BETWEEN MEASURE AND MEANING:

EXPLORING EXPRESSIONS OF 'THIRD TABLE' EMERGENCE IN DIGITAL

CULTURAL OBJECTS

A Dissertation

by

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ABSTRACT

The point cloud medium in digital survey has been little explored in its overlap with philosophy and theory. Exploring this overlap between the point cloud and philosophy can affect our approach and consideration of such data in unforeseen ways. This research considers the point cloud medium in architectural and archaeological contexts through the lens of object-oriented ontology, specifically ideas surrounding Graham Harman's concept of the 'third table.'

For Harman, this is a table beyond its undermined parts and its overmined effects, a table that withholds its being from us, but can be accessed indirectly. For me, this 'third table' is beyond its measure and meaning – the point cloud is more than its accuracy and our practical relations to it. Harman's solution to the inaccessibility of the 'third table' is theatricality, metaphor, or vicarious causation. This is the inner space of a new, hybrid object where one object can hold elsewhere qualities for another object that withdraws from access. I interpret Harman's approach as expressing something through a non-discursive, aesthetic medium.

This study explores elements from two survey techniques used to create point clouds: photogrammetry and laser scanning. These elements are the everyday, throwaway debitage of the digital process, as well as erroneous data outputs, misalignments, and noise. Beyond the found object and the undesired misfits of process, we can develop further aesthetic expressions of point clouds that exhibit the actuality of the living digital model.

DEDICATION

This dissertation is dedicated to my late grandma Baaske (2017), and my grandpa Lindsay (2018). Thank you for being there for us all. I miss you and I love you.

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NOMENCLATURE

OOO   Object-Oriented Ontology

RO   Real Object

SO   Sensual Object

RQ   Real Qualities

SQ   Sensual Qualities

TLS   Terrestrial Laser Scanning

MIP   Multi-Image Photogrammetry

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CHAPTER I

AN INTRODUCTION TO A DISSERTATION: OR HOW I LEARNED TO STOP

WORRYING AND LOVE THE POINT CLOUD

In this introduction I want to present the outline for this dissertation, so if you're expecting some sly analogy to a satirical comedy about impending nuclear war, you will be sorely disappointed. This introduction will include a thesis statement, or aim of this dissertation; the authors, texts, and outputs pertinent to this dissertation; the internal value of these authors, texts, and outputs in themselves; the value of these authors, texts, and outputs as they relate to the other authors, texts, and outputs; the value of these authors, texts, and outputs as they relate to the aim of this dissertation, how they shaped the aim of this dissertation; the value of this dissertation in itself; and finally the value of this dissertation as it relates to the respective discourses where the authors, texts, and outputs reside: architecture, archaeology, historic preservation, philosophy, and art.

In Chapter 2, I will discuss Andrew Saunders' *Baroque Topologies* (Andrew Saunders 2018) and Paul Chapman et al.'s *Art of the Point Cloud* (Chapman et al. 2018). I establish these collections of works as exceptional in terms of aesthetic pursuit within the point cloud medium, the artful point cloud. That is, these are inspiring catalogs of point cloud expression. Saunders, with his focus on representation and aesthetics, creates beautiful expressions of the point clouds and surface models/meshes of Baroque Italian churches. Furthermore, Saunders attempts to codify new terminology for representation of the point cloud: diaphanous bodies, verduta per angelo, spheroidal cosmologies, and

figured voids (Andrew Saunders 2018). Chapman et al. democratizes the point cloud

aesthetic with a collection of various contributors to *Art of the Point Cloud*. These

entries vary in approach and representation, with some taking particularly creative

representations and application of the techniques used to create point clouds: using these

techniques to capture artful scenes, applying nontypical filters to the point cloud,

augmenting elements with pop culture graphics, adjusting scene/object during the

scanning/capture process, editing the point cloud in post processing, applying

sophisticated apparatuses to capture in challenging scenarios, etc. (Chapman et al. 2018).

These collections serve as inspiring in themselves but are bolstered by considering

object-oriented philosophy and its concepts related to aesthetics.

In Chapter 2, we will have unpacked the in-depth review of the inspiring

collections of Saunders and Chapman et al. Next, we will get into the philosophical

weeds of object-oriented ontology (OOO, pronounced 'triple O'). In this chapter, I will

present two of key figures of OOO: Graham Harman and Timothy Morton. Harman and

Morton are the most prolifically published of those directly or peripherally connected to

the OOO project and their concepts are the most foundational and essential to OOO

itself.

Graham Harman is the main figure in OOO, though others like Timothy Morton,

Levi R. Bryant, and Ian Bogost come in and out of the fold – for the last ten years or so,

Harman and Morton have dominated the textual and lecture representatives of OOO.

Harman's key components to this dissertation are his quadruple object structure, the

'third table,' vicarious causation (which became metaphor, theatricality, and the cell),

and undermining and overmining. Harman's quadruple object structure illustrates the tensions, junctions, and radiations within an object. This is done by crossing the real-sensual binary with the object-qualities binary, creating the real object (RO), sensual object (SO), real qualities (RQ), and sensual qualities (SQ) (Harman 2011: 50). This structure serves a basis for exploring the four tensions (essence, space, eidos, and time), three junctions (sincerity, disjunction, and continguity), and three radiations (duplicity, contraction, and emanation) (Harman 2011: 114-115). Furthermore, the quadruple object structure helps Harman conceptualize vicarious causation (Harman 2007), or metaphor (Harman 2018), theatricality (Harman 2020a), the cell (Harman 2022).

Before diving into vicarious causation, etc. we need to present Harman's position on knowledge. For Harman, there are only two kinds of knowledge, describing something in terms of its parts, or describing something in terms of its effects. These two forms of knowledge are referred to as undermining (downward reduction to parts) and overmining (upward reduction to effects). Neither of these get at the essence of what something truly is for Harman. Citing Sir Arthur Eddington's anecdote of the two tables, there exists only the table in terms of its chemical composition (parts) and its practical effects, Harman argues that the real table is between these, a 'third table' (Harman 2012; 2019). Neither undermining or overmining can get at the 'third table,' nor their synthesis into duomining, where both are done simultaneously. Harman advocates for the arts as well-positioned to get at the 'third table' through indirect, allusive, and oblique means.

This brings us back to vicarious causation, metaphor, theatricality, and the cell. These concepts show us how objects relate, particularly in a non-literal way. A literal

relation would be akin to undermining and overmining i.e., knowledge. Vicarious causation, etc. describe how relations are made to get at a brief experience of 'third table' emergence (Harman 2007). The latter point, "get at a brief experience of 'third table' emergence," is my interpretation of Harman's 'third table' and indirect access (vicarious causation, etc.) concepts. A key point here is the difference between 'get at' and 'point at'; we can get at the real object, but only briefly and to a high magnitude of feeling i.e., we can briefly feel the real object in direct aesthetic experience. We cannot, by comparison, point at the real object. This means we cannot point, nor re-present the 'third table' emergence experience. However, it is my position that expressions derived from 'third table' emergence experiences, resulting in what we often call inspiration, increase the potentiality of further 'third table' emergence experiences in other objects e.g., inspiring art begets new art, which inspires unforeseen others in unforeseen ways.

Timothy Morton is another main proponent of OOO, exploring the philosophy in the contexts of ecology, art, beauty, and science fiction. Of key importance to this dissertation are Morton's ideas around beauty experience, being ecological, and the hyperobject. Within the concept of Morton's hyperobject, five key elements help us discuss both hyperobjects and objects themselves (which Morton concludes, and I agree, that all objects are really hyperobjects): viscosity, nonlocality, temporal undulation, phasing, and interobjectivity (Morton 2013a). The last point concerning hyperobjects, interobjectivity, becomes pertinent to both beauty experience and being ecological. As one might guess, both beauty experience and being ecological refer to high amplitude feeling in a new, shared inner space and showing solidarity with nonhuman objects,

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respectively (Morton 2021a; 2018; 2017). Put differently, both concepts deal with specific relations between objects. Given the philosophies and philosophers that Harman and OOO, and sometimes Morton, come into disagreements with, it might seem odd to focus so much on object-object relations. As Harman, Bryant, Morton, and others in the OOO project contend, it is not that things don't relate, but that relations are earned – it is not a default status that all things are connected and related all the time (Harman 2022; Bryant 2011).

In "How complex is a lemon?" (Mulhall 2018), Stephen Mulhall reviews and critiques Graham Harman's *Object-Oriented Ontology: A New Theory of Everything* (2018), and by proxy, making criticisms of Harman and OOO in general. In this section, I discuss Mulhall's frustration with OOO's accessible/inaccessible dualism – and Mulhall is not alone in this; object withdrawal remains one of the philosophy's more confounding principles. This confusion largely revolves around another dualism: direct versus indirect access. While I sympathize with Mulhall (and others') frustration, I put forward my own interpretation of 'indirect access' and that such access does not mean that an indirect approach grants complete and total access to reality, but that an indirect approach gives us a brief and fragmented access to reality, one that we can get at but not point at.

Thomas Sutherland's "The Contortions and Convolutions of the "Speculative Turn"" (Sutherland 2021) takes more issue with the approach or style of OOO than its logical qualms, as Mulhall pointed out. Sutherland certainly points these logical issues out but speaks more pointedly on the suspicious position OOO appears to put itself in

with regards to access to reality. Sutherland reads the 'speculative turn,' OOO, and Harman as trying to 'save' objects, white knighting in a kind of way while simultaneously admitting a convoluted and ambiguous 'indirect access' to reality (Sutherland 2021). The implication in OOO, primarily through Harman, is that savvy taste or sensibility to aesthetic, non-literal media allows one to get at an object indirectly, obliquely, a real object. There is also the issue of OOO's anti-anthropocentric rhetoric, or at least pro-nonhuman rhetoric – how can we possibly escape our humanism, our specific human species-being? Sutherland also indicates some trends in Harman's writing that indicate a hegemonic gatekeeping – it is possible to learn this power, but not from a correlationist-Jedi, so to speak.

Rein Raud's process philosophy offers a compelling alternative to OOO. To shamedly simplify Raud's ontological approach, the process is the object. That is, flows and flux and dynamism are the fundamental stuff of the universe (Raud 2021). What Harman and OOO refer to as 'an object,' for Raud, is a 'cross section' of reality, a cross section of flow and flux. Raud is with the 'speculative turn' in that he also rejects the privileged mind-world correlation but argues that different things have different thing-being, different modes of reality. These modes of reality, for Raud, are grounded in the processes and flows of events that reinforce the existence of a thing. The cross section may show minimal change over time and may undergo significant changes that are not equivalent to others e.g., losing a hair versus losing a bet. And, these cross sections endure, much like these processes endure, but they are finite.

With foundational OOO concepts in Harman and Morton, critiques from Mulhall and Sutherland indicating prevalent weak points, and finally an alternative approach to ontology, contra to OOO, I establish a balanced presentation on OOO in its current form. OOO has many critics, and I am one of them, but the opportunities presented within OOO are worth its faults for now. OOO puts us in a position where there is a withheld reality in objects, regardless of whether a human mind is there to engage it or not. Furthermore, relating to such a reality *must be earned* – relation is not a default state of things. Discussions by Harman, Morton, and Levi R. Bryant expound on inter object relations, how these new, relational objects form and the feeling of mind that is necessary to earn such relations.

In establishing an aesthetic medium in the point cloud and an ontological framework in OOO, I combine these into a point cloud metaphysics in Chapter 4. This exercise in a point cloud metaphysics consists of a thought experiment expressing the principles OOO through the point cloud medium. In this specific exercise, I use the point cloud of a building, of architecture. This is an experiment using the point cloud medium as a philosophical device – analogizing the point cloud medium to object-oriented ontology's structure of reality (at least Harman's structure of reality). This is valuable in the same way that analogizing anything is valuable; it helps those familiar with the aesthetic device understand the content of the philosophy. It does literalize the philosophy in a way, so we should discuss that, and whether we think it is literalizing the infinite regress of OOO. This thought experiment illustrates Harman's structure of metaphor (Harman 2018). We must step in for the withdrawn object of 'access to reality'

(which can be briefly achieved in Harman's 'cell' (Harman 2022)) and hold point cloud qualities for the access to reality real object that has withdrawn. Here, we have the real object (us) holding point cloud qualities for the withdrawn real object (access to reality). In a similar way that we have a strange reading of the sea through the metaphor, "wine dark sea," we now have a strange reading of the access to reality through the metaphor which uses point cloud qualities.

From here, Chapter 5 gets into the technical weeds of my own best practices for both photogrammetry/photoscanning and laser scanning, as these are both pertinent to the creation of the point cloud discussed in the review of Saunders and Chapman et al. This explanation of my methodology for photogrammetry/photoscanning and laser scanning also establishes the basis for the brief aside in the thought experiment of a point cloud expression of OOO principles. I discuss the aesthetic point cloud prior to the technical weeds of point cloud creation, since we do not encounter the point cloud medium through the methodology first, at least, not anymore. We encounter the aesthetic point cloud first, and as such, this dissertation will present the aesthetic point cloud (Saunders and Chapman et al.) first. Then we shift parallel to the philosophical project of OOO. Next, we combine the two into the thought experiment. It is only then, that we dig to the epistemological level of the techniques that create the point cloud medium.

To put it another way, Saunders and Chapman et al. establish the aesthetic basis; OOO establishes the ontological basis; we then combine the two into a metaphysical experiment on the tension between appearance (aesthetics) and being (ontology); then we can establish the epistemological basis for photogrammetry/photoscanning and laser

scanning that create the point cloud. After establishing these baselines with a brief

metaphysical exploration, Chapter 6 explores the point cloud aesthetically, guided by my

interpretation of the 'third table' and the further concepts around OOO that I consider

'third table' emergence experiences – experiences where we *do* access the 'third table:

vicarious causation (Harman 2007), beauty experience (Morton 2021a), semblance

(Langer 1953), and spooky action at a distance (Morton 2021a). While we do *get at* the

'third table,' I contend, by our OOO definition that we cannot access the 'third table' –

we cannot *point* at the 'third table.' I argue, through exploration, that we can be so

inspired by these 'third table' emergence experiences to create expressions that increase

the likelihood of further 'third table' emergence experiences for others. I explore this

position by exploring the feeling of engaging digital cultural objects, creating

expressions inspired by 'third table' emergence experiences. The specific objects

considered in this dissertation are point clouds, surface meshes, digital debitage,

erroneous outputs, unintended outputs, and artful explorations derived from these prior

considerations. Enjoy.

CHAPTER II

THE ARTFUL POINT CLOUD

The artful point cloud considers the point cloud as an aesthetic thing, considering the peculiar qualities of the point cloud, presenting them as they are while pursuing new avenues of visual representation unique to the point cloud medium. In this chapter, I consider Paul Chapman et al.'s *Art of the Point Cloud* (Chapman et al. 2018) and Andrew Saunders' *Baroque Topologies* (Andrew Saunders 2018; 2020; Andew Saunders, Ehly, and Hergert 2020) due to their non-literal/aesthetic expressions of the point cloud. Tangentially, films made using the point cloud as a medium are also non-literal/aesthetic expressions of the point cloud, but go further, becoming non-native media i.e., making a 'film' without using film or a camera - using the point cloud as a narrative medium. This is how computer-generated imagery and even animation begins. Illustration is illustration, but when combined with a temporal dimension, film (or a movie) appropriates the medium of drawing, painting, etc. for use as a temporally dynamic medium. I use 'temporally dynamic' here, since I consider some temporally static media e.g., literature, painting, sculpture, to be quite dynamic. This chapter will establish the artful point cloud to be synthesized with object-oriented ontology (OOO) in a point cloud metaphysics and an exploration in expression.

Andrew Saunders' *Baroque Topologies*

Andrew Saunders' ongoing work with laser scanning and the point cloud reached a resolved and cohesive tone with his text and subsequent lectures, exhibits, and

workshops, *Baroque Topologies* (Andrew Saunders 2018; 2020; Andew Saunders, Ehly, and Hergert 2020). This survey of Italian Renaissance churches pertains to only the church interiors. The selected projects and the interior approach produced an immense and compelling point cloud dataset. Saunders comes from an architectural background and has particular interest in visual representation. These foci translate into beautiful images of the point cloud data. Beyond formalist and aesthetic expressions of the point cloud, Saunders amplifies the visual particularities of the point cloud, solid surface mesh, and textured surface mesh. Not simply amplifying the qualities of the point cloud and surface mesh, Saunders creates his own terminology for the visuals these points clouds and surface meshes can achieve. Saunders organizes his text, *Baroque Topologies* (Andrew Saunders 2018) into four sections, each containing visuals that present the visual representation type that titles the section: diaphanous bodies, verduta per angelo, spheroidal cosmologies, and figured voids (Andrew Saunders 2018).

Diaphanous bodies pertains to the transparent visual character of the point cloud, where we can see the "outside" of the inside and the inside of the inside of the point cloud in the same perspective projected view (Andrew Saunders 2018); this amplifies the idealized character of the point cloud as this infinitely thin, colored surface made of

points, almost like a double-sided poster used to promote films at the cinema (Figure 1).

Figure 1 Colorized photogrammetry point cloud of the interior of the Sacristy of Basilica di San Lorenzo in Florence, Italy. This is an example of Saunders' 'diaphanous bodies' created by the author.

Verduta per angelo means 'an angel's view' and shows elevated views in

perspective projection, which are largely impossible without the use of a point cloud (or

a drone or scaffolding, or some other heightening prosthesis) (Andrew Saunders 2018)

(Figure 2).

Figure 2 Colorized photogrammetry point cloud of the interior of the Sacristy of Basilica di San Lorenzo in Florence, Italy. This is an example of Saunders' 'verduta per angelo' created by the author.

It is important to note the perspective projection in these first two types.

Perspective projection amplifies the transparent, double-sided quality of the point cloud

in the diaphanous body views, while providing a necessary experiential feeling to the verduta per angelo. Spheroidal cosmologies presents an orthographically projected top view of the "exterior" of the textured surface mesh of the church ceiling (Andrew Saunders 2018). The spheroidal cosmologies visually read as shaded reflected ceiling plans of their respective churches (Figure 3).
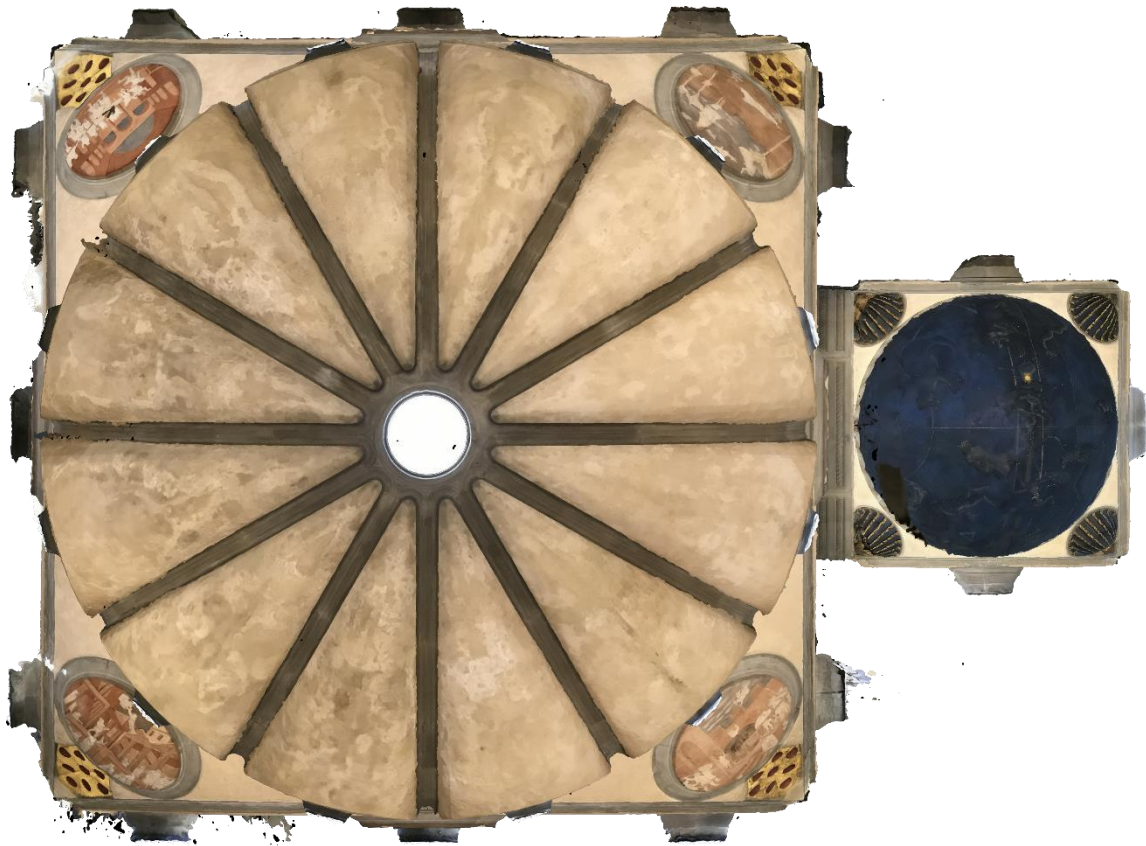
Figure 3 Textured photogrammetry surface model of the interior of the Sacristy of Basilica di San Lorenzo in Florence, Italy. This is an example of Saunders' 'spheroidal cosmologies' created by the author and re-termed 'textured voids.'

