms of reproduction allow for different modes of encounter, sensory experience, and critical reflection. In this sense, one could imagine a museum or archive containing imperfect or mutated copies. However, his discussion seems to only concentrate on the highly mediated and crafted versions of digital processes, neglecting the raw data outputs of scanning technologies.

For Labyrinth the animals produced by the machine are first and foremost expected to embody the musical scores but still adversely to retain some semblance of uniformity that does not stray too far from his expectation of an evolutionary archetype. However, the transmogrifying process the machine has been programmed to carry out does not just interpret the manuscripts as data but also encapsulates the emotive experience of listening to the music. This is clearly demonstrated in the character traits, biological makeup, and abilities to adapt that the animals exhibit. This sends Labyrinth into an existential crisis as he ponders the parameters by which he is judging the animal's ability to survive. The flaw in this methodology is scale, and that no one bug, or beast will be able to encapsulate all of the understanding the sheet music encapsulates.

Labyrinth's notion of a copy in flesh form points to the chasm between translations from one material to another. This problematic notion is highlighted by Latour who stresses that facsimiles

are discredited because they are “ associated with a gap in techniques of reproduction.”⁷⁰ This gap is synonymous with understanding reproductions as being inferior, a logic that resonates with the problematic notion of photography as an index of reality from the original. In this sense, *The Preserving Machine* appears to raise questions about the nature of copies, particularly regarding whether a copy could potentially contain more life than an original. Furthermore, the agency of the copy may not necessarily be understood by those that create them in such narrow terms. Latour contends that for reproductions to be successful for their designated purposes acknowledgement of a wider infrastructure must be present because for “ a work of art to survive, it requires an ecology just as complex as the one needed to maintain the natural character of a natural park.”⁷¹ In the context of Labyrinth’s creatures, the process of technological intervention creates new and emergent hybridised organisms. These creatures live by their own terms, residing outside of his intentions of how they would function as containers of cultural heritage.

There are similarities to Dick’s narrative in the way that Hito Steyerl imagines the radical output of 3D imaging processes functioning outside of techno-capitalist systems of control. Her conclusion to *Ripping Reality*⁷² determines that a slightly boring explanation of the potential of imaging technologies is the reversing of the hierarchical relation between original and copy. This seems to resonate as a critical perspective on Latour’s opinions regarding the potential of the digital aura present through technological imaging processes that aligns with forms of copies as an exemplar of industrial image production. Steyerl instead conceives when images take on a dimensionality, they start a revolt against conventions of representation and their application to aerial surveillance, stock markets and cockpit simulators, crystalizing, and bursting free of their servitude to screens. She argues that as they break free of their constraints of visibility “they start to grow their own architecture, uncontrollable and unprecedented”⁷³

We propose that Steyerl’s vision of the rebellion of images parallels the untethered animals in *The Preserving Machine* that break through the constraints Labyrinth has sought to impose upon them. Moreover, Steyerl’s contention that we need to think of a “completely different dimension”⁷⁴ where images shake off their likenesses entails an important counter to the rhetoric of hermetic perfection of industrial imaging processes. While Steyerl’s allegory that imagines the

spontaneous fossilisation of images on LCD screens can be conceived as a break to visuality, we contend there is a similar challenge embodied in the protrusions manifested by raw process outputs. Furthermore, the resultant assemblages of incoherent structure that the *Preserving Machine* creates could be seen to align with the ideology posited in the *Manifesto of Glitch Feminism*.⁷⁵ The manifesto resonates with Haraway's conception of the composite nature of "situated knowledge"⁷⁶ but foregrounds the celebration of perceived technological failures. The positionality of the glitch manifesto challenges notions of white cisgender heteronormativity as being a threat to social orders that Labyrinth's world view does not account for. Here errors or aberrations need to be perceived as "something that extends beyond the most literal technological mechanics: it helps us to celebrate failure as a generative force, a new way to take on the world." ⁷⁷