In the case of 'spheroidal cosmologies, I disagree with Saunders' terminology here. Alternatively, I draw from Saunders' final category, 'figured voids', to re-term 'spheroidal cosmologies' as 'textured voids.' I go on to re-term 'figured voids' as 'solid

voids', which creates a potential paradoxical category name, as solid and void are seemingly antithesis to one another. Figured voids (or solid voids) are a synthesis of diaphanous bodies and spheroidal cosmologies (or textured voids), since they are represented as solid 3D prints of the interior church space using a translucent material (Andrew Saunders 2018) (Figure 4).
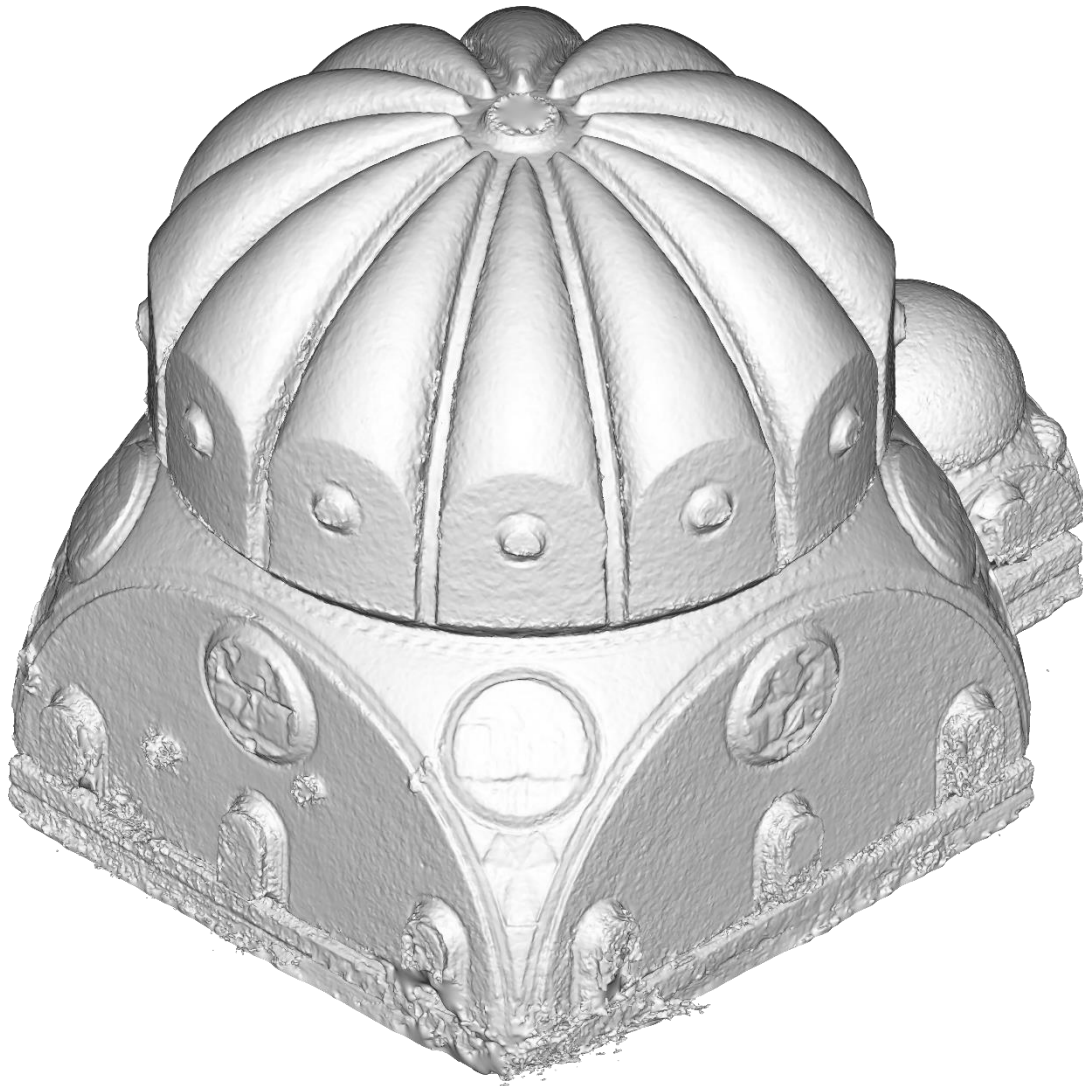
Figure 4 Monochrome photogrammetry surface model of the interior of the Sacristy of Basilica di San Lorenzo in Florence, Italy. This is an example of Saunders' 'figured voids' created by the author and re-termed 'solid voids.'

This is an attempt by Saunders to establish new representation types for architecture, specifically when architecture is surveyed and made into point cloud and surface mesh media. The aesthetic magnitude and beauty of the images in *Baroque Topologies* hold immense value in themselves, however, the best contribution to architecture and architectural survey by Saunders are these point cloud representation types. Considering the point cloud or surface mesh, then the camera position and projection, Saunders subtly amplifies the novel qualities of the point cloud and surface mesh. Beyond creating a collection of images with consistent considerations for each church, Saunders creates categories for the considerations of each type: diaphanous bodies, verduta per angelo, spheroidal cosmologies, and figured voids. The aesthetic quality of these images draws us in and provoke awe and criticism. Demanding 'usefulness' seems to indicate the work has missed semblance with the observer. If there is a direct aesthetic experience i.e., semblance (Langer 1953), a beauty experience (Morton 2017; 2021a), vicarious causation (Harman 2007), spooky action at a distance (Morton 2013a), then you have entered the shared space of sincere attentiveness to something else. This is a shared space where the question of 'usefulness' is of little consequence. Saunders' images inspire and impress me, because these aren't simply copies of San Carlo alle Quattro Fontane or Basilica Sant'Andrea al Quirinale. These are new things, new objects, mediating objects between architectural surveyor and architecture. Saunders work adds to an ongoing conversation and archive of work in architectural survey in our new digital cultural reality, where we laser scan and photoscan cultural objects, making point clouds and surface meshes. Being bold enough

to create new categories for these relatively new media, Saunders provokes me to find issue with the new categories and adjust them where I see improvements.

<p style="text-align:center">Chapman et al.'s <i>Art of the Point Cloud</i></p>

Saunders' *Baroque Topologies* offers a rigid and meticulously curated collection of digital cultural objects, while various architectural surveyors present a looser and playful (yet technologically specific) collection of point clouds in the *Art of the Point Cloud* (Chapman et al. 2018). Where the preceding discussion made sense to present the content in *Baroque Topologies* as categories in a collection, the content in *Art of the Point Cloud* is rigidly meticulous in a different way. View, projection, color/filter, tool (laser scanning, photogrammetry, radar, CT scan), model, methodology, intent, etc. are all up to the contributing surveyor-artist to the collection. Each entry in the collection is granted a two-page spread, one with directory information and a text description and the following page with a full-page image (apart from a few entries that earn a two-page spread for their respective images). In terms of non-literal/aesthetic (what we can consider artful or even playful) approaches, *Art of the Point Cloud* surpasses the work of Saunders. There are entries that present research rigor, that is, outputs from an intentional research project. However, there are point clouds presented as one-offs, intending to tell a brief story or elicit a feeling. Some even go beyond considering the medium non-literally and apply the tool (in a specific instance the laser scanner) in aesthetic ways. Other entries are still frames from films using the point cloud as narrative medium (examples of this will be discussed later in this section).

I want to discuss some of entries that standout to me in terms of their peculiarities regarding the intentional research, intentional expression, non-literal/aesthetic tool application, and film. These give us precedent in considering the point cloud and the creation of the point cloud as expressive tools, artistic and aesthetic manifestations. While most of the entries concern intentional research, the 'Deep-sea octopus' is a standout of photogrammetric capability (Chapman et al. 2018: 90-91). The octopus was suspended in a tank of seawater and photogrammetric capture was achieved using 28 synchronized cameras (Chapman et al. 2018: 90). This is an exceptional feat given that something suspended in water (or any fluid) will move, even if slightly. The multi-camera synchronization allows for a simultaneous image to be taken. Typically, photogrammetric capture sequences vary in both time and space i.e., the photographer takes an image and then changes position and takes another image and so on and so forth. While this might seem like something of a dream to those that use photogrammetry to model artifacts in archaeological contexts, the film industry has been doing this for quite some time and has a quite sophisticated apparatus and exceptional outputs. In order to achieve de-aging effects in film, the actor is situated in a hemispherical apparatus with an array of cameras and lights – with the cameras synchronized the operators can then change lighting and have the actor change expressions (Phillips 2022). This allows the visual effects team to create a moving surface which can then be mapped onto the actor, creating the de-aging effect. This is done most notably in films like *The Irishman*, *Rogue One: A Star Wars Story*, and *The*

Curious Case of Benjamin Button (Welk 2019). But let's not dwell too long on how depressingly ahead the film industry is compared to digital cultural survey.

Several entries in the *Art of the Point Cloud* aim at intended expression, simply use the point cloud much like a camera. We see the recognizable living room, tree by a sidewalk, but we see them in points, or monochrome points in the case of the tree. Other artists take things a step further and wield the point cloud's point-peculiar quality, allowing objects to blur and disintegrate. Such an entry is 'Mama' by Léon Denise in Sarthe, France. Denise uses photogrammetry to make a point cloud of his mother and proceeds to disintegrate the left side of his mother's face in a kind of evaporative flowing move (Chapman et al. 2018: 32-33). Another intended expressive move presents itself in Marco Callieri's 'PAC-MAN in Pompeii', where the laser scan of a city-block shows scan positions as small, yellow spheres – this reminds the author of a PAC-MAN maze, inspiring the 'scientific data and pop culture' mashup (Chapman et al. 2018: 76-77).

Considerably lacking in number of entries (there is only one), the non-literal/aesthetic application of the tool is whimsically presented in 'Me and I' by Alessio Bortot in Venice, Italy. While seemingly novel and trivial, Bortot might have one of the more profound entries in *Art of the Point Cloud*. 'Me and I' positions Bortot with an outstretched hand at the beginning of the scan rotation shaking hands with Bortot at the end of the scan rotation (Chapman et al. 2018: 118-119). Bortot realized parts of him were showing up in the scan rotation, so he decided to make a playful, artistic expression in the scan. This is representative of the play between human and tool, the human-

scanner cyborg; the scanner was designed for some intended purpose, Bortot noticed a peculiarity of the instrument, and Bortot modified their relation to the tool to amplify that peculiarity. Bortot makes a further observation: "The image also highlights the non-instaneousness nature of 3D scanning, and the relationship between time and space perceptible through a point cloud." (Chapman et al. 2018: 118) (Figure 5).
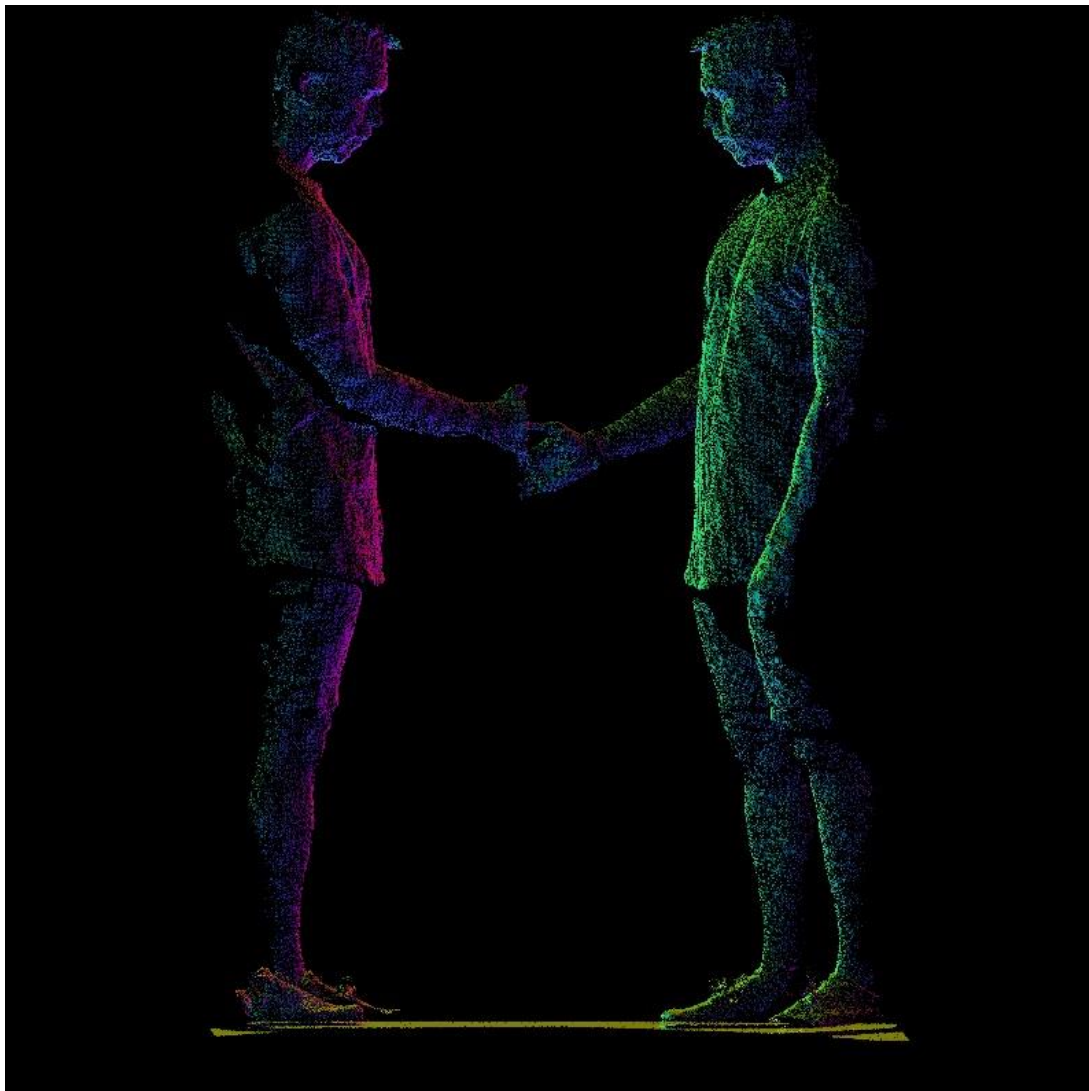
Figure 5 Normal filter, laser scan point cloud of the author, created based on the concept of Alessio Bortot's "Me and I" concept.

This is wonderfully put and a largely ignored peculiarity and misinterpretation of scanning, whether photo scanning or laser scanning: the capture is not temporally and spatially instantaneous (unless we have an arsenal of synchronize cameras). 'The scan' is not this instantaneous and flawlessly realized thing – the octopus' tentacle drifts in the seawater, the clouds cover the sun, a pedestrian walks in front of the laser. Even in 'lab settings' things are variable, strain as we might to control lighting and movement. Smaller objects can be scanned with almost instantaneous and flawless realization, but this is not the reality of the scanning process. This seemingly instantaneous and flawless realization is held within our human-being, our mode of being. The error in this thinking exponentially grows when outside 'lab settings' e.g., scanning a plaster floor adjacent to dark topsoil, partially under a suspended tarp on a particularly sunny and windy day under the canopy of a tropical forest. In such a scenario it is laughable to imagine a scanned output with consistent lighting and movement – even the synchronized camera array would be challenged under such conditions!

This non-instantaneousness that is peculiar to the scanning mediums e.g., point clouds and surface models, works to the benefit of film projects that explore the point cloud as narrative medium. Two entries dedicated to the project, "Traveling light" by Anna Heinreich and Leon Palmer in York, United Kingdom, serve more as a fly-through, projection, art installation work, but a compelling project nonetheless (Chapman et al. 2018: 114-115, 184-185). "Traveling light" projects the point cloud animation into the same space that was scanned, The Workshop in the National Railway Museum; as trains inhabit the workshop, this animation is augmented with audio of the

functioning trains (Heinrich and Palmer 2016a; 2016b). "Ifauna" is a similar still image

from a video, *Vivere, parte IV*, also from a kind of fly-through animation, though this

time an orbital path as the object being scanned is an Ancient Greek sculpture of a

military cadet (Chapman et al. 2018: 96-97; Carton and Rogues 2016). This particular

still demonstrates what we see in many of the video stills, as well as almost all of the

entries in *Art of the Point Cloud*: what Saunders termed the peculiar 'diaphanous bodies'

(Andrew Saunders 2018).

With the year 2016 apparently being a particular busy year for the point cloud in

animation and art installations, the film, *Where the City Can't See*, by Liam Young, uses

scanning technology to produce animated figures in the point cloud; in this case, human

figures that move in relation to the static point cloud background scene (Young and

Maughan 2016; 2017; Chapman et al. 2018: 160-161). The aesthetic produced by the

moving point clouds in *Where the City Can't See* is much like the earlier music video for

'House of Cards' by Radiohead, both using a combination of movement animation

(movement of the model-space camera e.g., fly-through, orbit), frame animation (the

apparent moving of the point cloud figures), and animation effects (the evaporative

flowing we saw with 'Mama') (Frost 2008; Kreps 2008).

These two bodies of work present the most cohesive, fringe thinking expression

regarding specific digital cultural objects (point clouds and surface models) in our

current digital cultural reality. While I present the projects of Saunders and the

contributors to *Art of the Point Cloud* as exceptional examples of non-literal/aesthetic

(non-discursive) point cloud and surface mesh expressions, I welcome other examples

sparked by this discussion. I spend a lot of time in the discourse and medium of point

cloud creation and engage with people, texts, videos, and forums that exchange current

and creative work in the discourse. However, this does not mean that I have some

heightened sense for who is doing the most creative work with point clouds and the like.

The work of Saunders and *Art of the Point Cloud* resonate strongly with me, and from

the work I have observed, their projects seem to be exceptional. I would be thrilled to

have other similar projects sent my way and to further develop this niche in the point

cloud medium. Considering these projects as non-literal/aesthetic approaches to the point

cloud medium aligns them with OOO and Harman's advocation for non-literal/aesthetics

over literalism. As Harman associates literalism with knowledge, he subsequently

associates non-literalism with art and aesthetics – this is not Harman rejecting value of

literalism and knowledge but pointing out the pedestal that knowledge has been put on

far above aesthetic feeling. It is not that aesthetic feeling needs rescuing; aesthetic

feeling will be fine. It is that the imbalanced scales of value are tipping steeply in favor

of knowledge to where we might lose any placed value in aesthetic feeling.

CHAPTER III

OBJECT-ORIENTED ONTOLOGY'S FOUNDATIONS, CRITICS, AND AN

ALTERNATIVE

This chapter will serve as the second half of the literature review for this dissertation and divided into five sections: 'Graham Harman,' 'Timothy Morton,' 'Complex lemons and the speculative turn,' 'Rein Raud's process philosophy,' and 'Summary.' The section on Graham Harman, and the foundations of object-oriented ontology, presents current literature on object-oriented ontology (OOO, pronounced triple-O), which includes its foundational principles, such as Harman's 'quadruple object,' undermining/overmining, the 'third table,' and 'vicarious causation.' Timothy Morton's section discusses Morton key insights and contributions to OOO: 'being ecological,' 'beauty experience,' and 'hyperobjects' (the hyperobjects' subsequent five characteristics: viscosity, nonlocality, temporal undulation, phasing, and interobjectivity (Morton 2013a)). The section, 'Complex lemons and the speculative turn,' presents two critiques of Graham Harman, OOO, and the speculative turn. The first critique is a book review by Stephen Mulhall, "How complex is a lemon?" (Mulhall 2018), of Harman's *Object-Oriented Ontology: A New Theory of Everything* (2018). The second critique Thomas Sutherland's "The Contortions and Convolutions of the "Speculative Turn"" (Sutherland 2021), where Sutherland takes aim at the 'speculative turn,' but focuses on Harman. The fourth section discusses Rein Raud and his process philosophy as an alternative post-anthropocentric ontology to OOO, an ontology immersed in flows and

flux rather than objects. In the final section, I round out the chapter in much the same way that we are starting here but expand on the key points indicated here that are presented in their respective sections.

Graham Harman

Graham Harman is the main proponent of OOO and has published a considerable library of texts that reiterate OOO's main principles and explores the philosophy as an approach to philosophy, art, social theory, and architecture. Harman's 'third table' will be a key component of this dissertation. This dissertation will explore the interpretation of the 'third table' as a non-discursive expressive approach to cognitive value, or non-literal/aesthetic approach. The 'third table' comes from Sir Arthur Eddington's discussion on two tables: the table in terms of its parts and the table in terms of its practical effects (Harman 2012; 2019). The table considered in terms of its parts is what Harman refers to as 'undermining,' where we *downwardly reduce* an object to its components (Harman 2012; 2019). The table considered in terms of its effects is what Harman refers to as 'overmining,' where we *upwardly reduce* an object to its relations (Harman 2012; 2019). We often see these used simultaneously, undermining and overmining an object, reducing it in both directions, Harman calls this duomining, which he divulges is a term that is used in finance where credit card companies simultaneously data mine and text mine individuals (Harman 2017). Harman contends that neither of these are the "real" table, and that there is a 'third table' between them. This is slightly different from Tristan Garcia that argues that the 'third table' or essential object is the difference between something's parts and effects (Garcia 2013; Garcia, Ohm, and

Cogburn 2014). As Rein Raud posits in *Being in Flux* (2021), Harman is an essentialist, and the 'third table' is just that, the essential object (Raud 2021). The problem or frustration with this 'third table' is that Harman and OOO's own definitions and principles render this 'third table' completely inaccessible, withheld from direct access, even from itself (Harman 2011; 2020b). The 'third table' then becomes equivalent to Kant's thing-in-itself, but unlike Kant, Harman and OOO contend that we *can* "get at" the thing, the thing-in-itself, the 'third table', indirectly, obliquely, allusively (Harman 2018; 2020a). This seems paradoxical, possibly even reminiscent of gatekeeping, where only those intellectually savvy in art and philosophy can indirectly access the essential object.

      While I am sympathetic to this critique of Harman and OOO, I think we need to be more specific about what Harman, OOO, and the 'third table' intend to find and are capable of doing. The 'third table' is inaccessible; it is the essential object that withdraws from all access. However, we *do* get access in very specific situations, temporally and spatially brief flashes of reality. Susan Langer referred to this specific experience as 'semblance' or direct aesthetic experience (Langer 1953). Timothy Morton describes this as the 'beauty experience,' where we feel an uncertainty about who started this strong resonance between ourselves and something else, often with an accompanying sadness that we cannot capture or measure the beauty of something (Morton 2018; 2017). Harman describes this particular situation as 'vicarious causation,' where things touch without touching – an object is sincerely interested in some other object, where the relation creates a new object where both objects are on the interior

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(Harman 2007). In vicarious causation, some 'real object' is sincerely interested in some 'sensual object', thus creating a new object of that relation (Harman 2007; 2013). Morton references Einstein with regards to electrons' ability to affect one another at a distance, something Einstein refers to as 'spooky action at a distance' (Morton 2013a). Each of these describes the instantaneous experience of reality, when something so completely holds our complete attention with such intensity that a flash of the inner, withdrawn reality of the object emerges and then immediately withdraws. Such an experience cannot be properly described, recreated, translated, etc. Try as we might, we can never adequately communicate intense emotional feeling.

We can, however, get very close to communicating the experience of intense feeling: this is the realm of the arts. Harman contends that the arts and philosophy are well-suited to such pursuits of expression of essence (Harman 2012; 2020a; 2019). I think if we hold Harman and OOO's principle of complete inaccessibility of the essential object, that even the arts and philosophy cannot reach the real object. I do think we can get at the essential object in that brief, intense shimmer of the experiential feeling. Let's say I have a semblance-beauty experience-vicarious causation-spooky action at a distance experience. As soon as that moment passes, that flash of inner reality, I am losing sense of that experience. Let's say I run to a canvas and attempt to paint the feeling of that experience, transcribing it from mind to paint on canvas. The completed painting will not elicit the same feeling in me, but the painting is not for me – I have already experienced vicarious causation. The painting is a desperate attempt at capturing

that flash of inner reality, to translate that *intensity* of feeling into an expression that might result in another vicarious causation for something else.

Now, we've gotten ahead of ourselves, which is good. I want to discuss some of the more fundamental principles of Harman and thus OOO's philosophy, some principles and terms that I have already thrown out there without explanation. Firstly, we have the realm of the withheld, the 'real' for Harman, which he derives from Heidegger's philosophy on 'being' (Harman 2002; Heidegger, Stambaugh, and Schmidt 2010). Secondly, we have the realm of the apparent, the 'sensual' for Harman, which he derives from Husserl's phenomenology (Harman 2011). Then, there are two types of things in reality: there are objects and there are qualities. The real, the sensual, objects, and qualities make up Harman's 'quadruple object' structure, an elegant diagram for the reality of things (Harman 2011)We cross these realms and types like a matrix, which yields real objects (RO), sensual objects (SO), real qualities (RQ), and sensual qualities (SQ) (Harman 2011: 50; 2018: 80) (Figure 6).

object   qualities

real — real object (RO)   real qualities (RQ)

sensual — sensual object (SO)   sensual qualities (SQ)

Graham Harman's Quadruple Object - Illustration recreated by the author, based off of Figures 3 (page 50) and 8 (page 114) from The Quadruple Object (2011) and Figure 1 (page 80) from Object-Oriented Ontology (2018).
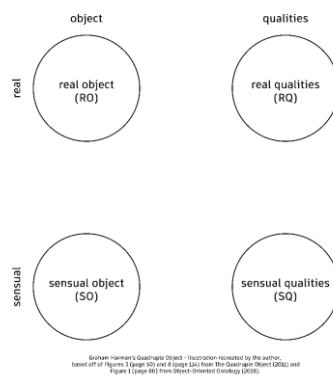
Figure 6 Base matrix for Graham Harman's Quadruple Object - illustration recreated by the author, based on Figures 3 (page 50) and 8 (page 114) from The Quadruple Object (2011) and Figure 1 (page 80) from Object-Oriented Ontology (2018).

Next, Harman crosses these objects and qualities to show four tensions: RO-RQ (essence), RO-SQ (space), SO-RQ (eidos), and SO-SQ (time) (Harman 2011: 114; 2018) (Figure 7).
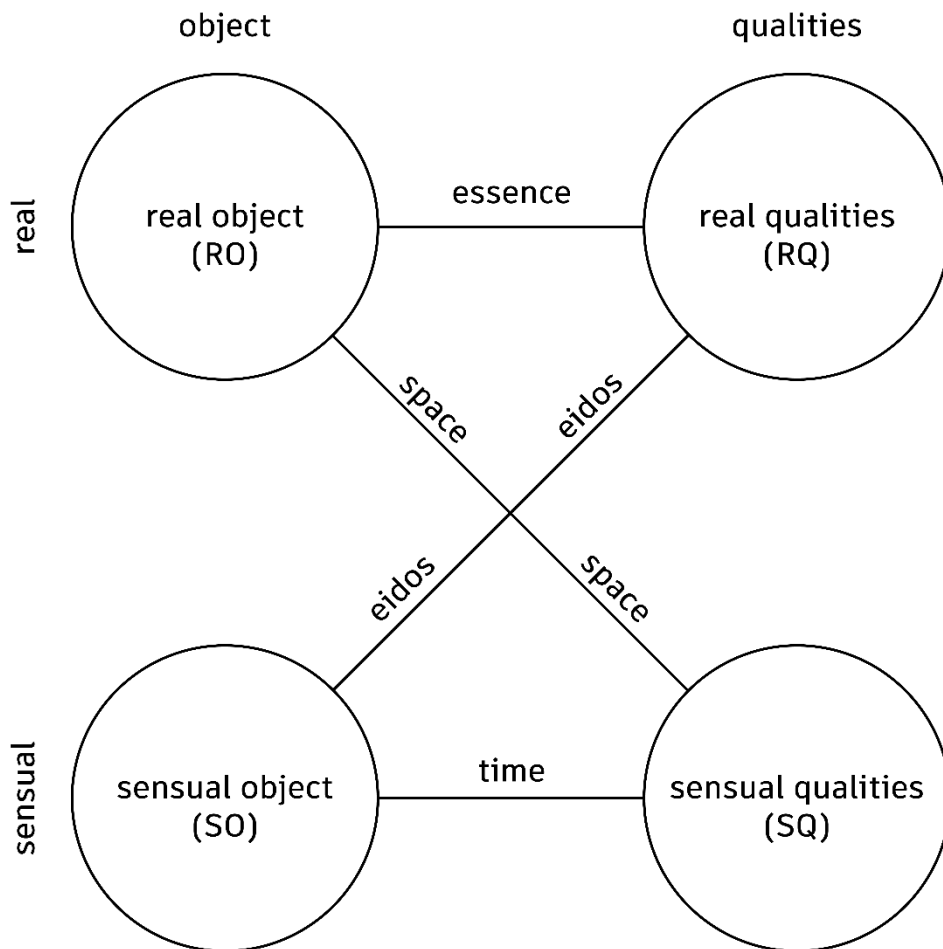
Graham Harman's Quadruple Object - illustration recreated by the author,
based off of Figures 3 (page 50) and 8 (page 114) from The Quadruple Object (2011) and
Figure 1 (page 80) from Object-Oriented Ontology (2018).

Figure 7 Four Tensions - Graham Harman's Quadruple Object - illustration recreated by the author, based on Figures 3 (page 50) and 8 (page 114) from The Quadruple Object (2011) and Figure 1 (page 80) from Object-Oriented Ontology (2018).

Harman derives these tensions from Leibniz (essence), Heidegger (space), and Husserl (eidos and time) (Harman 2011: 50). Harman further uses the fourfold structure to align 'broken links' with these tensions: causation with essence (RO-RQ; Leibniz), allure with space (RO-SQ; Heidegger), theory with eidos (SO-RQ; Husserl), and confrontation with time (SO-SQ; Husserl) (Harman 2011: 107) (Figure 8).
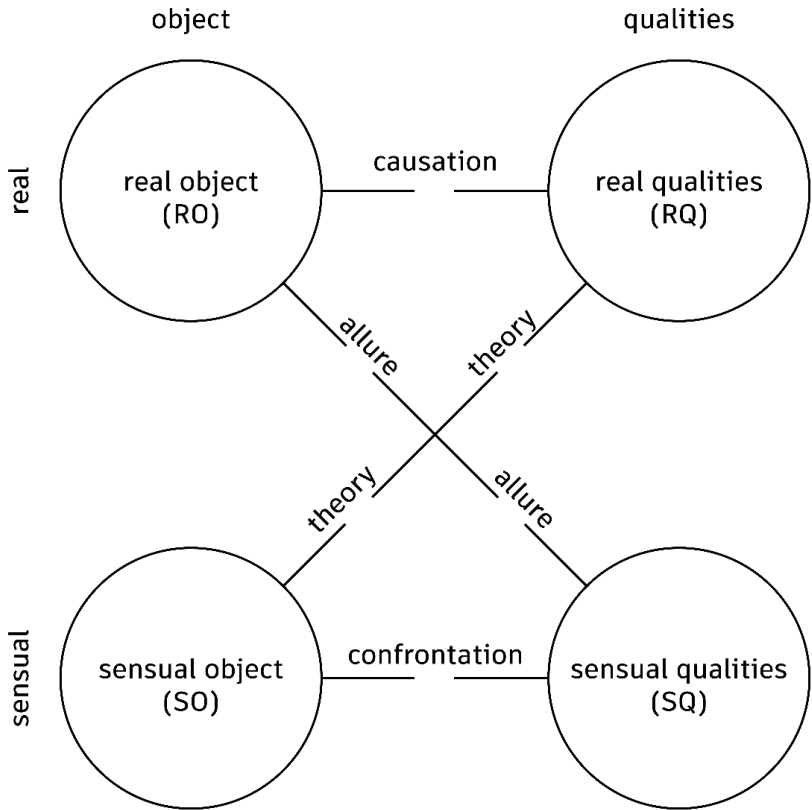
Graham Harman's Quadruple Object - illustration recreated by the author, based off of Figures 3 (page 50) and 8 (page 114) from The Quadruple Object (2011) and Figure 1 (page 80) from Object-Oriented Ontology (2018).

Figure 8 Four Broken Links - Graham Harman's Quadruple Object - illustration recreated by the author, based on Figures 3 (page 50) and 8 (page 114) from The Quadruple Object (2011) and Figure 1 (page 80) from Object-Oriented Ontology (2018).

For Harman's 'quadruple object' structure, there are four tensions, three radiations, and three junctions, making 'The Ten Possible Links' (Harman 2011: 78). In these links we have the more intuitive tensions, where Harman defines how real or sensual objects relate to real or sensual qualities. However, Harman also discusses how real objects relate to sensual objects, real qualities relate to sensual qualities and how each of these relate to themselves: these are the radiations and junctions. First, Harman's radiations, real qualities and sensual qualities relate via 'duplicity'; real qualities relate to themselves via 'contraction'; and sensual qualities relate to themselves via 'emanation' (Harman 2011: 114) (Figure 9).
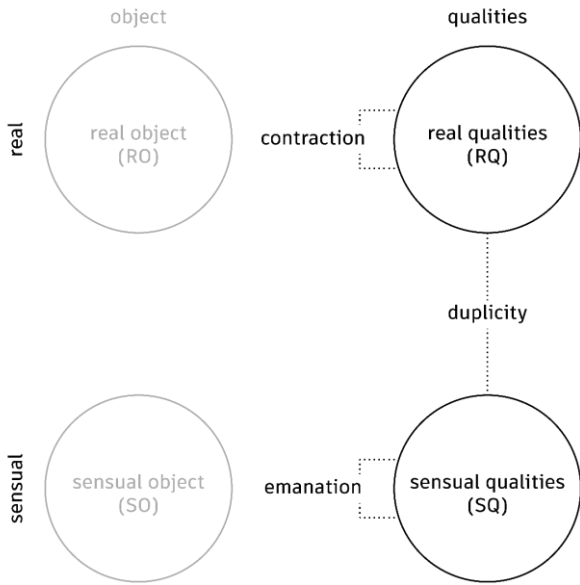
Graham Harman's Quadruple Object - illustration recreated by the author,
based off of Figures 3 (page 50) and 8 (page 114) from The Quadruple Object (2011) and
Figure 1 (page 80) from Object-Oriented Ontology (2018).

Figure 9 Three Radiations - Graham Harman's Quadruple Object - illustration recreated by the author, based on Figures 3 (page 50) and 8 (page 114) from The Quadruple Object (2011) and Figure 1 (page 80) from Object-Oriented Ontology (2018).

Both qualities have a duplicity of real, essential qualities that contract and duplicate sensual, ephemeral qualities that emanate. Second, Harman's junctions, real objects and sensual objects relate via 'sincerity' or conjunction; real objects relate to themselves via 'withdrawal' or disjunction; sensual objects relate to themselves via 'contiguity' or mediation (Harman 2011: 115) (Figure 10).
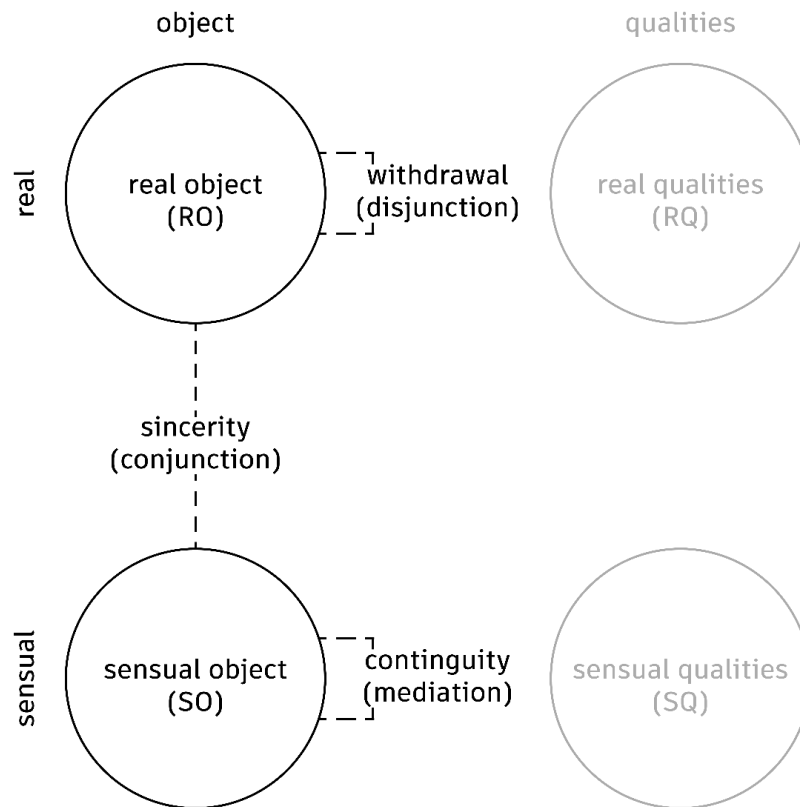
Graham Harman's Quadruple Object - illustration recreated by the author,
based off of Figures 3 (page 50) and 8 (page 114) from The Quadruple Object (2011) and
Figure 1 (page 80) from Object-Oriented Ontology (2018).

Figure 10 Three Junctions - Graham Harman's Quadruple Object - illustration recreated by the author, based on Figures 3 (page 50) and 8 (page 114) from The Quadruple Object (2011) and Figure 1 (page 80) from Object-Oriented Ontology (2018).

Sincerity or conjunction is this kind of locking-in of attention e.g., the RO-me sincerely considers the SO-me in the mirror, the SO-me has the complete attention of the RO-me. Withdrawal or disjunction is the not-locked-in-ness of attention or access; I add 'access' here because it is not that we do not care to attend to the RO, but that we cannot access it, not even when the RO is ourselves. Contiguous or mediating, the SO is the accessible intermediary between other ROs and its RO.

Next, I want to discuss how Harman uses this quadruple object structure to demonstrate metaphor and knowledge, that is non-literal (metaphor) and literal (knowledge) descriptions of things. This will be important with regards to creating expressions inspired by 'third table' emergence experiences; metaphor is the conceptual model for how we expressively communicate feeling from experience into a new medium. For this, Harman takes the same fourfold structure: we have objects on the left, qualities on the right, the real at the top, and the sensual at the bottom (Figure 6). Metaphor in Harman's structure, omits the RQ (real qualities) and applies 'improbable but not impossible' SQ (sensual qualities) to the object, but something strange happens due to the 'improbably but not impossible' nature of the qualities, and of metaphor – the SO cannot hold such qualities as they are strange to the object, and the RO withdraws into itself (Harman 2018: 84). Here, we are in a strange position as we cannot have qualities without an object, so another RO must theatrically stand-in and carry the strange qualities of the metaphor (Harman 2018; 2020a).

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Even in explaining this use of the quadruple object to discuss metaphor, it should be apparent how unfortunately (or maybe not unfortunately), such an ontological model is blatantly anthropocentric. However, we can stop our attack before we even get started. A critique of Harman's metaphor concept might be, "Well what does a cat or a brick or a table or a water molecule care about metaphor? It seems this theatrical structure demands a *human* mind!" I admit that I am sympathetic to such a critique. For all speculative realism and object-oriented ontology's seemingly posthumanist or postanthropocentric position, flattening the ontological plane and widening our sphere of concern and solidarity to nonhuman things, many of Harman's pursuits are incredibly *human-centered*. I say human-centered instead of anthropocentric because we all know and feel the sting of the negative connotation of being 'anthropocentric', ethnocentric, Eurocentric, egocentric, etc. Harman is, there is no denying it, deeply interested in humanity, in art, in architecture, in literature – things that cannot exist without humans, as Harman himself contends (Harman 2019). Although, we have fantastic speculative fiction cases, such as Nalo Hopkinson's short story, 'Message in a Bottle', that extend the ability of artistic expression beyond the human to nonhuman artists – an artist's immersive archaeological exhibit of 'ordinary contemporary junk' is the site of an artwork (a shell), unknown to the artist, but of utmost importance to an art curator from the future, a future where nonhuman artists are renowned in their day (Hopkinson 2015; Shaviro 2021). As far as Harman and OOO as a basis, there is no escaping our human-being, our species-being as humans. Even Rein Raud's process philosophy, which I will discuss in the final section, cannot escape anthropocentrism (Raud's ontology is more an alternative to OOO than anti-OOO, since

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they share a lot of overlapping ideas). Our human-being is inescapable, but that does not

mean we should despair – we can have solidarity and concern for nonhuman objects, and

that leads us to Timothy Morton.

Timothy Morton

Timothy Morton is another major proponent of OOO and is almost as prolifically

published as Harman. Morton adheres closely to the structure set forward by Harman,

though Morton tends to take a more ecological and popular science-fiction approach in

applying OOO's concepts. Morton is ecologically focused, in that, they [Morton] convey

and discuss solidarity with nonhumans, and a 'being ecological,' which is caring for

something without situating need or use for that thing e.g., nonhuman beings that we

share our lives and homes with, such as cats, dogs, birds, reptiles, plants, etc. This

solidarity, or 'being ecological', is almost like a kinder, new-age version of Kant's

disinterested care or deontology; in order to properly judge something, one must have

distance from it in terms of interest, while deontology refers to an ethics regardless of

consequences (Kant and Walker 2007; Kant and Weigelt 2007). Morton often uses

references to popular science fiction to make analogies to philosophical concepts to

make these ideas clear and accessible. Morton's most recent text, *Spacecraft* (Morton

2021b), takes this analogous science fiction approach and makes it the entirety of the

book. Morton refers to the popular *spacecraft*, the Millennium Falcon, from *Star Wars*

as an expression of a nonhuman having considerable agency relative to its human

costars. The Millennium Falcon is stubborn, breaks down, communicates, and changes

hands in a way that implies different relations to the different human characters i.e., it is

not "owned," it has relations with Han Solo, C-3PO, Lando Calrissian, etc. (Morton 2021b). Morton discusses other spacecraft in popular science fiction, and then sets 'spacecraft' in opposition to 'spaceship' – the latter being less an agent with its own stakes, but an amalgamated expression of institutional power e.g., the Imperial Empire of *Star Wars* (Morton 2021b). While, yes, a wonderful, entertaining, and wonderfully entertaining read for any philosophy and science fiction fan, this analogous approach by Morton helps to convey philosophical concepts in a kind of metaphorical way. The sensual qualities of spacecraft and spaceships in popular science fiction are held by the real object reader for the sensual object philosophical concept.

Morton also speaks very often of art and beauty in ways that seem more melancholic than the rhetoric used by Harman in his discussions on art, beauty, and aesthetics. Both Harman and Morton are exceptionally seductive writers, which has been indicated to their detriment by some like Katherine Behar: "the scent of seduction and conquest permeates terminology, capturing object within the gaze of a perverse exoticism…" (Sutherland 2021). While Behar is specifically referring to Harman, and we will discuss this sentiment more in the following section on the critique of OOO, we do need to acknowledge the bold style in which both Harman and Morton captivate an audience both in their writing and their speech (in lectures and discussions). Also note my bias towards the writing and speaking styles of both Harman and Morton – I enjoy them, their styles resonate with me; I do not find them nearly as abrasive as Behar, but I see their point.

In another of Morton's recent books, *All Art is Ecological* (Morton 2021a), they

reiterate and refine some of their notions regarding art and beauty. Morton describes a

quality of art as that which "disables getting from A to B", moving from seemingly

smooth operation to an error, revealing "the spooky openness of things" (Morton 2021:

28). Furthermore, Morton argues that art has holographic properties, "art is actually a

tiny but still recognizable fragment of the kind of larger world" (Morton 2021: 76); I

find this argument 'holographic' due to the sentiment of "tiny but still recognizable

fragment," where any piece of the hologram contains information of the whole. In a

similar way, the tiny fragment, texture image extracted from photogrammetric and

texture mapping processes can also be argued to be a kind of holographic artifact, since

it contains all the texture and surface information in a single, two-dimensional image. I

will discuss the texture image in more detail in the next chapter (Figure 11).
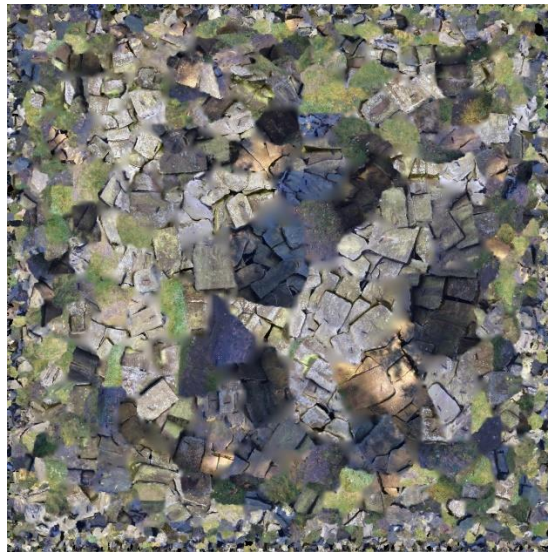
Figure 11 Texture image, generic mapping with mosaic blending, from surface model (.obj) export out of Agisoft Metashape - textured photogrammetry surface model created by the author of Igloo di pietra by Mario Merz (1982) at the Kröller-Müller Museum in Otterlo, Nederland.

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Returning to Morton and his discussion on art, Morton seems to be resonating quite strongly with art as a kind of high-amplitude object, a specific object that helps to describe and explore the nature of objects in a more general sense. They express a profound agency within artworks and things-in-themselves, as well as a wealth of depth and potential: "A thing is bursting with parts and scales and temporalities and sexualities" (Morton 2021: 77). Morton goes on to portray the dynamism, non-binary, and gradation of beauty: "a thing is never keyed to our taste or to a standard of good taste, but somehow that doesn't mean it's always definitely only ugly or that beauty and ugliness are false categories. It means that beauty is wild, spectral, haunting, irreducible, uncanny. And causal." (Morton 2021: 77). Beauty and ugly set up a false binary, there is everything between. And not only that, but whichever aesthetic quality something has is in flux. Making the 'beauty experience' increasingly unnerving is Morton's final statement there, "And causal." Beauty affects us in a very strange way, and rightly so does Morton bring The Force from *Star Wars* into the fold as things "penetrate and bind us together" (Morton 2013a). The beauty of someone we are attracted to, the song that brings us to tears, the strange hypnotic trance that comes from looking at the stars on a particularly clear night – these things affect us (and affect us strongly at that) without any apparent contact, it is quite like magic as Morton has eloquently put it (Morton 2013b; 2021a).

'Beauty experience' is a concept of Morton's that is key to this dissertation. This focus comes from my alignment of Harman's vicarious causation, Langer's semblance,

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and Einstein's spooky action at a distance (via Morton) all with Morton's description of 'beauty experience'. I think these various authors are discussing the same thing, and I think that thing is a 'third table' emergence experience, where the RO in the equation briefly glimpses the 'third table,' essential object or RO, of the SO. It is due to the magnitude of feeling and the inability to express the experience that indicates brief and fleeting access to something that is by OOO's own definition, inaccessible.

Morton is a master of creating new terms or repurposing terms, and 'hyperobjects' are maybe their most well-circulated of such terms. Many of the ideas pertaining to hyperobjects help consider objects themselves and 'beauty experience.' Some of the qualities and concepts surrounding hyperobjects offer some insight into the nature of reality as well as the nature of 'beauty experience.' Hyperobjects are objects that are massively distributed in space and time and this distribution precludes some of Morton's fundamental qualities of hyperobjects (Morton 2013a). Hyperobjects only appear as 'local manifestations,' so that hyperobjects themselves have a characteristic of 'nonlocality.' A common example given by Morton is that between weather and climate; extreme weather events (or any weather event for that matter) are local manifestations of the nonlocal, climate hyperobject. This brings in a key concept to Morton's philosophy: very large finitude. For Morton, infinity is too easy and leaves us feeling superior and quite safe and special in our understanding of reality. Finitude, and particularly very large finitudes, make us feel small, uncertain, insignificant – it is easy to count to infinity, but it is very difficult if not impossible to count to 293,867,415 (Morton 2013a). This very large finitude is the realm of hyperobjects. These are objects on astronomical,

geological, cosmic *scales*, not just spatially but temporally as well. This is where 'temporal undulation' comes into play – we must bring concepts of our reality into human time scales. The use of time-lapse and modeling simulation (often with a combination of the two) help us to understand spatially and temporally massive things.