Conclusion

At the end of the story Labyrinth, dissatisfied with the results of his *Preserving Machine*, attempts to re-convert a bug transmogrified from a Bach Fugue back into sheet music. The consequence of the feedback loop when he attempts to play the score renders the music to his eyes, "distorted, diabolical, without sense or meaning, except, perhaps, an alien, disconcerting meaning that should never have been there."⁷⁸ Labyrinth appears to be unable to accept any value in the computationally interpreted sheet music which the *Preserving Machine* produces. Here Dick's story complexifies exploration of how Labyrinth can reverse engineer the process of biological reproduction so that the animal is returned to a data input. We account for his disappointment residing in his limited perception of the potential in the results created simply because they maintain agency and independence from his expectations.

Technological developments in the context of photogrammetry, while becoming ever more photographically like the appearance of their referent, are not automatically creating more truthful or accurate images, determined in other terms. But rather, these developments are creating apparatus that challenge claims made by previous versions within the same paradigm and positional intersection. In this scenario, emphasis is placed on rhetorical use of the computational idea of truth rather than an expanded and more holistic account of what is being

pictured through photogrammetric images. These images rather embody the perfectly formed replication of computational parameters, the result of incomplete data capture through camera sensors and the partial alignment of photographs through software. However, there is something in these mutative misalignments that represents the operativity of the interface, the machine-to-machine communications which see the world in computational, though human interface determined terms. In this sense, the agency of technology needs to be accounted for in the representation of cultural artefacts. We interpret that Latour's logic and understanding of the expanded function of reproduction includes the possibility of inconsistent versioning. This position adds something essential to understanding processes of imaging through photogrammetry to account for the mutative process by which the agency of the black-box is apparent in new forms of computational visualisation.

Inherent in technological interfaces, particularly in the processes of high-tech photogrammetric imaging, is the infrastructure of the technology. This pertains to multiple complex factors including those who have the power to make decisions about what is preserved, through what apparatus this takes place and how the resultant images are experienced. While Labyrinth may have been misguided to rely on the agency of non-human life to carry and perpetuate certain aspects of his concept of civilization, the idea of what photogrammetric practices transcribe is informed by his attempts. Certainly, as David Farrier says of the relations between human and non-human organic life, it is at the heart of a needed paradigm shift in conceptualising relations. This is not least a concern of seeing the world through the computational lens of imaging technologies, as treating "other forms of life simply as resources."⁷⁹

We too are living in a transitional state which necessitates a change in perspective, and consideration of positionality of the human in this realm, as a matter of urgency. We know that catastrophe is imminent but the signs of this are denied, or there is still an expectation that technology will save us, though we are living in the future now. No place is transitional, no empty spaces exist outside of human influence on it. So, the necessity is not to develop ever more technical apparatus, but to understand better the assemblage in which the human is only part.

These imaging technologies appear poised to become an ever more pervasive means through which to control and formulate the world. In the context of heritage industries, we therefore need to contend with how these technologies are embedded through financial power structures based on inequity. This is entangled with an ideology of ever more complete accuracy and unrestricted access to cultural artefacts. These concerns are inextricably linked to tacit coded biases of algorithmic processing and the colonialist extraction of data the technology of imaging entails. What the narrative of *The Preserving Machine* teaches us is that these aims will always be entangled with ideological presuppositions of use and value.

Hegemonic ways of conceiving vision do not contend with the mutations in current forms of photogrammetry except by determining them as necessitating removal. They exclude the complex means by which 2D metamorphoses into 3D where photography disintegrates, breaking into polygons, smears, and icicles of unresolved form. These perceived divergences may or may not remain detectable as the technology improves but they create a form of visibility through which we may be able to glimpse technological fault lines on the march towards a ubiquitous state of perfection. In their present state these aberrational images harken a new condition of the image, one that is vulnerable, dislocated in its temporality, imperfect and ragged, while at the same time mesmerising.