Hyperobjects are also sticky, they have viscosity; you cannot put the hyperobject baby in the corner, nor can we throw the hyperobject baby out with the bath water (even if we wanted to). We are inside hyperobjects, and, subsequently, hyperobjects are inside us. DDT and microplastics are good examples – microplastics being a sobering and more immediate threat, since Rachel Carson helped to combat DDT (Carson 1999). Rather than consider viscosity as some sort of amorphous blob from science fiction horror, the more effective way to think about the viscosity of hyperobjects is through Morton's discussions on 'away,' Nature, and World. In short, there is no 'away.' There is no magical place where our waste just disappears, though society tends to think and behave in such a way. Consider this – how would you live if you had no dumpster, no trash bin? Sure, some things will compost, others will burn, but what about the device you are either reading this on or the device used to print these words? Where does digital waste go? Certainly, for those in other countries where the United States and others pay to relocate their waste, computers, cell phones, monitors, printers, etc. these things do not simply disappear. Nature often sets up a false dichotomy between humans and everything else, between cultural and natural. Combatting this leads to ontological flattening, where humans are just a specific kind of object; it is not human subjects and nonhuman objects, but human objects, table objects, hat objects, bird objects, book club

objects, etc. And now, if there is no 'other,' no Nature to be in opposition to, then, we reach "the end of the world." This is not the apocalyptic, doom and gloom, revelations hellscape "end of the world," but merely the end of thinking of 'world' as some container that everything else is *in*. There is no 'other,' there is no 'away', and therefore there is no 'world'; we are in a soup, much more like a fish in the ocean or a cranberry in gelatin.

The interobjectivity of hyperobjects (and objects in general) contends that "nothing is ever experienced directly, but only as mediated through other entities in some shared sensual space" (Morton 2013a: 86). For those familiar with Harman's 'vicarious causation,' the description of a shared, inner space of a new object brought on by sincere attention of some RO with some SO (Harman 2007), Morton's interobjectivity is seemingly identical, or at least they are talking about the same concept. Morton gives the example of the dinosaur footprint, where "there is some form of shared space between the rock, ourselves, and the dinosaur, even though the dinosaur isn't there directly." (Morton 2013a: 86). Interobjectivity makes possible what Morton calls 'signs of causality', where the difference between cause and sign disappears (Morton 2013a: 88). With this study's disposition toward archaeology, architecture, and art, and Morton's footprint as a sign of causality, we can widen this consideration to the term, 'mark,' as in 'make your mark' or 'leave your mark'. A mark is a sign of causality in possibly the simplest sense. A mark indicates contact, interplay between objects, Morton's interobjectivity. Imagine this keyboard I am typing on were not linked to a computer but was part of a typewriter – I would be making marks through the interplay

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of various objects in that case: my brain with my hands (not to mention intermediary links between my brain and hands), my hands with my fingers, my fingers with the keyboard, the key with the pedal, the pedal with the stamp, the stamp with the ink, the ink with the paper. I am still engaging in such an activity here, even if digitally: my fingers with the keyboard, the keyboard with the computer, the computer with the specific software, the software with the user interface (where I see the words I am typing right now). These are marks, signs of causality between the reader, the digital document, and me. I cannot express these specific thoughts in this specific way without interobjectivity, without the digital document.

Morton takes interobjectivity to the realm of art, or rather, expressing art through another medium. "… writing about music really is like dancing about architecture – and a good thing too. Everything is like that." (Morton 2013a: 91). This is non-literal/aesthetic translation through a medium, or expressing feeling brought on by something through a different medium. This expression is not aimed at expressing the inner essence of the 'something' but expressing the feeling between objects, between RO and SO, in Harman's structure. Writing can be a mediator between someone and music, and dancing can be a mediator between someone and architecture. Referring back to our marking or 'signs of causality,' writing is the mark between someone and music, and dancing is the mark between someone and architecture. However, I contend that one cannot simply express feeling about something in another medium effectively, that is, with a high degree of potential resonance. We must be careful here both as artists and art critics, for we run the risk of pretension as is the case in the humanities (or discourses of

expression) (Harman 2020a). Expressions with 'high degrees of potential resonance' are

not algorithmic, and that is something frustrating about art and philosophy at times;

these discourses fuss about in *je ne sais quoi* of things – the 'I know not what' of things,

which the author may not even have a strong grasp of the 'how,' 'what,' or 'why' of

their spawn (Harman 2022). So we need non-literal/aesthetic marking, an

interobjectivity, an intermediary between objects, but we also need to avoid what

Harman argues ruins an artwork: literalism (Harman 2020a; 2022). An example familiar

to those in architectural discourse is the descriptions by architects and students of

architecture of their respective projects. One of the worst culprits is the literal metaphor,

a visual pun, so to speak e.g., the building *reflects* the surrounding natural features (such

as a mountain range or a particular bird that frequents the surrounding skies) (Harman

and Gage 2014).

      The last quality of hyperobjects (and objects in general) Morton discusses is their

'phasing.' Phasing deals with the quality of a kind of higher dimension of an object, "…

dimensions of the high-dimensional phase space. Time is now radically inside objects,

rippling through them…" (Morton 2013a: 73). This notion, time being inside objects,

refers to Morton's concept concerning futurality, that everything we see (sensual objects,

in a sense) is the past e.g., the marks on my face or a building are footprints of previous

events of interobjectivity, while the future emanates from within objects (Morton 2013a:

91). Possibly maddening for geologists and amusingly for archaeologists, the future, for

Morton, "lies ontologically "underneath" the past" – appearance is the past, essence is

the future (Morton 2013a: 91). And we can bridge to Harman's terminology with that

previous sentiment: sensual qualities and objects are the past, while real qualities and objects are the future. Furthermore, we can more accurately say, the sensual realm is the source of the past and the real realm is the source of the future. Given the withheld nature of objects that OOO contends, that the future and potential erupt from objects follows the logic of the OOO standpoint. Returning to the idea of phasing, an important distinction is made with regards to 'process,' an apparent allergen for OOO, given our discussion of the philosophy so far. For Morton, witnessing process implies the witnessing of "… an object seen from a standpoint that is $1 + n$ dimensions lower than that object's dimensionality." (Morton 2013a: 72-73). This also ties back to Morton's notion of temporal undulation, that timescales for different beings are quite different, particularly on massive scales e.g., geologic, cosmic, etc. Humans observe the processes of certain things, but we rely on tools to perceive them e.g., time lapse videos, displacement sensors. Even processes about us ourselves often require some outside perspective to approach some level of comprehension e.g., therapy. Another way to think of Morton's phasing is to consider the analogy made in the story *Flatland* between humans and gods: a two-dimensional inhabitant, a square, of Flatland encounters a strange circle of varying size (Abbott and Jann 2020). Priests in Flatland are circular, but their dimension remains static, so this strange stranger of varying circular diameter is uncanny. The varying size circle can appear and disappear from Flatland while the circle's voice remains. It is not until the dynamic circle "raises" the square "out" of Flatland that the square realizes the dynamic circle is a *sphere*. The square was only seeing the *cross-section* of the sphere in Flatland. Analogous to the square's inability to

comprehend a third dimension until taken out of its own reality, we humans are unable to comprehend a dimension higher than our four dimensions. In reference to phasing, humans struggle with or are incapable of comprehending hyperobject dimensions, particularly that of hyperobject time e.g., geologic and cosmic time.

Of Morton's contributions to the OOO project, there are a multitude, but I will attempt to summarize those that are key. 'Beauty experience' as a kind of shared inner space between objects where it is unknown which object started the engagement; this is a fantastic insight into the deep connection that is possible between things, between objects. 'Hyperobjects' and their viscosity, nonlocality, temporal undulation, phasing, and interobjectivity are particularly important for the large-scale conversations we are having regarding global warming and global pandemics – we are waking up to the realization of being *inside* a hyperobject. 'Being ecological' advocates for a caring for that which we have no reason, no utilitarian reason to care for; this is a way to bring nonhumans into the human sphere of empathy – we are all objects inside this tumultuous hyperobject within hyperobjects within hyperobjects… Much like hyperobjects themselves, Morton's qualities of their concepts have a depth and value in themselves. The concepts found within ideas of viscosity, nonlocality, temporal undulation, phasing, interobjectivity, etc. have valuable insights to our reality and the nature of being in such a reality. With this, I have established a firm baseline within the OOO project between the ideas of Harman and Morton and their concepts of importance to this dissertation. From here, we can explore some of the faults of OOO through two critical texts on the philosophy.

Critique of OOO: Complex lemons and the speculative turn

This section will present and discuss two critiques of OOO: one by Stephen Mulhall pertaining to Harman's text, *Object-Oriented Ontology* (2018); and the second by Thomas Sutherland taking aim at the 'speculative turn,' but focusing on Harman and OOO. Stephen Mulhall's critique largely orbits the notion that Harman claims indirect access in a particular dance with the object, a non-literal, metaphorical one. This is part of Mulhall's larger review of Harman's *Object-Oriented Ontology: A New Theory of Everything* (2018). I still hold this text to be one of Harman's more polished and well-structured presentations of his philosophy and OOO, so this makes Mulhall's review an important critique of the mature state of OOO. Harman continues with his diagrams of object structure i.e., the quadruple object, but uses the same diagrammatic language to show how he is considering theatricality and metaphor (Harman 2018: 84). Mulhall breaks down Harman's example of the cypress tree as an example of metaphor and theatrical exchange. I want to address Mulhall's critique in pieces, but I want to first present it in full:

"First, he [Harman] tells us that the real cypress cannot be accessible to us because it's real; then that the subject, which is a real object is always genuinely and truly present in aesthetic experience, and so can substitute for the absent real cypress; and then that the only real object involved in such experiences is not the subject but the newly amalgamated object of which it is a part. And if this new object is not a way of

gaining access to any pre-existing object, how can it be the root of all philosophy: that is, provide a privileged vantage point for apprehending the underlying reality of things? But if it does offer such insight, then surely reality must be accessible after all." (Mulhall 2018: 5).

"… the real cypress cannot be accessible to us because it's real…", yes, but we do have access to the sensual cypress. This is a specific case of Harman's vicarious causation – Harman's description of the inner space of vicarious causation, or how things touch without touching, is the basis for his metaphor diagram (Harman 2007; 2018). And, yes, to Mulhall's second statement: subject = real object, and "genuine and true" presence is a prerequisite for theatrical exchange; in Harman's metaphor of the 'wine dark sea', the RO needs to be thinking on the SO sea sincerely in order to hold the SQ wine qualities for the withdrawn RO sea (Harman 2018: 84). "… the only real object involved in such experiences is not the subject but the newly amalgamated object of which it is a part." – this is a misreading of Harman, or perhaps a misspeaking of Harman that Mulhall caught. In the case of metaphor or theatrics, there is $1 + n$ ROs in play. So here, we have the beholder (assumedly a human in this case), the cypress, the root object of the seemingly impossible qualities applied to the cypress, and the metaphor itself. The metaphor is a higher order object, not unlike Morton and their hyperobjects (Morton 2013a). Perhaps clearer is Harman's often used example of 'wine dark sea' where we have our $1 + n$ ROs again: the reader, the sea, the wine, and the metaphor.

"And if this new object is not a way of gaining access to any pre-existing object, how can it be the root of all philosophy…", which implies that the new, inner space of the shared object warrants no further access by the beholder of the real cypress, nor the cypress of the real beholder. This new object is not a way of gaining *direct* access to either the real beholder or the real cypress, but indirect access, yes. This is a frustrating aspect to Harman and OOO; it's almost as if they want to gate-keep access with witchcraft and wizardry. I approach this frustrating and seemingly paradoxical claim by OOO by considering this *moment* of indirect access. It is anthropocentric, but we are exploring these concepts as humans, and so I argue to consider 'indirectness' as temporally specific and of intangible feeling. I use words like 'brief,' 'glimpse,' 'shimmer,' 'intense,' and 'high-magnitude' when I discuss precisely what my dissertation interprets as the 'indirect access' as a 'third table' emergence experience; some RO (like the beholder or the reader), in a shimmering blip, *experiences* the emergence of the 'third table', the essential object, the real object. Which, as we all know at this point, is impossible, by Harman and OOO's own definitions of objects and reality. Reality is impossible for direct access, to *know*; it is not, by contrast, impossible for indirect access, to *feel* – we can *feel* real objects. Put differently, we *can* experience the reality of things through feeling, but we cannot know the reality of things through knowledge e.g., through undermining and overmining.

This aligns with the string of terms I associate with the 'real': imaginary, immaterial, virtual. This string of apparent synonyms, particularly in philosophy and ontology will be discussed more in Chapter 4, but I do want to add some terms before

returning to Mulhall. In current historic preservation, heritage conservation, archaeology, and architectural history circles, the distinction between tangible and intangible heritage has been a popular issue to discuss, this with regards to increasing means to document and preserve intangible heritage such as oral histories, myths, songs, etc. We can align 'intangible' with the real-imaginary (meaning nonphysical)-immaterial-virtual world. We can also bring in Levi R. Bryant and his distinction between 'local manifestation' and 'virtual proper being' (Bryant 2011). Bryant is drawing directly from Harman and the trajectory of OOO in facilitating his own discussion around substances – here he aligns 'local manifestation' with Harman's 'sensual' and 'virtual proper being' with Harman's 'real.' Local manifestation, if we recall Morton, is also a quality of hyperobjects, and this interlinking of Bryant's local manifestation to Harman's sensual objects and qualities, further adds to Morton's concluding notion in *Hyperobjects* (2013) that all objects really are hyperobjects (Morton 2013a: 201).

Returning to Mulhall's critique of Harman's metaphor structure, we follow the issue of access to the real object, to the reality of a thing. "And if this new object is not a way of gaining access to any pre-existing object, how can it be the root of all philosophy: that is, provide a privileged vantage point for apprehending the underlying reality of things?" (Mulhall 2018: 5). The new object, the metaphor object, is not "the root of all philosophy" nor "a privileged vantage point" for understanding reality. This combines Harman's and OOO's position that objects are the fundamental stuff of reality with Harman's description / equation-diagram for metaphor / vicarious causation. This combination by Mulhall conflates the two distinct concepts. Harman and OOO claim

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that objects are the fundamental stuff of reality, but as far as "root of all philosophy", at least for Harman, that is aesthetics (Harman 2019). The difference between 'fundamental stuff' and 'root of philosophy' is that the former is an ontological position, a position of the nature of being, the nature of reality; while the latter is a very *human* position, an experiential one, an aesthetic one – the root of philosophy as *feeling*. In this statement on the new object, philosophical roots, vantage point, and understanding ontology, Mulhall attempts to discredit object-orientation as well as indirect access by forcing the two into the same thing.

Also, I think it is important to note that, while Harman does not say this directly, I contend that indirect access or a brief access to the inner reality of some object is not equivalent to direct and total access to the reality of some object. In a more informal and blunt manner, just because you love something does not mean you know anything about it. Furthermore, this does not give you privilege or right to act or speak on its behalf. This evolves into why this dissertation approaches not some duplication or replication of a 'third table' emergence experience, but the expression inspired by such an experience; this is all we can do. Direct access to a 'third table' is impossible, and 'direct' implies *intention*; direct access (while never a possible concept) is how we consider tools, things to be used, things with utility and instrumental value – this harbors a level of *certainty*, that we can rely on the certainty of the behavior of this tool or that. There is little more sickening than the realization of someone manipulating, using someone else; now, why would we be so repulsed by such an act? The manipulator is merely flexing their comprehending muscles about the causalities and manifestations pertaining to this thing

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or that (in this case another human). This is what we call 'objectifying' humans,

reducing humans down to a tool or thing. However, as Bruno Latour points out, "When

humanists accuse people of 'treating humans like an object,' they are thoroughly

unaware that they are treating objects unfairly." (Colomina and Wigley 2016). Object

orientation does not advocate for objectifying humans, it wants to point out that we have

much relate to in showing solidarity with nonhuman objects, and much to gain for that

matter (Morton 2017).

Returning once again to Mulhall: "But if it does offer such insight, then surely

reality must be accessible after all." (Mulhall 2018: 5). Mulhall is using 'accessible' as a

catchall for both direct and indirect, and this might indicate an aspect of its philosophy

that OOO (and Harman) needs to explore further or explain differently. This is the issue

of access. OOO and Harman have advocated for reality's inaccessibility, objects'

tendency to withhold themselves from direct access by other objects. OOO and Harman,

at the same time, advocate for *indirect* access by approaching objects allusively and

obliquely, hinting and gesturing but not directly pointing (Harman 2013; 2018). So,

which is it (as Mulhall is implying); can we access things or can we not? For Harman

and OOO, they establish 'direct access' as a means to exhaust all there is to know or feel

about a thing. The problem of 'direct access' is the paradox of the coin; there is always

an inaccessible 'other side', both sides are never simultaneously present. And if we want

to take images of both sides of the coin and look at them simultaneously, well, we're not

looking a "coin" anymore then, are we? We are looking at images taken from the coin,

or at least an image of one side of the coin while looking at the other side of the actual coin.

OOO does (though maybe not often enough) admit access to reality, to real objects, it's just fleeting and impossibly brief on human timescales, and this access cannot be attained directly, intentionally; this access must surprise us. For OOO, reality is strange, weird, mystical specter, and this kind of language fills the texts of Harman and Morton (and makes appearance in some of the terminology for Ian Bogost's 'alien phenomenology' and Levi Bryant's 'onticology'). Reality is something, for OOO, that disappears as soon as you shine a light on it. So, what am I typing on right now then? Is this computer not "real"? OOO would argue that indeed the computer is real, but what I am *accessing* is not the real computer, but the sensual computer. I access its sensual qualities that attach to the sensual object of the computer, while the real computer withholds its real qualities and real object, essential self. What we are accessing is not the RO, but Harman's structure of an object holds that no SO can exist without an RO counterpart. We can access the SO, but not the RO, or reality (as Mulhall puts it); but there is a caveat to this for OOO – there are special cases of access to the RO: these are the vicarious causation, beauty experience, semblance, spooky action at a distance, the direct aesthetic experience with something where there is a high-magnitude resonance between objects creating a new, shared object. This experience can never be translated into what we would consider access, because we cannot point to it. In other words, the real is "so real that it can never be identical with any representation of it." (Harman 2022: 102).

This is by no means a definitive end to the discussion and issues raised by Mulhall, but for now we'll continue to discuss another critic of Harman and OOO, Thomas Sutherland. Sutherland writes a more pointed critique of OOO, Harman, and the speculative turn in "The Contortions and Convolutions of the "Speculative Turn"" (Sutherland 2021). An oversimplification of Sutherland's issue with OOO is the hypocrisy in its anti-anthropocentric rhetoric and its apparent position as just another anti-established power structure movement i.e., a counter-cultural movement, like punk or postmodernism. Without delving too deep into the issues with a counter-culture movement, we can acknowledge that an issue with counterculture is it must always have something to counter; punk cannot stand alone without some normative, mainstream opponent. Postmodernism was a reaction to modernism, and we are still fighting amongst ourselves to determine some direction past or beyond modernism, or maybe we have never been modern (Latour 1993). The point is that punk needs a mainstream authority, postmodernism needs modernism, and OOO and Harman need literalism.

Returning to Sutherland's issue with OOO and Harman, Sutherland claims that the movement declares "OOO to be the only system faithful to the world of things, rather than merely the world of humans." (Sutherland 2021: 122). We'll return to this notion of white knighting that OOO seems to position itself as, according to Sutherland, and I do not exactly disagree with him on that point. I do not agree with Sutherland's claim, at least not that OOO is making it explicitly – though, I think Sutherland's inference of such a notion is well-founded. Process philosophy, which I will present and discuss in the next section, makes a strong case for caring about things in a similarly

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heightened level of inclusivity, caring, and solidarity. In this sense, both OOO and process philosophy (at least Rein Raud's version of it) are intent "to account for the occluded, marginalized, or repressed" (Sutherland 2021: 113). It's not so much that Sutherland disagrees with such a pursuit, it's the privileged, hegemonic position OOO seems to put itself in. Sutherland appears to read OOO and its proponents as neoliberal, in a sense, that they are rescuing objects from obscurity and servitude. While a noble endeavor, Sutherland's problem with this seems to be the irreconcilable notion of human *being* and tools; it is impossible for us to not think like a human and it is a baseline of survival for us to *use* things e.g., to breath, to eat, to drink, to hunt, to cultivate resources, etc. This follows a rational trajectory, but I think OOO, and projects like it, fight an uphill battle in merely attempting to slow and destabilize the accelerating exploitative behavior of humans and our obsession with the plane of immanence. Power systems establish and maintain such status by exploitation and feinting certainty – any stasis or contentment and any sign of uncertainty results in loss to those that *use with certainty*.

It's not exactly objects that need rescuing, though we should certainly not be dismissive of caring for nonhuman things, but that we need to rescue ourselves, our human being from our own delusions. Should we have a kind of Kantian ethic and care for nonhumans without any perceived benefit to our own well-being? Probably, yes. Should we also just admit that widening our sphere of solidarity to include nonhumans benefits both us and nonhumans? Also, yes. A very prime and pointed example of this I find to be useful here is waste or trash. A consumer society does well to ignore such a notion that there is no "away." The cruel cycle of consume this, throw that "away," so

we can make more and then you can buy more is misnamed as a "cycle." We cannot spend, consume, produce our way out of this, we need a mindful, caring approach to the way we humans are in the world, and to be honest, I am not optimistic humans will rise to the occasion.

Objects do not need rescued. As Latour so eloquently puts it: "Things-in-themselves? But they're fine, thank you very much. And how are you? You complain about things that have not been honored by your vision? You feel that these things are lacking the illuminations of your consciousness? But if you missed the galloping freedom of the zebras in the savannah this morning then so much the worse for you; the zebras will not be sorry that you were not there, and in any case you would have tamed, killed, photographed, or studied them. Things in themselves lack nothing, just as Africa did not lack whites before their arrival." (Bryant 2011: 34). Things, objects, entities, etc. of which humans are a *kind* of thing, object, entity, nonhuman things, objects, entities, etc. will be just fine without us, without our care, without our harm, without our interest or disinterest. Things existed well before humans existed and things will exist long after. This puts into frame a key dispute between anthropocentric and anti-anthropocentric philosophies. For anthropocentric philosophies (not that they would refer to themselves that way), philosophy and theorizing about the world is our human endeavor. It's not anthropocentric because we have malice in our hearts, but because *we are human,* and we only have our human-being. To philosophize or theorize about what a nonhuman-being is not some harsh waste of time, but to embark on such a venture is impossible and possibly disingenuous to the very goal of an anti-anthropocentric philosophy (such as

OOO or post-anthropocentric process philosophy [Raud]). By the very rhetoric within OOO, we humans never understand what it is like to be a nonhuman, we can *speculate*, sure.

As Sutherland rightly points out, OOO and Harman do become paradoxically anthropocentric at times. Harman's "traces" that are another synonym to real objects battle things out in some subterranean caverns. However, Sutherland points out Harman's anthropocentricism within Harman's own apparent defense of the autonomy of nonhuman objects: combatting that objects be confined "… within a theory of human meaning rather than letting them battle it out amongst themselves…" (Sutherland 2021: 118). It is the word, "letting," that is the issue here – objects do not require permission to "battle it out amongst themselves," they just do, or do not… or try, for that matter. OOO and Harman do not have everything figured out, but the environment of philosophical debate requires declarative statements about reality, appearances, ethics, etc. to test and explore such philosophical projects. While OOO and all philosophical projects are flawed in this way or that, the project provides much in terms of compelling styles and content of ways to approach our love of wisdom.

Rein Raud's process philosophy

Rein Raud's *Being in Flux* (Raud 2021) presents an alternative post-anthropocentric approach to philosophy, beginning with a discussion on current ontological literature, which includes OOO and Harman, before exploring his own process ontology. While I agree with posthumanism and a post-anthropocentric movement, when it comes to the arts and architecture, this becomes difficult. As we

discussed in the section on Harman, humans are a critical ingredient to art and architecture (Harman 2019; 2020a). I also do not think the distinction of 'object' by OOO (or thing, entity, unit, etc.) being anthropocentric, according to Raud (Raud 2021), is a sufficient or even useful argument against OOO. I do agree that 'object' and its subsequent synonyms is a human-determined thing and is intimately entangled with language i.e., nouns and verbs (we could even analogize Harman's qualities to adjectives). This discreteness of objects also applies to the Latourian litany expressed by OOO philosophers and supporters e.g., a list of objects varying wildly in terms of scale, materiality, and biology: birds, bricks, the wind, a chess club, this computer, my bracelet, the Republican party, the Black Lives Matter movement, trigger laws, etc. The point is that humans and our languages work to make discrete these 'things' in the world, which OOO refers to as objects. Raud's issue is the implication of a static object, even though any OOO proponent would argue against this – they would argue that objects are not infinite or immortal; all objects are very finite and very mortal.

What is Raud's alternative then, if he does not agree with the use of the term 'object'? In addition to that, Raud does not agree with the concept of object withdrawal – that all objects inherently withdraw from direct access (Raud 2021). Given these two strong points on OOO, it should be apparent that Raud is going to propose a more dynamic, flowing, fluxing, process philosophy. Raud does contend that what we might refer to as 'objects' exist, but prefers to consider these objects as 'cross-sections' of a reality that is always in flux (Raud 2021: 111-112). Raud also goes so far as to suggest Harman's particular approach to OOO should be renamed essence-oriented ontology, as

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Harman is clearly more interested in essence than ontology (Raud 2021: 31). This is correct about Harman and exactly what the 'third table' is i.e., the 'third table' is the real object (RO) in Harman's quadruple object. This essential object and the concept of object withdrawal i.e., the essential object (RO) withdraws from direct access, is why this dissertation is not about finding a 'third table' in archaeology or architecture, but focuses on the 'third table' emergences, the 'space' tension in Harman's structure – the RO-SQ tension. Despite Raud's point on Harman's essentialism, I think, to Harman's credit, that he really is after expressions of 'third table' emergences; this is where some RO glimpses another RO, which is supposed to be impossible.

Raud's issue with OOO's discrete designations come to a head with his agreement with OOO that reality is mind-independent (this contrary to 'correlationism' which argues there is only a mind-dependent reality), but Raud "…does not accept…the imposition on nature of mind-made structures and hierarchies. Reality is mind-independent in spite of its slices appearing to us always and only in a particular, perspective-bound and gaze-dependent form." (Raud 2021: 54). For Raud, object-orientation i.e., that objects, things, etc. are the basic 'stuff' of reality (Harman 2013), is this 'mind-made structure and hierarchy," which I agree with. This is the issue of designating things as things, that is, some human mind applying its structure and hierarchy to things. However, the larger issue with this, though anthropocentric imposition is a significant issue, is that OOO argues this is the basis of *reality*. Where Raud disagrees that this is the case, I agree with Raud that OOO is in error of its name and premise i.e., that objects are the foundational stuff of reality. I think object-

orientation (and ideas within OOO) has immense value, not in terms of ontology, but in terms of epistemology and more importantly to aesthetics. I think designating something as this or that is how we approach the *knowing* of things i.e., epistemology, but I do not think that is OOO's 'collective vibe.' Despite its name, I think OOO is fantastically positioned to address considerations in aesthetics, to concerns of feeling. This feeling in aesthetics is our interface with reality, Raud's "mind-independent slices" presenting themselves to us "always and only in a particular, perspective-bound and gaze-dependent form."

Raud explores his process philosophy or field ontology through a discussion on mind, body, consciousness, the brain, or more pointedly, an exploration of 'the self.' Raud sets up and explores a tension between mind and brain, that is between what could be called the immaterial consciousness and the material consciousness. Raud, like Harman and OOO, favors the immaterial in this, not denying the advances of neuroscience, but arguing that the intricate physiology of the brain cannot "be correlated with all of the compositional elements of the mind, so that the phenomenon of consciousness would be exhaustively described just by reducing all of its processes to patterns of the intracranial interaction of neural cells." (Raud 2021: 126-127). Here, Raud is clearly parallel with OOO in avoiding empirical exhaustion and reduction of the mind to the functions of the brain. While Raud argues for process and field over discrete objects, Raud agrees with OOO in resisting scientific reductivism.

There seems to be a favoring of immaterial dynamism in Raud's process philosophy. As mentioned in the previous paragraph, Raud argues against scientific, or

materialist reductivism – so, on that point he agrees with OOO. However, Raud is acutely sensitive and advocates for the flowing and influencing between individuals and their environments, that is, the self and the not-self. Raud goes so far as to state that "no one is ever and fully their 'real self,'" because there is always interference, entanglement with one's environment, an interaction that the self relies upon and vice versa (Raud 2021: 138). The self does have agency, however, to break from routines and trajectories, and it can do this from decisions made internally – this internal process does not function independently from the outside world, and yet only exists inside the self (Raud 2021: 161). This would maintain or even be an example of 'object withdrawal' – where an object, the real object, the essential object, in this case the 'self,' withdraws from all access (Harman 2013). Although, the self, in Raud's case, is not completely withheld from all access – the self has an internal 'mental pattern' that only exists in the mind, though it is not autonomous from the world (Raud 2021: 161). The mental pattern is gaze AND world dependent, while the world is gaze independent, which is a long-and-fancy way of saying the mental pattern in the self has a lot of pressure on it from both its own gaze as well as the world.

This overwhelming dependency on gaze and the world is not unique to humans but considering the self and the internal mental pattern helps make a profound point regarding humans and our specific human-being (our specific species-being as humans). For Raud, 'being' as such only takes place in engagements, in relations between beings. Humans and nonhumans are both capable of such relations with others. However, while both humans and nonhumans have "the ability to meaningfully engage in various ways

with others of so many different kinds," humans have this ability "in abundance", or at least more than any other being we are aware of at this point (Raud 2021: 207). While this might seem like indicating such an ability in humans is backsliding into human exceptionalism or anthropocentrism, Raud is not gatekeeping the ability from nonhuman entities. Humans and nonhumans have this ability, but Raud acknowledges the exceptional magnitude of the human capacity of such an ability. This is critical for both positive and negative consideration of human agency and impact on other humans as well as nonhumans. This applies quite well to issues of global warming, something Timothy Morton has been vocal about in his philosophy. In this context, "meaningfully engage" means impact, whether that be positively or negatively impact. Raud's explanation of the self as this open system, gaze and world dependent mental pattern, engaging the independent world, aligns well with Morton's discussions on being ecological and solidarity with nonhuman things. Being ecological can be considered having solidarity with nonhuman things, or more simply, caring for nonhumans for no reason, no ulterior motive (Morton 2017; 2018). Substituting being ecological in as a specific case of meaningful engagement, humans can use their abundance of meaningful engagement to increase positive impact on the planet as stewards.

What of Raud's process philosophy can be important in this dissertation? Process-as-object, or the cross section of reality can help the terminology be clearer in referring to 'third table' emergent expressions as not the end-all-be-all thing, but as a momentary snapshot. That does not belittle or demean the value of such expressions, or of things. It makes the discrete known and seen and then OOO provides a framework to

understand the discrete and express engagement between things, while Raud's process philosophy keeps us grounded in the ontological truth that things are always in flux.

Summary

We have looked at OOO in general and considered the ideas of its two prolific proponents: Graham Harman and Timothy Morton. We then addressed some of the critics of OOO, particularly of Harman with Stephen Mulhall's review of Harman's *Object-Oriented Ontology* (2018), "How complex is a lemon?", and Thomas Sutherland's "Contortions and Convolutions" (a more general critique of OOO, Harman, and the speculative turn). We rounded this chapter out with an alternative post-anthropocentric philosophy, Rein Raud's process philosophy – that, while mechanically opposes OOO, aligns with many other aspects of it. Harman lays out an elegant framework with the quadruple object, subsequent understanding of metaphor and knowledge, undermining/overmining/duomining as the only approaches to knowledge, the 'third table', and vicarious causation. Morton builds off this framework and develops strong sentiment towards kindness and solidarity with nonhuman things, being ecological, beauty experience, and hyperobjects that explore and consider our understanding of objects with ideas on viscosity, nonlocality, temporal undulation, phasing, and interobjectivity. Mulhall raises issues with the paradoxical directly inaccessible, yet indirectly accessible nature of reality that Harman puts forward. Sutherland points out Harman and OOO's paradoxical and hypocritical anti-anthropocentrism – something no philosophy, being that they are developed by humans,

can escape – and the potential hegemonic pitfall of the privileged artist-philosopher with "good" taste. Raud brings us back to a proactive approach, counter to objects, developing a process-driven philosophy, in which flux and dynamism are the fundamental things of the universe. I find myself indebted to the foundations laid by Harman, but more in resonance with Raud's process philosophy as an ontological framework and Morton's ideas regarding beauty, ecology, and hyperobjects as approaches to epistemology and aesthetics i.e., Raud lays out how reality *is*, Morton delves into how reality *feels*, while Harman setup how we come to *know* feeling and being.

CHAPTER IV

POINT CLOUD METAPHYSICS

A point cloud metaphysics is an exploration into the aesthetics and ontology of the point cloud i.e., an exploration into the tension between the point cloud's appearance and 'what it is', or its reality. This chapter serves as a synthesis of the previous two chapters that concern aesthetic approaches to the point cloud in Saunders and Chapman et al., and an aesthetically concerned approach to reality in object-oriented ontology (OOO). This synthesis impacts how we talk about the point cloud and how we might consider it as an analogous device for OOO.

Relative to media like drawing, painting, photography, or film, the point cloud (at least in the case of the digital-human manufactured point cloud) is a new medium. In this discussion, I want to liken photography to imaging (an image, not a photograph) (May 2019; 2017), and film to video; the image and video being more generic forms of media – an 'all photographs are images, but not all images are photographs' kind of perspective. As far as the human scale of time is concerned, images are two-dimensional, with no dimension of time. Videos are two-and-a-half-dimensional, as we view a temporal effect played out in two-dimensions. Like images, the point cloud is temporally static i.e., once the point cloud or surface model is captured it is sealed in a stasis for the most part.

Let's return to the point cloud and surface model. Often, these media are referred to as 'reality capture', 'scanning', or 'modeling', but 'reality capture' seems to embody

our definition of the point cloud more accurately as a static, three-dimensional thing i.e.,

a spatial image, a snapshot of the present conditions of space in three dimensions (Figure

12).

Figure 12 Colorized laser scan point cloud of Chiesa di Sant'Agostino in Castiglion Fiorentino, Italy. Laser scan by Mark Gastelo, Bob Warden, and the author; image created by the author.

The point cloud and surface model are therefore often regarded more closely to the methodology used to create them. These terms are often used interchangeably, but suitable alignments between a term and its methodology are as follows: 'capture' refers to imaging, or a camera, "photography"; 'scanning' refers to the use of laser measurements to create a point cloud; and 'modeling' refers to digitally born things, as in something originating in digital space; it does not have a physical space alibi. It is an exercise in semantics, but for this dissertation, those will be the meanings for those terms.

The preceding thoughts largely surround the question of ontology for the point cloud, but we also need to consider the aesthetics of the point cloud. As you might imagine, the point cloud is simply that: a cloud of points. 'Cloud' implies volume or a spatial component that includes depth into or off a two-dimensional plane, while 'point' implies simply that, a point. The point consists of two components: position and color. Color is a component to a point only when we have color input, almost always from a camera capture in conjunction with the laser measurement. Position is recorded using the previously mentioned laser measurement, whether time-of-flight or phase-based. So why not just call the thing 'points'? 'Cloud' is used here to imply a specific aesthetic, or direct experience, of the points. We might just as easily refer to the thing as a 'point world', 'point building', or 'point ecology,' since the medium translates physical space into the specific form of points.

A point cloud is not a 1:1 duplicate in many ways, that is, the point cloud is not a 'copy' of some material 'thing'. Point clouds are shells, a casting that captures a mask of

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reality. They do not penetrate physical material, whether camera or laser. Even a technique such as infrared thermography does not do this, even though it gathers information about deeper material conditions (Kavuru and Rosina 2021; 2020). Given this shell-like quality of point clouds, we could scan entity after entity and never reach a material truth of satisfaction to the material scientist.

Before returning to the issue of 1:1 replication, let's take a brief aside to chase an infinite regress, 'turtles all the way down,' power set axiom (Bryant 2011), thought experiment in the context of scanning. We place a scanner (camera plus operator or laser plus operator) somewhere in physical space. The scanner collects information about that scene/object as far as its capabilities allow e.g., maybe 10 meters of high resolution with resolution tapering off to 0 around 300 meters, and vibrant color and high contrast shadows on a sunny day (FARO Technologies Inc. 2016). In the scene is a building, but we only record its exterior surface. Imagine we can separate the foundational piles and/or the slab from the upper stories and then scan, in its entirety, that foundation. We can align that foundation scan to our initial scan, and we now have a 'part' to our initial scan shell. Next, imagine we can separate the steel reinforcement in our slab and concrete piles, and then we can scan these in their entirety. We can now add yet another component to our scan shell. These three shells – exterior scene, foundation, steel reinforcement – are still just that, shells. They hold spatial and color information, which can serve visual alibi for "actual" material properties of concrete, aggregate, sealant, steel, etc. As you can further imagine, we can continue down and down, to material components e.g., cement, aggregate, water, molecular components, atomic components,

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and subatomic components. As far as we humans are concerned, the subatomic is largely the end of the regress for our scale of understanding.

A peculiar conclusion from this thought experiment regards the access to these finitely regressing components (though we could finitely *upwardly* regress as well). We can imagine accessing this or that because we have some knowledge about the *creation* of such things e.g., buildings, foundations, steel reinforcement. If we did not have this knowledge, how might we approach this? To put it simply, and rather harshly, we would have to *destroy* the building. In the context of this study, this aligns conceptual understanding of things through either creation or destruction with architecture and archaeology, respectively. Pursuing this oversimplified analogy is beyond the scope of this dissertation, but the concept will drift in and out in an allusive way.

Returning to our thought experiment, yet focusing on the problem of infinite regress, the point cloud quality of surface recording and subsequent regression positions the medium within a philosophical discussion from the previous chapter on ontology, 'objects', and process (Harman 2018; Raud 2021). One of the fundamental principles of object-oriented ontology (OOO) is a flat ontology, where all 'things' exist in the same way, in that every 'thing' has some inaccessibility to it, or an *excess* of itself (that is not accessed by anything else) (Harman 2013; Garcia 2013; Garcia, Ohm, and Cogburn 2014). Another way to think of this is what Timothy Morton calls 'subscendence', where the 'whole' subscends its 'parts' (Morton 2017). These ideas of ontological flattening, subscendence, and infinite regress are important to consider and create our architectural analogy.

Referring to flat ontology, the analogy in architecture follows that a building, a foundation, and steel reinforcement all exist in the same way. A building has excess, as does a foundation and steel reinforcement, meaning there is excess to a foundation that the building does not have access to, an excess of being or ontological excess. The building does not have complete access to foundation-being by way of the foundation being within the building. Similarly, we, as humans, do not have complete access to microbiome-being simply due to the microbiome being within of us.

Given our infinite regress analogy with regards to point clouds and their capturing of a shell-like, casting of a mask, surface, etc., the point cloud and scanning make a compelling analogy to ontological excess. Despite their seemingly opposing approaches, both Graham Harman (OOO) and Rein Raud (process philosophy) are sympathetic to the idea of ontological excess, that there is always something more hidden in the depths of a 'thing' (Harman 2011; Raud 2021).

We might try one more thought experiment before getting into the technical weeds of both literature on best practices and my own methodologies for creating point clouds using photogrammetry/photoscanning and terrestrial laser scanning. One way to approach the issue of access to the depths of things within things is simultaneous multiplicity using the same medium. Let's take a building again, but this time simplify it even further to bottom, middle, and top. Then, consider all three put together as a building. To realize some idea of access to the building, we need to realize some idea of access to the bottom, middle, top, AND the bottom-with-middle, middle-with-top, bottom-with-top and then finally all three together (the building). As alluded to at the

onset of this chapter, this is a power set axiom (Bryant 2011) and shows us how the whole *subscends* its parts (Morton 2017). We need all these things *simultaneously* and in the same *medium*. Think of it as phases of a thing all lined up on a table at the same time. Each 'lowest' scale 'thing' would appear four times, but its excess, its thing-being in every case would be different e.g., bottom, bottom-with-middle, bottom-with-top, and all three together. Put differently, we need to consider the whole, the parts, and all the relations between the parts to approach any kind of access to the thing.

The purpose of these brief anecdotes and clarifications are intended to allow us to catch our breath from a particular thick discussion on OOO and begin to mix the point cloud with some of the derived concepts from OOO. In this way, the chapter alludes to a symbiotic relation between the point cloud and OOO. The point cloud, and its surface-level casting of reality, allow for an effective analogy of OOO, flat ontology, and how wholes subscend their parts i.e., the whole is *less* than the sum of its parts (Morton 2017). OOO allows for the point cloud to be understood differently, particularly with regards to its surface-level casting of reality – this begins to resolve misconceptions of subsurface capture in the point cloud. This all provides us an allusive bridge to methodologies used to create point clouds.

CHAPTER V

PHOTOGRAMMETRY AND LASER SCANNING: METHODOLOGIES IN

CREATING POINT CLOUDS

Current best practices

The chapter will present some literature on best practices in

photogrammetry/photoscanning and terrestrial laser scanning, before spending the

remainder of the chapter describing my methodologies for those same techniques to

create point clouds, our digital cultural objects. Current best practices cannot be summed

up within a single tool or method, or even a single software. A repeated concept when

approaching a survey process involving point cloud data is that your tool and method

should be chosen based on your research goal for the project (Fortenberry and Leifeste

2020; Brusaporci 2015; 2017). Even when we develop methods that are 'towards' best

practices, such as Galeazzi's 'archaeological stratigraphy' (Galeazzi 2016; Galeazzi et

al. 2016) (Figure 13), these methods are still catered heavily to archaeology in that

specific context. Though, we could reverse Galeazzi's approach as a kind of time lapse

approach to creation, to construction, in architecture.
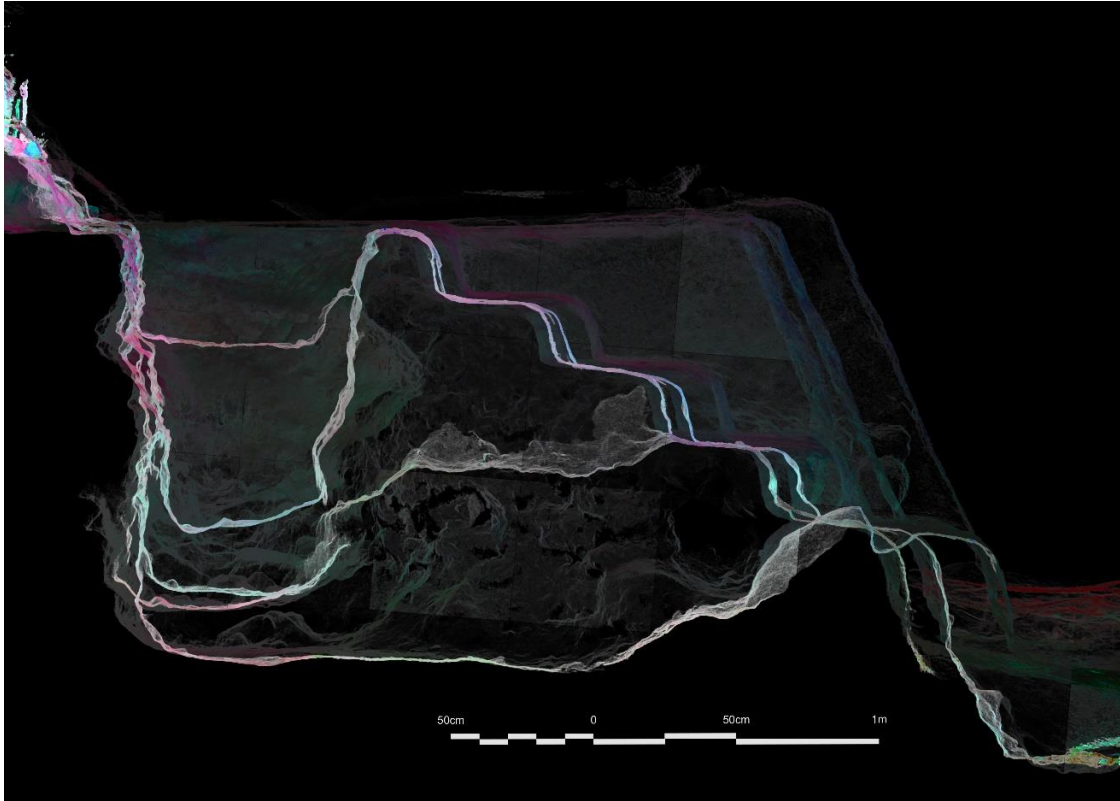
Figure 13 Archaeological stratigraphy - photogrammetry point cloud of Structure 100 at Xno'ha, a Maya archaeological site in northwestern Belize. Excavation led by Hollie Lincoln and the Maya Research Program, photogrammetry and imaging by the author.

In Stefano Brusaporci's *Digital Innovations in Architectural Heritage*

Conservation, Brusaporci presents the prevalent avenues of tools and methodology in

architectural survey and modeling, while contextualizing these approaches within

heritage conservation and archaeology and the more intangible values associated with

these discourses (Brusaporci 2017). There is clarification of intervention terms in

heritage conservation: conservation maintenance, preservation, restoration,

reconstruction, and adaptation (Brusaporci 2017); survey is the foundation of such

interventions, that is documentation of current conditions of heritage assets. In

approaching heritage sites, much consideration is required with regards to the site,

vulnerability of the site, policies in the area, and ensuring that those policies are being

used and checked throughout the process (Wijesuriya, Thompson, and Young 2013).

Given the high stakes of such recording projects, development, experimentation,

and comparison of the hardware and software tools for architectural and archaeological

survey frequently occur in literature using photogrammetry/photoscanning and laser

scanning. New software emerges and operators rush to test these new tools, discovering

their idiosyncrasies and their advantages and disadvantages compared to their current

tools. Kingsland (2019, 2020) conducted such comparisons in subsequent years,

comparing Agisoft Photoscan (now Metashape) and RealityCapture in 2019, then

returning to these software and adding ContextCapture to the comparison in 2020

(Kingsland 2019; 2020). Favorability was shown toward Agisoft's flexibility and its

current longevity as a software standard in archaeological survey, while

RealityCapture's quality was comparable, its speed outmatched Agisoft considerably

(almost half the time), yet lacked substantial literature on its use given its relatively new

arrival to the photogrammetry market (Kingsland 2019: 79). Comparison of the three

software found to reinforce the advantages Agisoft: Agisoft required the least percentage

of total time dedicated to manual editing, RealityCapture showed the highest percentage

of total time for manual editing; both RealityCapture and ContextCapture spent a lower

percentage on generating the dense point cloud, surface mesh, and texture, yet

ContextCapture spent around half the percentage of time on manual editing compared to RealityCapture (Kingsland 2020: 8). For this dissertation, I will be using Agisoft Metashape for photogrammetry/photoscanning purposes, though I acknowledge RealityCapture's improvements since these articles were published.