Endnotes

1. Philip K. Dick, "The Preserving Machine," *The Magazine of Fantasy and Science Fiction*, June 1953, (Fantasy House, Inc, Concord, NH, 1953): 76
2. Philip K. Dick, 76.
3. Donna Haraway, "Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective," *Feminist Studies* 14 (3) (1988): 575
4. Lev Manovich, *The Language of New Media* (London, The MIT Press, 2001). 200.
5. Gilles Deleuze. *Cinema 2. The Time-Image* (University of Minnesota Press, 1989).

6. Steven Shaviro. *Post Cinematic Affect* (John Hunt Publishing, 2010). 64.
7. Shane Denson, *Discorrelated Images* (Duke University Press Books, 2020). 9
8. Shane Denson. 9
9. Alexander Galloway. *The Interface Effect*. (Cambridge, UK: Polity. 2012) 20
10. Alexander Galloway. 20
11. Alexander Galloway. 20
12. Thomas Elsaesser, "The "Return" of 3-D: On Some of the Logics and Genealogies of the Image in the Twenty-First Century," *Critical Enquiry* 39 (Winter 2013): 242
13. Elsaesser, 242
14. Lev Manovich, *The Language of New Media* (London, The MIT Press, 2001). 200.
15. Daniel Rubenstein and Katrina Sluis, "A Life More Photographic: Mapping the Networked Image". *Photographies* 1(1) (2008): 9–28.
16. Philip K. Dick, "The Preserving Machine," *The Magazine of Fantasy and Science Fiction*, June 1953, (Fantasy House, Inc, Concord, NH, 1953): 73
17. Philip K. Dick. 73
18. Philip K. Dick. 74
19. UNESCO, "The Criteria for Selection" 2005. <https://whc.unesco.org/en/criteria/> (accessed 15/11/22)
20. Otto Lowe, *Shared Skills and Technologies: Teaching photogrammetry in Alula*, ed. Adam Lowe et al, The Aura in the age of digital materiality. Rethinking preservation in the shadow of an uncertain future (Silvana Editoriale, 2020)
21. Otto Lowe. 131
22. Ariella Aïsha Azoulay, *Potential History Unlearning Imperialism* (New York: Verso, 2019).
23. CyArk, "Mission", 2022. <https://cyark.org/whoweare/mission/> (accessed 15/11/22)
24. CyArk.
25. CyArk.
26. Hito Steyerl, *Duty Free Art* (London, Verso, 2017). 198
27. Hito Steyerl. 198
28. Hito Steyerl. 199
29. Lorraine Daston and Peter Galison, *Objectivity* (Zone Books, 2007).
30. Lorraine Daston and Peter Galison. 139
31. Lorraine Daston and Peter Galison. 139
32. Mario Carpo, *The Second Digital Turn. Design Beyond Intelligence* (London, The MIT Press, 2017). 65-70.
33. Ruha Benjamin. *Race After Technology: Abolitionist Tools for the New Jim Code* (Polity, 2019). 5-6
34. Joy Buolamwini, "AI, Ain't I a Woman," 2018 <https://www.youtube.com/watch?v=QxuyfWoVV98> (accessed 15/11/22)
35. André Bazin and Hugh Gray, "The Ontology of the Photographic Image," *Film Quarterly* 13, no. 4 (1 July 1960): 7.
36. Bazin and Gray. 8
37. Tristan Garcia, "The Photographic Real," *Site 0: Castalia*, The Game of Ends and Means, 2016 <https://www.glass-bead.org/article/the-photographic-real/?lang=enview> (accessed 15/11/22)
38. Gilbert Simondon, Cécile Malaspina, and John Rogove, *On the Mode of Existence of Technical Objects* (Univocal, 2017). 16
39. Simondon, Malaspina, and Rogove. 16
40. Simondon, Malaspina, and Rogove. 17
41. Vilém Flusser, *Into the Universe of Technical Images* (Minneapolis, 2011).
42. Vilém Flusser, *Towards a Philosophy of Photography* (London: Reaktion Books, 2012). 27
43. Vilém Flusser. 27
44. Vilém Flusser. 28
45. Asko Lehmuskallio, "The Camera as a Sensor, The Visualization of Everyday Digital Photography as Simulative, Heuristic and Layered Pictures," in *Digital Photography and Everyday Life: Empirical Studies on Material Visual Practices*, ed. Gomez Cruz, Edgar and Lehmuskallio, Asko, (London: New York: Routledge, 2016), 244.
46. Vilem Flusser. 27
47. Wendy Chun, *Programmed Visions. Software and Memory* (Cambridge, Mass.: MIT Press, 2013). 17

48. Chun. 17
49. Chun. 17
50. Chun. 17
51. Chun. 17
52. Chun. 17
53. Trevor Paglen, "Invisible Images (Your Pictures Are Looking at You)," *The New Enquiry* December 8th 2018 <https://thenewinquiry.com/invisible-images-your-pictures-are-looking-at-you/> (accessed 15/11/22)
54. Joseph A. Schumpeter and Joseph E. Stiglitz, *Capitalism, Socialism and Democracy: With a New Introduction* by Joseph E. Stiglitz, (London New York: Routledge, 2010), 82.
55. Rosi Braidotti, *Metamorphoses: Towards a Materialist Theory of Becoming* (Cambridge, UK, Polity Press, 2002). 202
56. Braidotti. 216
57. Braidotti. 216
58. Philip K. Dick, "Man, Android, and Machine," in *Science Fiction at Large: A Collection of Essays, by Various Hands, About the Interface Between Science Fiction and Reality* (ed) Peter Nicholls (Gollancz, 1976): 11
59. Philip K. Dick. 11
60. Philip K. Dick. 1
61. Philip K. Dick. 1
62. Philip K. Dick. 1
63. Thomas Elsaesser, "Simulation and the Labour of Invisibility: Harun Farocki's Life Manuals," *Animation* 12, no. 3 (November 2017): 222
64. Elsaesser. 227
65. Trevor Paglen, "Operational Images," e-flux journal, Issue #59 November 2014, <https://www.e-flux.com/journal/59/61130/operational-images/> (accessed 15/11/22)
66. Walter Benjamin, "The Work of Art in the Age of Its Technological Reproducibility [First Version]." *Grey Room*, no. 39 (2010): 11–38.
67. Hito Steyerl, "In Defense of the Poor Image," Issue #10 November 2009 <https://www.e-flux.com/journal/10/61362/in-defense-of-the-poor-image/> (accessed 15/11/22)
68. Bruno Latour, "The Migration of the Aura – or How to Explore the Original Through Its Facsimiles application" in *The Aura in the age of digital materiality. Rethinking preservation in the shadow of an uncertain future* (ed) Adam Lowe et al, (Silvana Editoriale, 2020). 34
69. Bruno Latour. 33
70. Bruno Latour. 33
71. Bruno Latour. 40
72. Hito Steyerl, *Duty Free Art* (London, Verso, 2017). 205
73. Hito Steyerl. 205
74. Hito Steyerl. 204
75. Legacy Russell. *Glitch Feminism. A Manifesto* (Penguin Random House, 2020)
76. Donna Haraway, "Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective," *Feminist Studies* Vol. 14, No. 3 (Autumn, 1988): 575-599
77. Legacy Russell. *Glitch Feminism. A Manifesto* (Penguin Random House, 2020) 30
78. Philip K. Dick, "The Preserving Machine," *The Magazine of Fantasy and Science Fiction*, June 1953, (Fantasy House, Inc, Concord, NH, 1953): 76
79. David Farrier, *Footprints: In Search of Future Fossils* (Fourth Estate, 2020). 277