Methodology: Photogrammetry

I will continue by discussing my own workflows and specific experiences with photogrammetry/photoscanning before proceeding to laser scanning. Photogrammetry, simply put, uses overlapping images to make a 3D model. Images can be taken using a digital camera (digital single-lens reflex [DSLR] camera), a cell phone camera, and drones (or unmanned aerial vehicles [UAV]). If using a cell phone camera, it is preferable to use manual settings or an application that allows you to use manual settings. However, usable 3D models can be created using cell phone camera images even without the aid of manual settings. This has been demonstrated by the author in the case study of Italian architecture e.g., Basilica di San Lorenzo in Florence, Villa La Rotonda in Vicenza, Basilica di San Vitale in Ravenna, and others (Figure 14).

Figure 14 Textured photogrammetry surface models created by the author using an iPhone 7 and Agisoft Metashape: (from left to right) Villa La Rotonda, Vicenza, Italy; Sacristy of San Lorenzo, Florence, Italy; Basilica di San Vitale, Ravenna, Italy.

Furthermore, we can still create usable (though less precise) 3D models from imagery (both phone camera and DSLR) taken that was not intended to for photogrammetric purposes. This is also demonstrated by the author in the case study of Italian architecture e.g., Duomo di Siena in Siena, St. Peter's Basilica in Vatican City, Chiesa di Sant'Ignazio di Loyola in Rome, Basilica dei Santi Ambrogio e Carlo al Corso in Rome, and others (Figure 15). Images are then imported into software where the alignment function in the software uses overlapping/common pixel patterns and features in the scene; a surface seen from multiple images, such as a wall, floor, pavement, etc.

Figure 15 Unintended models - textured photogrammetry surface models created by the author using an iPhone 7 and Agisoft Metashape: (from left to right) Duomo di Siena, Siena Italy; Basilica dei Santi Ambrogio e Carlo al Corso, Rome, Italy; Chiesa di Sant'Ignazio di Loyola, Rome, Italy.

There is quite a lot of considerations already mapped out in those statements regarding photogrammetry, so I am going to make explicit and discuss more in-depth each of those factors: camera (tool), capture (the method carried out by the tool-human cyborg), and processing (software workflow and outputs). As previously mentioned, we can generally use any camera to produce a recognizable 3D model of a scene.

Before unpacking the camera, capture, and processing, we need to consider *what* we are interested in capturing with photogrammetry. Furthermore, before we get into photogrammetry and the 'what' of it, we should also consider the basis of photogrammetric capture: photography. Photography, film, lasers, sonar, radar, etc. are all 'reality capturing' tools; they record and present us a translation of the material world into their medium-specific outputs e.g., photographs, movies, point clouds, etc. We no longer take 'photographs' or 'photos', at least not often, particularly if we are considering cell phones and digital cameras. A photograph is the specific output of exposure of chemical film to light (photons), creating an 'image' of that which the light is bouncing off of (May 2019; 2017). An *image*, according to May (2019), is now what we are actually creating with our phones and cameras, where the chemical reaction on film is replaced with the digital excitement of the sensor (May 2019). Regardless of the distinction, photographs and images freeze the material world into a static (as far as the human temporal scale is concerned) two-dimensional image.

As stated previously, cell phone cameras, DSLR cameras, and drone cameras can all effectively be applied to create photogrammetric 3D models. Even if used in a cavalier manner, cell phone cameras can be advantageous both intentionally and unintentionally for photogrammetry, as demonstrated by the author. Pausing discussion on how lazy we can be and still generate usable models, let's discuss the more ideal tools and settings one could use for photogrammetry. A DSLR camera is ideal. Consistent settings, which we will discuss in a moment, are also ideal. As one might imagine, this can be difficult if not impossible to maintain in exterior settings between direct sunlight

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and shadow – best lighting in terms of exterior conditions for photogrammetry (as well as laser scanning) is a heavily overcast day. Heavy clouds can even out the lighting, reducing high contrast shadows. But back to the camera itself. While lens length can vary, it is ideal to maintain a consistent lens length throughout the capture sequence of an object. If possible, it is better to adjust the distance between the camera and the object. Between focus and consistent focus, it is best to favor focus, meaning the use of auto focus – this will not change the lens length. If possible, it can improve output if auto focus is switched off, barring that one can maintain a distance that keeps the object in focus; this is more likely feasible when capturing smaller objects in a lab setting, not building or contextual scale objects.

This establishes our consideration in terms of lens length and focus, so we can discuss the three main manual settings that should be considered: shutter speed, ISO, and F-stop/F-number. Shutter speed is largely determined by the lighting in the scene and the photographer i.e., how steady one can hold the camera during an exposure. The shutter speed does not directly affect the quality of the image or model – we can adjust the

shutter speed to other factors such as lighting and photographer, as well as our ISO and

F-stop/F-number settings.

Figure 16 Colorized photogrammetry point cloud of Chultun 16-01 in Structure 33 of the Structure 32 Courtyard Group at Xno'ha, a Maya archaeological site in northwestern Belize. Excavation led by Kevin Austin and the Maya Research Program, photogrammetry and imaging by the author.

ISO, for all intents and purposes, determines the graininess of the image. The lower the ISO, the crisper and clean the image, while higher ISO can make the image grainy and fuzzy by comparison. In dark settings, it can be appropriate to use a normally inappropriate ISO e.g., ISO1600, ISO3200. This has been demonstrated by the author in the documentation of multiple 'chultuns' in northwestern Belize, in direct or near proximity to Maya architectural remains. Chultuns are subterranean features that can vary in terms of human intervention: some are completely carved out shafts (Chultun 16-01, Structure 33, Xno'ha) (Figure 16), while others are natural features with carved, circular openings (Chultun 16-02, Structure 32, Xno'ha; Chultun 18-02, Structure 22, Tz'unun) (Figure 17). However, an ideal ISO is low e.g., ISO100, ISO200.
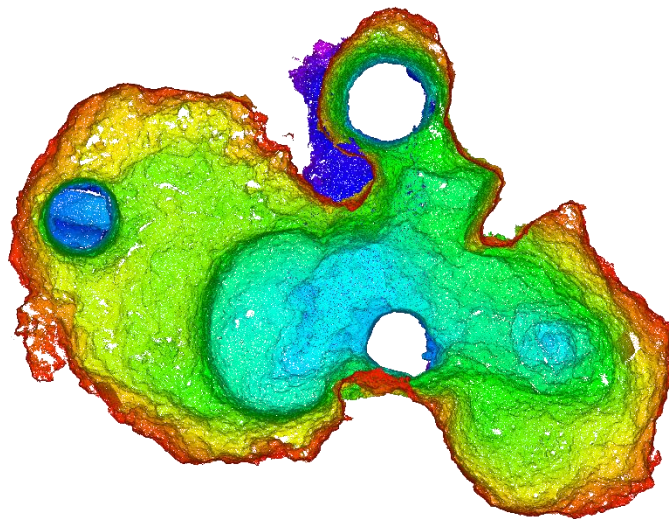
Figure 17 Elevation filter, photogrammetry point cloud of Chultun 16-02 in Structure 32 of the Structure 32 Courtyard Group at Xno'ha, a Maya archaeological site in northwestern Belize. Excavation led by Kevin Austin and the Maya Research Program, photogrammetry and imaging by the author.

F-stop/F-number deals with aperture size in relation to focal length, which affects the depth of field i.e., the range of objects in a scene that are in focus. A smaller F-stop/F-number means a larger aperture and that the range of objects in the scene that are in focus is shorter e.g., F/8 may have objects 1 meter to 1.5 meters away in focus while F/16 may have objects 1 meter to 3 meters away in focus. In relation to both ISO and shutter speed, it is important to consider the sentiment, "smaller F-stop/F-number means a larger aperture". A larger aperture means a larger *opening*, which means more light passes through the aperture and hits the sensor. Consequently, this means that a smaller aperture, with a larger depth of field (large range of objects in focus), allows less light to pass through the aperture and hit the sensor. While it might seem that a good rule-of-thumb would be a higher F-stop/F-number e.g., F/16, F/22, this depends on the depth of field one requires for the object of interest to be captured. A lower F-stop/F-number can be useful when capturing a smaller object, where the depth of field desired is smaller – in this case, the depth of field around the object keeps it in focus, while blurring background objects considerably. This blurring of the background can help in the processing stage where software aligns images based on common features that are in focus in adjacent images. These are some of the general camera considerations for photogrammetry with some allusion to special cases. In the following paragraphs, I will discuss the general capture process and include special cases with regards to the environment.

Given some of the flexibility we have discussed with regards to the camera and camera settings i.e., the corners we can cut and still produce usable 3D models, one would assume there are similar corners that can be cut in the capture process. This is true and the 'unintended' models produced by the author add to the vast and largely unseen dataset (and potential datasets) produced by those familiar with the capabilities of photogrammetry software. In my case, unintentional 3D models came from the perspective of a photographer-tourist, taking a multitude of images of objects, trying to find 'the shot' (Figure 15). Archival images can also be used to create unintentional 3D models – this is particularly useful for sites and structures that have been damaged or destroyed, in some cases, as few as four images were adequate to produce a 3D model (Wilson et al. 2016). In the case of the photographer-tourist, and with a cell phone camera at that, these models may be little more than 3D memories i.e., not survey-grade data. Despite their shortcomings, these models are important as not many would argue that memories are inconsequential.

Returning to the capture process, and particularly the ideal and best practices of capturing images for photogrammetry, the conceptual approach can be put simply as this: capturing for photogrammetry is like Bruce Lee's metaphor of being water or, more pointedly, like dancing. Less poetically, the capture process for photogrammetry (as well as laser scanning or any kind of reality capture) depends on the interplay between human-camera (or human-scanner) cyborg (whether DSLR, phone, or drone) and the object being captured (Figures 18 and 19). Even less poetically, where you stand to take an image depends on the shape of the thing you're taking images of e.g., taking images

of a building with a rectangular footprint will yield a rounded-rectangular capture

sequence or path, doing the same for a cylindrical tower will yield a circular capture

path, and so on.
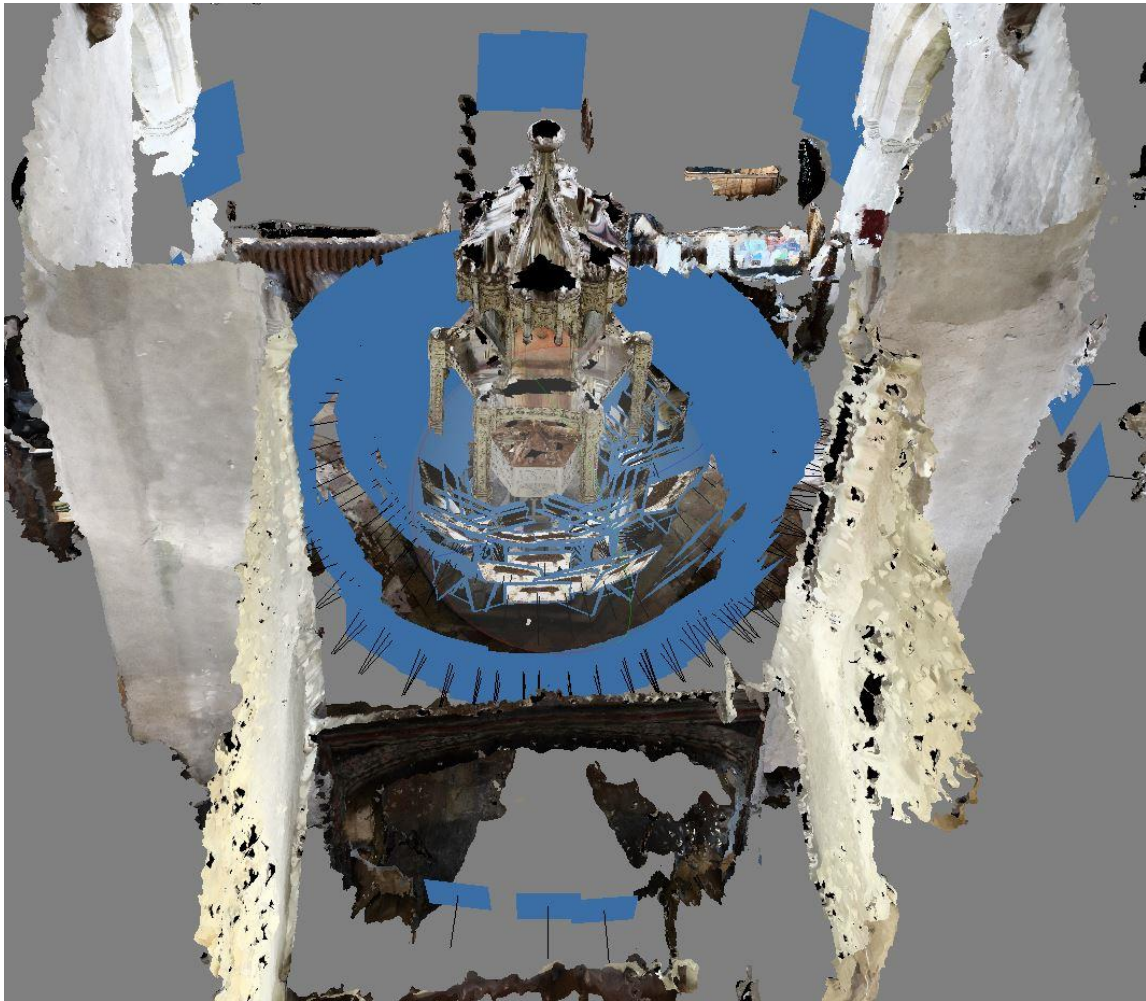
Figure 18 Capture path - textured photogrammetry surface model of a font canopy in the Church of St. Botolph in Trunch, United Kingdom. Project led by Zachary Stewart, laser scanning by Brent Fortenberry, photogrammetry and imaging by the author.

Translating this approach, a fluid approach to dancing with the object, onto

interior spaces already helps us reduce the likelihood of an old capture error: pivoting.

Again, we can stand in the center of a room and pivot while taking images and get an adequate model to come out. Another useful technique is 'fanning', or a partial pivot. Fanning can be applied more successfully if one 'fans' while stepping, almost like an oscillating fan on rollers. I have sometimes described this technique to my students as a kind of 'brushing,' almost a reverse painting of reality. With a reality capture technique, like photogrammetry, we are attempting to brush in a reversal, to record to as close to the same level of detail as the brush that created the object we are recording.
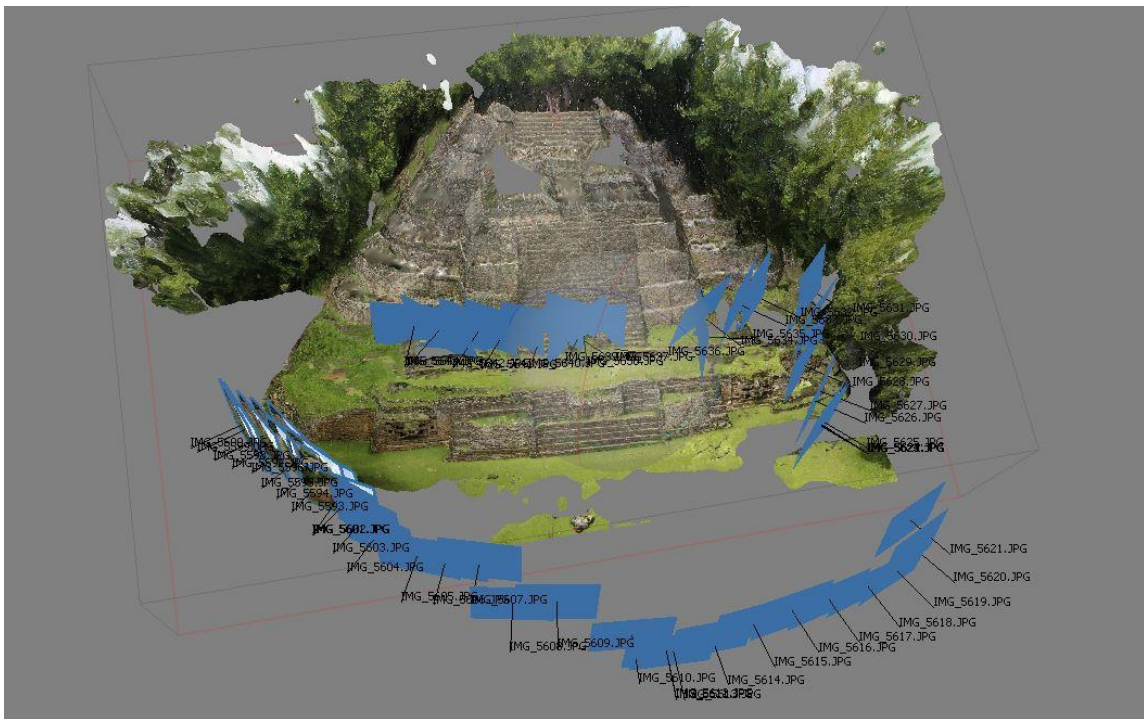
Figure 19 Capture path - textured photogrammetry surface model of the Jaguar Temple at the Maya archaeological reserve, Lamanai in northwestern Belize. Visit facilitated by the Maya Research Program, photogrammetry and imaging by the author.

Capturing large areas using drone, or unmanned aerial vehicle (UAV), photogrammetry can be slightly more automated. This can also be called aerial

photogrammetry (amongst other things). With a drone and the accompanying software, large flight paths can be mapped out with assigned capture frequency along the path e.g., the onboard camera takes an image every set distance across the flight path. Drone imagery can be taken manually as well, without a designated flight path. This allows us to take detail images and images closer to ground level, often when documenting buildings.

Terrestrial photogrammetry, which is the photogrammetry used in this study and the photogrammetry described thus far in this section, consists of a human operator and a camera (this can also include a tripod). So, when we consider our dancing around a building or in a room, we are taking a step, taking an image, taking a step, taking an image and so on and so forth until we have captured everything that we want to be in the model. In a more automatic way, the drone (even with a predetermined flight path) also dances with a landscape or a building. The capture sequence for terrestrial photogrammetry very much resembles a freeform waltz. During this waltz, we need to be aware of our overlap between sequential images, making sure a minimum of 50% overlap is achieved. As you can imagine, less than 50% can and will yield adequate results, but greater than 50% is ideal and advisable. Vertical overlap also needs to be considered – waltzing around, capturing the first level of a three-story building is a good start but we will likely require all levels of the building. In this specific case, we can vertically fan/brush as we step horizontally, or we can continue multiple loops, shifting our camera angle higher with each loop. The latter option avoids pivoting, but we will require more loops – the former option can likely be done with one, slower loop. The

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hallmark of a *likely* successful capture is if one's images resemble a flipbook or frame animation when scrolled through quickly. If scrolling, or looking at your images sequentially and rapidly, is disorienting or seems to make large jumps from image to image, then this might indicate a lack of sufficient overlap between adjacent images.

To ensure that the maximum amount of the object is captured, we need to consider macro-capture versus micro-capture. Taking macro shoots will have more of the entire scene in each image, and so can take less time and can have considerably more overlap between images. However, macro shoots mean we have more scene of varying distance from the camera i.e., a larger range of distance from the camera. Meaning, we need to pay close attention to our F-stop/F-number in such cases, and that we will likely need to use a smaller aperture, a larger F-stop/F-number e.g., F/16, F/22. Doing this will put pressure back on the ISO to be higher and shutter speed to be longer, since a longer exposure will be necessary to get adequate light through the smaller aperture. This is not to say that if you capture using a low F-stop/F-number for an object that has a large depth of field, that a sufficient model will not come out.

Depending on the lighting of the scene, micro-capture can have similar issues with aperture settings. Micro-capture, or taking images a short distance from the object, has its own more pressing issues than aperture. Capture duration can get very long in micro-capture, and this becomes an issue in outdoor scenes or scenes with windows, where the lighting and shadows are constantly changing. This lighting flux cannot be avoided altogether but can be minimized with a faster capture time. Along similar lines, maintaining overlap and attention at the micro scale for the duration necessary to capture

a building, for example, can lead to fatigue and inadequate images. Overlap may not be sufficient or there might be motion blur from stepping to the next camera position too quickly. Motion blur is more prevalent with long shutter speeds i.e., longer exposures, so if lighting or other camera settings require longer shutter speeds, then it is important to slow down and regularly check images for motion blur.

We have hinted at some of the environmental or scene issues that can arise while taking images for photogrammetry. Here, I want to address some more general issues with scene lighting and special cases not discussed previously. The best scene lighting for photogrammetry is going to be lab conditions i.e., artificial lighting in a windowless room or artificial lighting at night. Secondary ideal scene lighting is a heavily overcast day without rain. An overcast day will minimize shadow and contrast in scenes both exterior and interior. Artificial lighting in lab settings, or settings such as caves, makes for consistent light and shadows. It is typically advantageous to minimize shadows with multiple light sources or light diffuser, but the main advantage is that the light is not moving or changing in intensity. In the absence of artificial light in dark scenes e.g., a cave, a chultun, using a flash to consistently provide inconsistent lighting can yield impressive results. This was demonstrated by the author to document four chultun features in northwestern Belize at the sites of Xno'ha and Tz'unun. With no two images having the same shadows, the processing software must rely solely on the material features in the chultun to align adjacent images and produce the 3D model (Figure 20).

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Figure 20 Colorized photogrammetry point cloud of Chultun 16-02 in Structure 32 of the Structure 32 Courtyard Group at Xno'ha, a Maya archaeological site in northwestern Belize. Excavation led by Kevin Austin and the Maya Research Program, photogrammetry and imaging by the author.

Once the image capture process is complete, those images can be taken into various photogrammetry software e.g., Agisoft Metashape, Autodesk ReCap Photo, RealityCapture, Pix4D, etc. Photogrammetry, or photoscanning, applications are also available for mobile devices e.g., Qlone, Scandy, etc. For this study, I will be using Agisoft Metashape Pro for alignment and creation of the dense point cloud, surface mesh, and surface texture. I will then export point clouds to .e57, .pts, and .txt formats for archival purposes as well as to import into post processing software like FARO

Scene (for manual orientation and high resolution image exports) and Autodesk ReCap Pro (for preset filters e.g., elevation heat map, intensity, normal, and scan position). These software can also produce orbit and fly-thru animations of the point clouds. I will also export textured surface meshes to .obj format for archival purposes as well as to import into post processing software like Rhino3D (for rendering and contouring) and Autodesk ReCap Photo (for preset filters e.g., x-ray and solid). ReCap Photo (as well as RealityCapture) has a more automated alignment process and restricts image count to 100 images. Agisoft Metashape Standard and Pro allow for unlimited (within the capabilities of computer processing and memory) image count. RealityCapture and Agisoft both allow different accuracy settings e.g., low, medium, high, for alignment and the ability to register chunks (Agisoft) and components (RealityCaputre). These chunks and components can then be aligned to one another; this is useful if all images do not align into a single chunk or component after trial-and-error with various accuracy settings (counterintuitively, on rare occasions, lower accuracy can correctly align images when higher accuracy has failed).

The processing workflow for images in Agisoft Metashape Pro (and Standard) follow the sequential order of workflow operations in the 'Workflow' drop-down tab. First, all images need to imported using the 'Add Photos' or 'Add Folder' operation in the 'Workflow' tab. Then, after images have been added, the 'Align Photos' operation will be active. From here, select the desired accuracy to first run an alignment – 'Medium' accuracy is a good starting point, since this will process faster than 'Highest', and 'High' and 'Highest' accuracies are then options should 'Medium' fail (although, as

stated previously, should 'Medium', 'High', and 'Highest' fail, 'Low' and 'Lowest'

accuracies *could* correctly align images, though it is a longshot). Sometimes, it can be

difficult to tell from the sparse cloud whether the images are correctly aligned – often the

software will show 100% e.g., 20/20 cameras aligned, alignment when it is visually

obvious that the sparse point cloud is not correct (Figure 21).
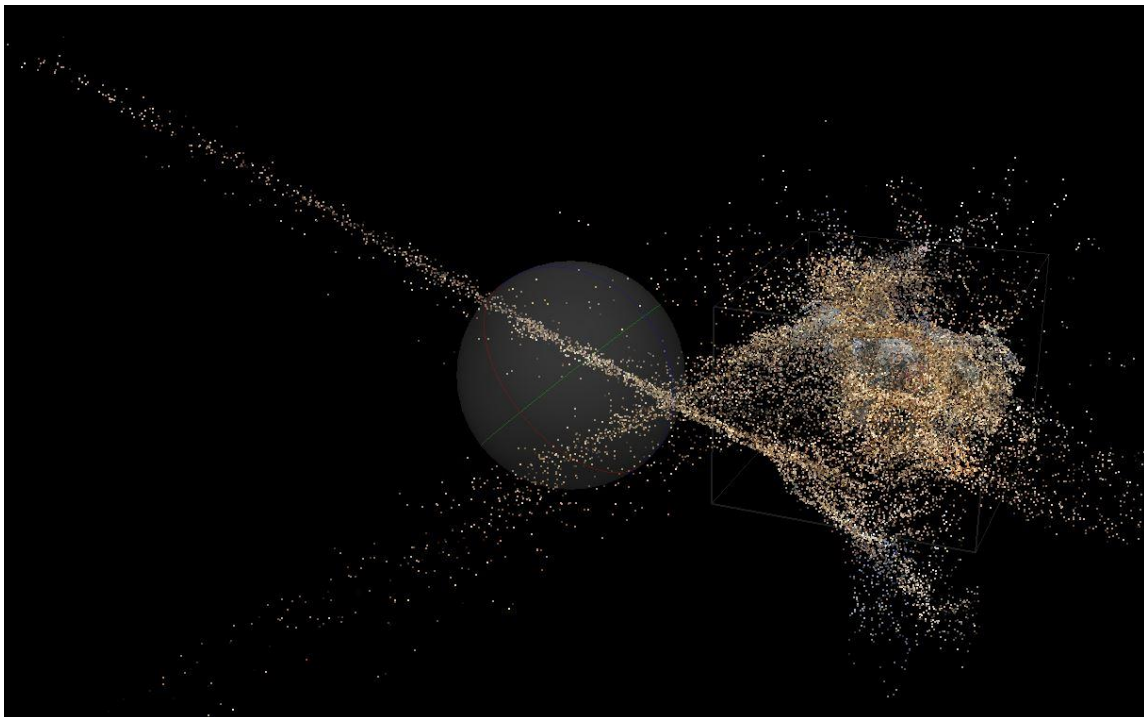
Figure 21 A misalignment that registered as 100% aligned - sparse photogrammetry point cloud of Sala del Senato in the Palazzo Ducale in Venice, Italy. Visit facilitated by ItalArt and Sharon Jones, photogrammetry and imaging by the author.

While we can now generate the surface mesh ('Build Mesh'), generating the

dense point cloud helps to confirm correct image alignment and this operation ('Build

Dense Cloud') creates the dense point cloud for export if desired. Like image alignment,

dense cloud creation has five quality settings: lowest, low, medium, high, and ultra-high

(peculiar given the other four are identical – could have just kept this 'Highest'). 'High' and 'Medium' quality are recommended, but this depends on your computing capabilities. If the estimated time to completion continues to increase for creating the dense point cloud, then lower the quality one setting e.g., drop 'High' to 'Medium', and run it again. 'Ultra high' is not recommended unless the image count is considerably low e.g., less than 10 or 20 depending on the resolution / size of the image files.
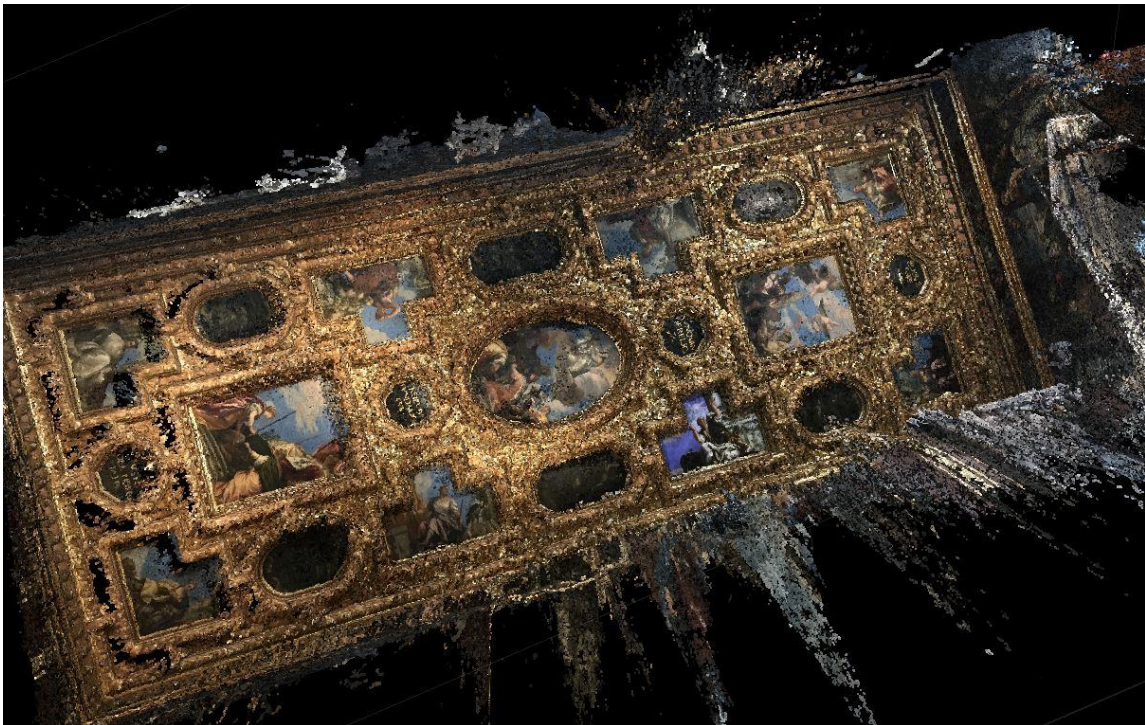
Figure 22 Dense photogrammetry point cloud of the ceiling of Sala del Collegio in the Palazzo Ducale in Venice, Italy. Visit facilitated by ItalArt and Sharon Jones, photogrammetry and imaging by the author.

Once complete, we should be able to confirm the accuracy of the image alignment from the dense point cloud (Figure 22). Agisoft does not automatically switch the view state to 'Dense Cloud' from 'Point Cloud', so view state will have to be

switched to review the dense point cloud. If accuracy of the image alignment is confirmed, then we can proceed to creation of the surface mesh. 'Build Mesh' has three "quality" settings under 'Face count': low, medium, and high. 'High' is recommended, but, again, this can depend on your computer's processing and memory relative to the number and file size of images used. 'Source data' should already be set to 'Dense cloud'; if we want to bypass the dense cloud stage (which can take a long time and a lot of computing power at times), we can create the surface mesh using the 'Depth maps' or 'Sparse cloud' as the 'Source data'. Use of the 'Depth maps' yields quality outputs to 'Dense cloud', while 'Sparse cloud' is not recommended.

Figure 23 Monochrome photogrammetry surface model of the interior of Battistero Neoniano, Ravenna, Italy. Photogrammetry and imaging by the author.

As with the previous stage, the view state needs to be changed to 'Model Shaded', 'Model Solid', or 'Model Wireframe' to view the finished surface mesh. There is little review that needs to happen here, as we should have verified the accuracy of

alignment by reviewing the dense point cloud. Next, we navigate to 'Build Texture',

maintain default settings; however, we can double the 'Texture size/count' from 4096 to

8192. This improves the quality of the texture but increasing beyond 8192 shows

diminishing returns and is not recommended. That will conclude the section on

photogrammetry; post-processing will be discussed further in Chapter 6: exporting and

importing, file formats of those objects, reasoning for import into post processing

software (we have alluded to that previously in this section), support files created from

those export/import processes, significance technically and theoretically for these

support files, etc.

Methodology: Laser Scanning

Next, I want to discuss best practices for terrestrial laser scanning (TLS), or just

laser scanning (also sometimes referred to as LiDAR [light detection and ranging]), as

far as the author is concerned. Laser scanning outputs are generally the same as

photogrammetry or photoscanning – it outputs a point cloud, which can also be

processed into a surface model. That is, both photogrammetry and laser scanning as

'reality capturing' tools create surfaces without depth information (meaning penetrative,

like ground-penetrating radar [GPR]) or material information (meaning elemental, like

X-ray fluorescence [XRF]) – point clouds are XYZ cartesian points with an RGB color

value (textured surface meshes are interpolations across these points and color values).

As previously mentioned in the paragraph about 'reality capturing' tools, laser scanning

"record and present us a translation of the material world into their medium-specific

outputs." In the case of laser scanning, the medium-specific output starts out as a point

cloud (and this is the case for photogrammetry as well). The point cloud is akin to the photograph, film (as in movies), the image (as in digital imaging, previously and still referred to as 'photography'), video (in relation to film in the same way that the image is relative to photographs), the painting, the sculpture, music, etc.

Aerial laser scanning is often referred to as LiDAR (light detection and ranging) and typically uses a time-of-flight (ToF) laser/sensor to measure distances, creating its point cloud. Terrestrial laser scanning is often referred to as laser scanning but can also be referred to as terrestrial LiDAR. Terrestrial laser scanning (TLS) can use ToF laser/sensors (we used a Riegl laser scanner that uses ToF for projects at Alcatraz Island, Georgetown, Texas, and Denton, Texas), although phase-based scanners are common in laser scanners such as the FARO Focus series. FARO Focus scanners were used for most of the projects worked on by the author. While some work was done using a FARO Focus 120 and a FARO Focus S350, almost all the data collected in part by the author was collected using a FARO Focus X330. The numbers in the FARO scanner name indicate the typical max distance of measurement e.g., the 120 laser scanner can measure objects up to 120 meters away, the 330 laser can measure objects up to 330 meters away, and so on.

The FARO Focus X330 has an onboard camera (most terrestrial laser scanners on the market now do, but the Riegl mentioned earlier has a separate DSLR camera mount), which is used to colorize the point cloud i.e., assign RGB values to the XYZ measurements (points). The laser scanner is mounted on a tripod that can be purchased from FARO or an outside tripod manufacturer. Purchasing a high-quality tripod is

advised, given the exceptional value of a laser scanner; while some scanners (Leica BLK) are approaching four figures, laser scanners range from low five figures to six figures. The FARO Focus series also has a built-in compass, inclinometer (self-leveler), and GPS. However, for the projects included in this study, the GPS is deemed largely unreliable (particularly with interiors); the compass is used for the first scan position (the reference scan); and the inclinometer is checked after leveling the tripod.

I will continue to present the components and workflow for the FARO Focus X330, scan positions, targets, considerations to the scene being scanned, and processing. Some site-specific considerations will filter in (as happened with the discussion on photogrammetric workflow) during the general discussion of components and workflow, with further site-specific considerations filtering in during the discussion of scan positions and targets; any site-specific considerations not raised in those discussions will then be brought forward.

Scanner setup for the FARO Focus X330 begins with setting up on the scanner interface, which begins with the project folder, establishing the scan project. The project name assigned to the project folder will help to organize various laser scanning projects on the SD card on the scanner – the SD card will be ejected and placed into a computer to transfer/download the scan project onto a local machine. Once assigned a new project name/folder, the active project on the scanner will automatically become that project. This is not required but changing the scan file base name to match the project name can help to avoid confusion if finding specific scan projects and scan positions is necessary

later. It is similarly not required, but good practice to change the initial scan number

from 0 to 1 – the logic in this recommendation will depend on the technician.

Now that the project is set, the parameters for the project can be set as well. The

resolution of the scan is a ratio e.g., 1/4, 1/5, 1/8. The larger the fraction, the smaller the

average point distance is at 10 meters i.e., the larger the fraction, the higher resolution,

or the denser the point cloud created from the scan. 1/2 and 1/1 are not recommended as

these are too high resolution for even the highest end consumer processors and memory

(Mancroft Canopy, Norwich, England – Fortenberry & Baaske 2018). Larger fractions

for resolution also increase the scan duration. On projects with limited access time to the

building or site, or limited daylight, scan duration can become a critical factor.
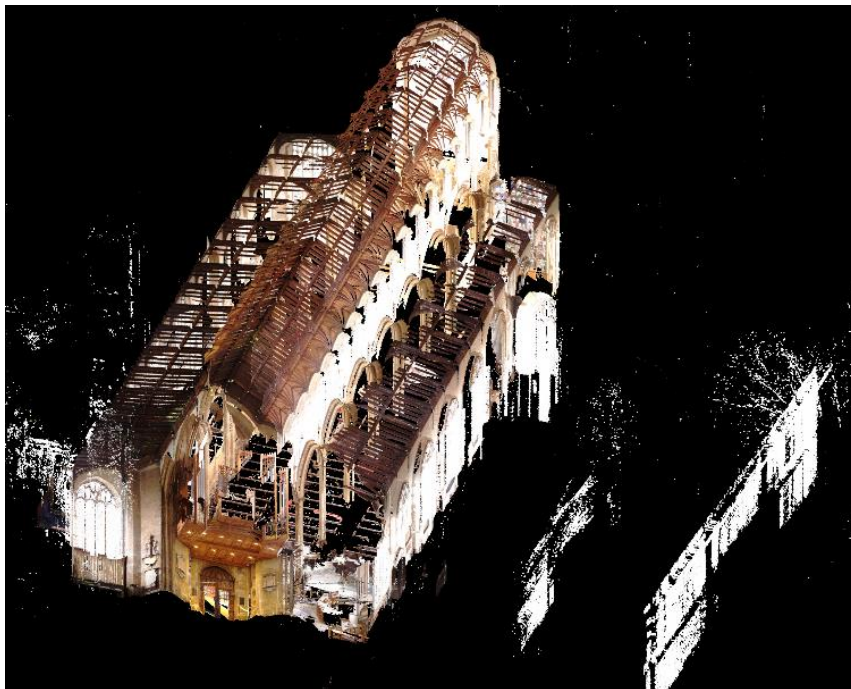
Figure 24 Screen capture before the data became inaccessible - colorized laser scan point cloud of the interior of the Church of St. Peter Mancroft, United Kingdom. Project led by Zachary Stewart, laser scanning by Brent Fortenberry, photogrammetry and imaging by the author.
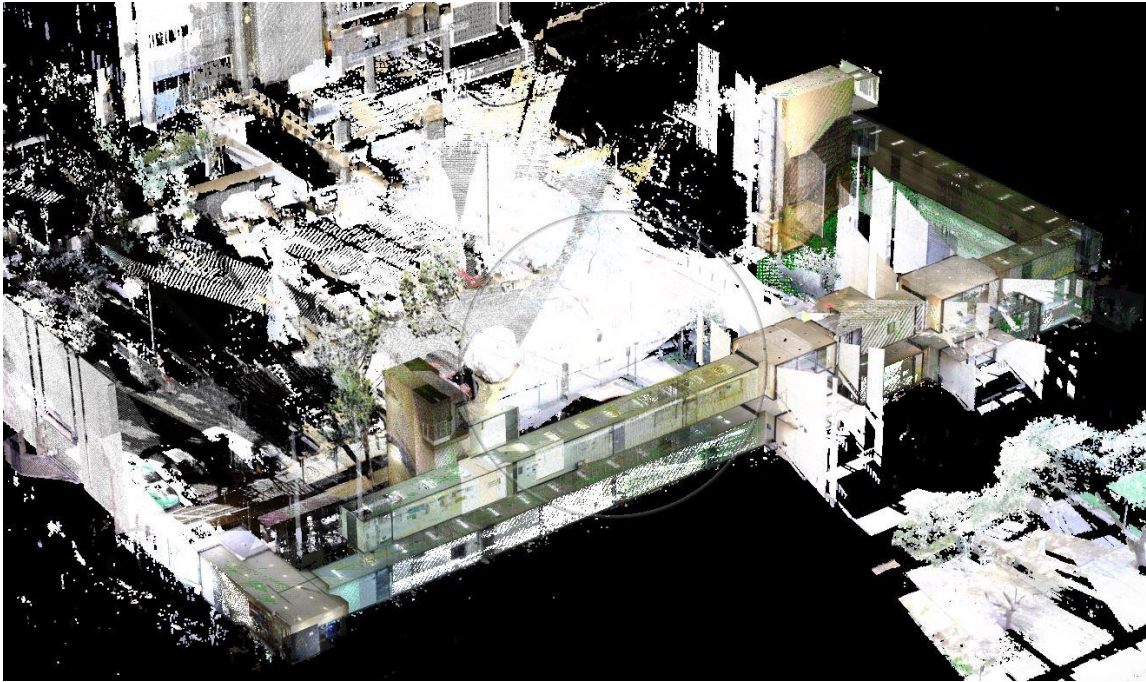
Figure 25 Reflection / Refraction Noise - colorized laser scan point cloud of the interior of the Teague Research Center, Texas A&M University, College Station, Texas, United States. Project led by the author, laser scanning and imaging by the author.

The quality parameter is a multiplier e.g., 2x, 3x, 4x. Increasing the quality multiplier, increases the cleaning done to the point cloud i.e., increasing the quality reduces noise in the point cloud. As with increasing the scan resolution, increasing the quality also increases scan duration. In more stable environments e.g., indoor scenes with no windows, cloudy skies, or nighttime with artificial lighting, lower quality can be used as fewer aspects of the scene might change. Consequently, if scanning a building with considerable glazing and other reflective surfaces, increasing the quality will help to reduce noise that inevitably follows with reflection and refraction of the laser off and

through glass, respectively (Figure 25). Generally, reflective, transparent, semi-transparent, smooth, and glossy surfaces are difficult to capture both with photogrammetry and with laser scanning. This also creates strange manifestations with regards to mirrors, where the mirror will be rendered without points and will create both the actual scene as well as twinning the scene on the corresponding side *through* the mirror (Figure 26) – this peculiarity of the relation between the laser and the scene, while considered noise, does create direct indicators of the actual materiality of the scene (Willkens 2019). With the ability to reduce noise with heighted quality, laser scanning is better suited in these scenarios over photogrammetry.

Figure 26 Mirror Reflection Error / Noise - colorized laser scan point cloud of the interior of Palazzo Gaci in Castiglion Fiorentino. Laser scan by Mailee Shaw, Ashlon Richburg, Bob Warden, and the author; imaging by the author.

Light metering determines the exposure of the camera capture for the scan position. There are three options for light metering: even weighted, horizon weighted, and zenith (vertical) weighted. Even weighted tends to be the best and safest option in almost all scenarios. Even weighted metering does not lengthen the scan duration, while both horizon and zenith increase the scan duration considerably. Even weighted, as its name would imply, balances exposure between the darkest and brightest areas of the scene. Moving from bright exteriors to darker interiors can present blending problems as far as the colorized point cloud is concerned – even weighted metering helps to minimize this issue. If the only area of interest in along the horizon, and is particularly dark, then using horizon weighted metering can help to brighten those areas; they will brighten with even weighted (assuming the zenith area is considerably brighter) as well, but a particularly dark area can benefit from horizon weighted metering, in this case. Similarly, if we have particularly dark and high ceilings that are of interest, using zenith metering can brighten those areas. However, it needs to be determined whether the surrounding horizontal scene can be potentially overexposed, as this is likely to happen with a dark, high ceiling perturbing a longer exposure. Getting the exposure right is not necessarily critical for registering scan positions together, while correct exposure is quite critical for photogrammetry. Laser scanning can get away with bad exposure since the software relies more on targets or the geometry of the point cloud to align individual scan positions.

Once we have our parameters set, we can navigate our sensors. We will check the GPS for satellites currently available. If no satellites are available or we are on the

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interior of a building or cave, this will not affect the immediate accuracy of the laser

scan or the cardinal direction. The cardinal direction orientation is controlled by the

compass, which we will go into and update for the first, reference scan position – we can

update the compass for each subsequent scan position, but this isn't necessary as long as

we have established orientation for the first scan position. We then double check our

level in the inclinometer sensor – if the tripod is sufficiently level, then the internal,

digital level i.e., inclinometer, should be sufficient.

Now that we have gotten far into the weeds of the laser scanner itself, we need to

return to the scene/object we are interested in scanning. Scene/object will *help* to

determine the parameters we set for the scanner. The scene/object will also determine

the number and location of the scan positions. Much like our

photogrammetry/photoscanning waltz, our scan positions are flexibly placed with

relation to the scene/object we are interested in scanning. We cannot go into explicit

detail of the placement of scan positions, as placement is largely reflected by the form of

the unique scene/object and research aim of the operator. However, we can apply some

general scan location guidelines. First and foremost, the scanner must not be in any

danger, nor cause an unnecessary hinderance to pedestrian, vehicular, or otherwise,

traffic in the area; loose soil or stone on steep hills (Structure 10, Xno'ha, Belize) can be

precarious situations for both the scanner and the operator, furthermore, densely

populated areas and tight streets (Castiglion Fiorentino, Italy (Figure 12)) can create the

potential for adrenaline spikes for operators when very little more than a car can safely

fit through the causeway.

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Figure 27 Long corridors - colorized laser scan point cloud of the interior of the Teague Research Center, Texas A&M University, College Station, Texas, United States. Project led by the author, laser scanning and imaging by the author.

Much like photogrammetry, sufficient overlap needs to be maintained between scan positions – this helps both in registration itself, as well as keeping report thresholds in the green. Sufficient overlap can mean different things in different scenarios. In this scenario, we are assuming target-less scanning (though overlap is pertinent to target scanning as well, but we will discuss that in the next paragraph). A maximum of 10 meters is advised between scan positions – this is largely governed by the resolution parameter of the scanner, which determines the point spread i.e., average distance between adjacent points, at a distance 10 meters from the scanner. This can become a consistent scan position determinant in more open scenarios e.g., Hockley Cemetery (San Antonio, Texas), Castiglion Fiorentino streets (Italy), Xno'ha and Tz'unun hiking trails (Belize), long corridors (Teague Research Center, Texas A&M University, College Station, Texas) (Figure 27), etc. In more closed scenarios like multi-room residences or offices, max distance is less a determining factor than the rooms themselves. For example, two multi-story, multi-room houses scanned by the author (and faculty and

architecture students at TAMU) provided considerable challenges with many rooms and

multiple level changes – these were Palazzo Gaci and Palazzo Roggi in Castiglion

Fiorentino, Italy (Figure 28). During these scan projects, the author and team developed

the practice of setting scan positions on either side of doorways, "zipping" or joining

adjacent scan positions via considerable overlap between one room to the next. Level

changes i.e., staircases were addressed by placing scan positions on every encountered

landing – this proved rhythmic for floors 1-3, while more irregular for the two basement

levels of Palazzo Gaci. Scan positions, like camera positions for

photogrammetry/photoscanning, are the expression of a relation between scene/object

and scanner operator i.e., the human-scanner cyborg.

Figure 28 Colorized laser scan point cloud of Palazzo Roggi in Castiglion Fiorentino. Laser scan Hannah Baldwin, Ruthy Zuniga, Bob Warden, and the author; imaging by the author.

Once the scan positions are loosely set, we can set up targets if we are using them. We generally have two kinds of targets for laser scanning: checkboards and spheres. However, some scanners, such as the Riegl, use cylinders with reflective tape as targets. Targets are set up to be seen from the scan positions, with a minimum of three targets visible from two adjacent scan positions. As with any rules or guidelines set forth in this dissertation, or any instruction on how-to-do-something, sufficient results can be attained without following these guidelines – sometimes things just come together. Also, distance between scanner and target is less rigid than distance between scan positions – targets visible to the human eye at a distance greater than ~30 meters will begin to sharply decrease likelihood of automatic detection in registration. Manual placement of targets can be done, but if insufficient pixels make up the target in the image, then FARO Scene will not allow you to manually place the target. Beyond the targets' relation to the scan positions, we also need to consider the targets' relation to each other. Variable height placement of both checkboards and spheres can help reduce the chance of misidentification of distinct targets as the same target (in the registration, that is). This is by no means the exhaustive list of criteria to consider for laser scan capture i.e., scanner set up and subsequent placement of scan positions and targets (if necessary), and even with all that preparation and planning, there are always unexpected obstacles that slow an otherwise smooth workflow i.e., place the tripod, level the tripod, scan, repeat. For the sake of time (and maybe sanity), however, we will press on to the processing of the laser scan data.

Laser scanning processing can be suspiciously automatic, traumatically abrasive, and any flavor in between. The initial processes of project transfer i.e., copying the raw scan files to a local machine, and processing scans i.e., preparing the raw scans for registration which includes colorization, are normally passive activities. Sometimes a scan or two will not process with the rest of the scans – processing the scan individually can resolve this issue, or should this not work, reverting back to an earlier version and reprocessing the whole batch of scans can be successful (Hockley Cemetery - Glowacki et al. 2019). Once successfully transferred and processed, the scans can be automatically, manually, or visually registered. Automatic registration can rely on targets, top view, cloud-to-cloud, or combinations of the three. Often, automatic registration will not register/align the individual scan point clouds together on the first attempt, but it can create useful clusters that reduce the time spent in manual or visual registration. Manual registration can be used in conjunction with targets, manually placing targets that were not found in the processing phase. Manual placement of the targets is done by reviewing two adjacent scan positions, two 360-degree images of each respective scan position. Corresponding targets are located and marked in both images. Upon recognition of sufficient overlapping targets, FARO Scene will label targets and prompt the user to register and verify, visually, and then move on to the next pair of adjacent scan positions. Visual registration requires the user to piece the point clouds together using direction arrows that appear on the respective point clouds when selected. A top view in orthographic projection is initially given for visual registration, and this is often sufficient to align and then register the point clouds together. However, if registration

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continues to fail, despite alignment in top view, check a side profile view to check alignment in the z-direction.

Once we have registered the scan project, meaning all individual scan positions are aligned in a way that twins the physical scene/object, we can check the registration report. The report indicates to a higher resolution than visual review the quality of the registration. If registration thresholds e.g., mean point error, maximum point error, and percent overlap, are not "in the green" (meaning sufficient deemed by the software), we can use fine registration techniques, particularly with adjusting subsampling of the cloud-to-cloud alignment in order reduce the error. If the overlap percentage is insufficient, little can be done in fine registration to improve this – if the error is medium (in the yellow – red is an insufficient error indicator) we might allow this if the mean and maximum errors are in the green. If we want to improve an insufficient overlap percentage, then we will need to add more scans to the project, process those scans, and align them to the existing scan project. When registration thresholds are to our liking, we can export a registration report for documentation. Then, we can create a project point cloud for export. We can export a unified project point cloud to .e57, .pts, or other point cloud formats to disseminate to other researchers on the project or for archival purposes. We can also export the scan project to post processing software like Autodesk ReCap Pro. FARO Scene also allows for visual representation exports such as images, videos, and AR/VR. Image resolution can be customized to high degrees, making for high resolution imagery of the point cloud. Although, these images are restricted to RGB values by default and take considerable knowledge of the inner workings of Scene to

adjust these color values. Such knowledge is beyond my current scope. We are also restricted to orthographic projection export, dictated by the clipping box, which needs to be created prior to exporting orthophotos i.e., image exports. We can rotate the clipping box off level to export isometric views of the scene/object, but this can take time and is not automated/accurate. By exporting the scan project to ReCap, or by importing the project point cloud into ReCap, we can take advantage of ReCap's preset filters and ability to export images of any view regardless of the clipping box position, as well as export images in perspective projection. These exports are capped at 4096x4096 pixel resolution at 96dpi, but this is sufficient for large format prints and presentations.

Now that I have expounded on the methodologies for creating point clouds via photogrammetry/photoscanning and laser scanning, we can return to a non-literal/aesthetic discussion on the point cloud in the next chapter. It is important to discuss the creation of these objects as this experience of capture and processing impacts our consideration of the realized point cloud and subsequent surface models. The innate knowledge and experience of these methodologies also alludes to the attention to the mundane, erroneous, and unintended outputs of these methodologies. The aesthetic exploration and the seemingly everyday quality of the objects explored in the next chapter indicate a different approach to digital cultural objects that is less about instrumental utility and more about sincere and caring engagement with these objects.

CHAPTER VI

EXPLORING EXPRESSIONS OF 'THIRD TABLE' EMERGENCE IN DIGITAL

CULTURAL OBJECTS

This dissertation explores the interpretation of Graham Harman's 'third table' as

the translation of content through a non-literal/aesthetic medium by aesthetically

considering the point cloud medium and some of its throwaway outputs. This is largely

the translation of feeling through art, in various forms (Harman 2012). The position I am

taking here is that expression of emotion largely takes place in the realm of language,

that is, speech and writing. What I disagree with is expressing feeling through literal

language. To express feeling with the most effectiveness – to express feeling to the

closest equivalent of what we are *actually* feeling – we need to express feeling

nonliterally, indirectly, allusively, obliquely. This is largely Harman's position on

metaphor, theatricality, and vicarious causation i.e., how things (objects in his case)

touch without touching (Harman 2007; 2020a). This is precisely what Timothy Morton

also discusses with regards to beauty – an artwork's ability to affect you and you are not

in complete control of how or to what magnitude the artwork affects you (Morton

2021a). Morton further relates beauty to quantum mechanics, and Einstein's notion of

'spooky action at a distance' where two electrons appear to affect one another at a

distance (Morton 2013: 44-45).

This can start to get confusing with different designations of our reality floating

around and often being used interchangeably. I will continue by clarifying some of these

terms, where thinkers fall in relation to them and where this dissertation is situated as far as though terms and concepts are concerned. As should be apparent, Harman and Morton are interested in the immaterial. For them, material or physical is not equivalent to *real*. Some terms we *can* group together as analogous (or synonymous) at this point: material, physical, and actual. The other side of the reality coin lies in this group of terms: immaterial, imaginary, and virtual. The distinction between material and immaterial is simple enough, and yet does need further clarification. We can *sense* both materially and immaterially, so associating the 'sensual' with the material world is incorrect. More accurately, we make phenomenological contact in the material world. Consequently, we make noumenological contact in the immaterial world, to borrow Immanuel Kant's phenomena and noumena (otherwise known as the 'thing-in-itself') (Kant and Weigelt 2007).

This is problematic, especially for those well-read in object-oriented ontology (OOO), the philosophical project to which both Harman and Morton are major proponents. One of the principles of OOO is that noumena, the thing-in-itself, the essential object, the real, or Harman's real qualities and real object tension (RQ-RO), is inaccessible, withheld from direct access (Harman 2011; 2018). So, how can I say, "we make noumenological contact in the immaterial world"? Whether sensual (phenomena) or real (noumena), we do not make *direct* contact with anything, as per Harman and OOO. This holds in both the metaphorical sense and the empirical sense. Things appear to be solid, static, unchanging, but we know in both the metaphysical (aligned with

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metaphorical here) and physical (aligned with empirical here) sense that things are dynamic.

Let's not get too far into the metaphysical weeds and return to clarifying our terms. We have material-physical-actual, and we have immaterial-imaginary-virtual, and 'real' applies to both as well as 'sensual' applies to both. While we might want to restrict 'sensual' to the material world, that would limit 'sensual' to contact sense i.e., feeling derived from direct contact, or seemingly direct contact. We can certainly have feeling derived from indirect or no contact, particularly in the case of artworks. What of things not sensed, but virtually present? For example, I can think of my apartment, though it is not actually present. Even though not actually present, virtual presence means there is no distance. What is the constant factor here? *Presence* means no distance, whether actual or virtual (DeLanda 2021).

'Virtual' is often equated/related to 'digital', so what is the difference between virtual and digital, if there is one? The digital creates problems for the actual-virtual distinction. If we take virtual to be unrealized, then the digital must be some level of actual – does the digital occupy an interstitial space between virtual and actual? It is my position that the digital is actual, not virtual. Furthermore, 'virtual reality' is actual, not virtual. 'Real' is quite all-encompassing; there is very little we encounter (actual or virtual) that is not 'real' in some sense. You can certainly say some things are not *material-physical-actual*. Dreams, goals, fictions, these are all *not* material-physical-actual; they are 'real,' and they are 'sensual' in that they affect me. Returning to 'digital' being actual and not virtual, the document I am typing currently, a 3D-model-of-a-

building I am designing, an abstract, orphism artwork I make – all of these are actual, not virtual. My *idea* for this document, a 3D-model-of-a-building, an abstract, orphism artwork – all these *ideas* are virtual, not actual. We often incorrectly use 'actualized' or 'realized' when it comes to art and architecture – that the drawing or model are merely virtual, and the building has yet to be (or never was) realized or actualized. The drawing and the model *are* actualizations, realizations towards a building. Building is a medium. Drawing is a medium. Model is a medium. The virtual idea of the artwork or architecture translates into the actual drawing, the actual model, the actual building.

Where do we find architecture in this? Because it seems I am implying that architecture and art only exist in the idea of the architecture or artwork, which, I concede, is not the case. Or rather, architecture and art do not exist *only* in the idea, the virtual idea. Let's focus on architecture for the moment. Architecture is not only in the virtual idea, the drawing, the model, the building, but *can* be in any of them. However, architecture is not solely in the virtual idea, the drawing, the model, the building – architecture occurs in a shared space experience, this is Harman's vicarious causation, theatrical, metaphor space (Harman 2007; 2020a). Architecture is the shared, inner space of a new object created by the interaction of two other objects. Architecture *can* be the shared, inner space by myself and the virtual idea. Architecture *can* be the shared, inner space by myself and the drawing. Architecture *can* be the shared, inner space by myself and the model. Architecture *can* be the shared, inner space by myself and the building. Architecture is a potentiality, not a certainty.

Architecture is also a *simulcast*. Art and architecture both do this, *casting* their ideas *simultaneously* through different media or different iterations in the same medium. This can be seen in the example I laid out in the previous paragraph – architecture as virtual idea, drawing, model, and building. These are by no means the only media of architecture, but they are critical media of architecture in our current architectural zeitgeist. Architecture as potential and simulcast revolves around the infuriating and yet paramount question, 'what is architecture?' This can be carried over to art as well i.e., 'what is art?' I contend that 'what is art?' is much more open to the idea of potentiality and simulcast than architecture. Potentiality consists of the potential for any two things to engage in what Harman calls 'vicarious causation', where things touch without touching on the interior of a new, higher order object (Harman 2007). This new, higher order object, Harman refers to as the 'cell' (Harman 2022). Simulcasting diversifies the thing e.g., art or architecture, increasing its likelihood of touching without touching something else. Simulcasting is a requirement for architecture, where less often do we see simulcasting in art. It would be much more difficult to find an architectural project realized in only one medium than it would be to find an artwork realized in only one medium. Architecture consists of these discrete medium leaps e.g., from virtual idea to concept sketch to schematic drawing and so on and so forth. Art does not often make these leaps, at least not in a way that artists get into debates about whether art exists in the virtual idea, the drawing, the model, or the building. Art and architecture are both cumulative, but the leaps in art are often buried and/or lost in the creative process. This can be due to early iterations or throwaway iterations or that a charcoal drawing 30

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seconds in gets covered over the next two minutes, two hours, etc. The medium of video is helping to combat this loss of progress information in art. Architecture consists of many discrete steps, and while we might be tempted to say that these steps culminate in the building, is that the case? Does architecture culminate in the realized building? For some, yes, for others, not so much. This last point probes a deeply problematic phrase popularized around art, aesthetics, and beauty, that is, "beauty is in the eye of beholder." This statement, while well intended to allow the subjective gaze credit, strips the *beheld* of its agency in the aesthetic experience, the semblance, the beauty experience, vicarious causation. This statement makes a formless, meaningless heap out of all things until the human subject walks by to cast value onto it.

Whether it be with art and architecture (in the case of Harman) or ecology (in the case of Morton), OOO is a philosophical move to adjust the human subject as *part* of reality, not the center of reality, particularly in the human mind. Art and architecture do not exist without humans, but once 'birthed', art and architecture wriggle loose of their author's and observer's control, not unlike a xenomorph fleeing the make-shift womb of John Hurt (Scott, Ridley 1979). There might be a much more entertaining metaphorical and analogical discussion between the xenomorphs of *Alien* and artistic creation, but we will leave that for another time.

Returning to OOO and humans as *part* of reality, that is precisely the aim of "objectifying" everything (including humans) for OOO – all things exist in their own way even if they do not equally exist. More importantly, all things are NOT objects that exist FOR human subjects. We humans are a specific type of object that exists amongst a

multitude of other objects. There is no 'outside'. There is no 'away,' or 'world' (Morton 2013a; 2017). Objects maintain discrete definition, but there is no space or void, no container in which objects float inside – objects are pressed uncomfortably against each other, waiting for their stop on the elevator that will never arrive at their floor. We cannot escape the immersive nature of our reality. Reality is a metaphysical soup.

Philosophical Weeds

If we focus on Harman's 'third table', I want to present that idea and interpretation as well as ideas that parallel this concept before getting into the relation of these concepts to the aesthetic point cloud and the aesthetic of the mundane. Discussing these concepts will indicate more clearly what this dissertation is after, or what this dissertation is. Harman's 'third table' is between what Harman calls 'undermining' and 'overmining,' yet not both simultaneously which is 'duomining' (Harman 2013). Undermining, overmining, and duomining are the only forms of knowledge according to Harman, and this leads to a reference to Sir Arthur Eddington as the source for Harman's 'third table': for Eddington, there are only two tables in reality – the table in terms of its parts, its fibers, molecules, atoms, etc. and the table in terms of its practical effects and utility. For Harman, neither of these are the 'real' table, they are approaches to knowledge about the table (Harman 2012: 7; Bedford 2020: 19) . Both are valuable, but they do not get at what the table really is. Harman claims that the real table is somewhere between these two tables, a third table, between its parts and its effects. This positions Harman as an essentialist, according to Rein Raud, in addition to much of Harman's philosophy that focuses on the essential object (Raud 2021). However, we

cannot get at the essential object, any of the real qualities, whether associated with the real object or sensual object; furthermore, we cannot get at the real object either – this is according to the principles of Harman and OOO of object's inherent quality of withholding their reality from direct access (Harman 2011). If there is a 'third table' and it seems to align with the essential object, then what do we do this approach? For Kant, and Kant's thing-in-itself, this essential object is acknowledged to exist, but is dismissed as unknowable. OOO wants to approach the thing-in-itself, and the idea of the 'third table' is an attempt to approach this essential object. That is, approach the 'third table' by non-literal/aesthetic means, approaching a thing indirectly, allusively, obliquely.

This approach can be achieved theatrically, engaging a thing, that is, to have skin-in-the-game of aesthetic experience. To engage a thing theatrically, one has to open one's self up and share the inner space of a new 'object,' the 'cell' (Harman 2007; 2020a; 2022). In this new space and to genuinely engage something outside of yourself, you are no longer in sole control of this new reality space – it is unclear whether you or the not-you thing is causing the experience (Morton 2021: 60).

To reiterate, we have the 'essential object', 'real object', and 'thing-in-itself' as synonymous, and this is the withheld reality of a thing. The 'third table' is an awareness of this withheld reality, that downward and upward (undermining and overmining) reduction do not get at the reality of a thing, but that we can indirectly, allusively, obliquely engage a thing for experiential glimpses towards the reality of a thing. Theatricality engages the thing, creating a new shared reality space where, for example, the real object me and the sensual object artwork are within the same object. This opens

us up to what Morton often quotes from Einstein as 'spooky action at a distance' (Morton 2013a) or what Susan Langer refers to as semblance, or direct aesthetic experience (Langer 1953). A specific example of this is the 'beauty experience,' an 'impossible' "access to the inaccessible, to the withdrawn, open qualities of things, their mysterious reality.", something that Morton also calls 'truthfeel' as opposed to Kant's 'thinkfeel' (Morton 2021: 4). There is often a sadness with the beauty experience, as Morton describes – "I can't grasp the beauty experience without ruining it, so I need to leave it alone in its deep ambiguity I often experience as a floating sadness without anything in particular to be sad about." (Morton 2017: 88). Our sadness emerges from the realization that the source of the beauty is outside ourselves, we cannot control it or make it stay, and if we could that would ruin the beauty experience.

This leads us to metaphor as opposed to literal, as the non-literal/aesthetic attempt to transcribe the 'spooky action at a distance,' 'semblance,' 'beauty experience,' 'vicarious causation' to adequately convey the *feeling* of the experience. This is the realm of the arts, and this is the aim of this dissertation: to explore the feeling of engaging digital cultural objects, exploring expressions inspired by 'third table' emergences in our digital-cultural reality with things like point clouds, surface meshes, digital debitage, errors, unintended outputs, and the like.

Aesthetic-Techno Weeds

How do we approach an exploration of the feeling of engaging digital cultural objects by exploring expressions inspired by 'third table' emergences in our digital cultural reality? So, there is this 'inner space' where I and a digital cultural object reside.

We reside here because the digital cultural object has my sincere attention. This is not a joint inner space that includes me and the *physical* cultural object. The digital cultural object is not divorced from its physical cultural object as its alibi, nor from its various contexts (geographical, cultural, or otherwise). It is impossible for the digital cultural object to be divorced from its physical source or its context. We cannot say, for example, the point cloud of Villa La Rotonda is the physical Villa La Rotonda; meaning, we also cannot say, while looking at the point cloud of Villa La Rotonda, that it is Villa La Rotonda (Figure 29).

Figure 29 Textured photogrammetry surface model of the interior of Villa La Rotonda, Vicenza, Italy. Photogrammetry and imaging by the author.

We can consider the way that Levi R. Bryant discusses substances and Harman discusses objects, where we cannot have properties without some substance, or qualities without some object – qualities must be held by some object (Bryant 2011; Harman 2011). Think about texture in a modeling or rendering software – even the preview must

attach these texture qualities to something e.g., a spherical-webcam-like thing
(Rhino3D), a logo (Keyshot), a box, etc. So, the digital cultural object, in our example,
the point cloud of the Villa La Rotonda has digital properties/qualities that the physical
Villa La Rotonda does not, and the physical Villa La Rotonda has physical
properties/qualities that the digital Villa La Rotonda does not. In this way, the *two* Villa
La Rotonda are discrete or distinct from one another. However, we are still referring to
both as *different* 'Villa La Rotondas'. So, despite their medial differences i.e., physical
versus digital media, there is still some shared Villa La Rotonda-ness in both the
physical and digital manifestations, which would imply that neither is the essential Villa
La Rotonda. So, what is the essential Villa La Rotonda? Certainly, we could infer that
some essence is more likely to reside in the physical Villa La Rotonda, since, despite
their distinctness, the digital cannot emerge without a physical alibi. But is that *actually*
true? Can the digital Villa La Rotonda be created without some physical alibi? In a
sense, yes. Reconstructions can be done using drawings, images, videos, etc. of the
physical object. So, the answer is yes, but there is still some root, some essence in the
physical realm here. And to answer the question, "what is the essential Villa La
Rotonda?", that pertains to the Villa La Rotonda that we can *get at* in direct aesthetic
experience, but not *point at* here in this dissertation – no one, including myself, can tell
anyone, or anything, else what the essential Villa La Rotonda is. You must experience
the essential Villa La Rotonda, and that has to be a direct aesthetic experience that
surprises you – you cannot prescribe this experience e.g., by telling someone they need
to visit the physical Villa La Rotonda to experience its essence.

This sets up one of the approaches to this dissertation. We will have a discussion on the point cloud / surface model, as these digital objects that have physical alibis. This approach pursues the ontological question raised by Harman's essentialist position concerning the 'third table,' the real object, the essential object, and how we 'get at' the thing-in-itself. As one might garner from the chapter on OOO, 'getting at' the essential object is misinterpreted as impossible – we can get at the essential object but we cannot *point at* the essential object. That is where the exploring the feeling of 'third table' emergences through expression comes in. This focuses on Harman's indication that the arts, that indirect, at the risk of pretension, approaches to cognition can indirectly get at the thing-in-itself (Harman 2019). We need to be careful with this claim as it garners frustration and a seemingly gate-keeping paradox. How I am phrasing it for this dissertation is that direct aesthetic experience (Langer, Harman, etc.) by some RO with sincere attentiveness (Harman's vicarious causation) briefly glimpses a shimmer of the withheld reality of another object, an SO that briefly reveals its inner reality. This brief access, this concentrated shock to the heart, is a glimpse of the 'third table.' As Harman argues, I agree that this takes a sincere attentiveness to the thing by another thing. However, that is not all. There must be some resonating sirens call as well. One must be paying sincere attention to the thing and the thing must affect one in an intense, high-magnitude way. That's a notion communicated by Morton's 'beauty experience'; we are not in control of this experience, at least not entirely, but are one side of the equation. We cannot merely pay genuine attention to something and garner a fleeting glimpse of its inner reality. And more importantly, this glimpse of reality of a thing must surprise us

– it cannot be intentionally and directly prescribed or programmed. Almost as if you were hypnotized by the Mona Lisa and the figure went, "BOO!" Also, this does not necessarily mean the gaze is reciprocated. The intense, high magnitude affect upon some attentive RO by the SO can be felt by indifference or attentiveness of the SO toward the RO.

So, we experience this inner reality glimpse, this 'third table' emergent experience, now what? We want to share it, no? No matter how hard we try, it is impossible to perfectly duplicate the feeling of experience, and that pertains to both ourselves as well as others we wish to share the experience with. This right here is the experience that moves us to tears, the sadness is beauty for deep people notion that Morton discusses. The feeling is so intense and resonates so strongly, not only are we overwhelmed by the inner reality of the thing, but we are also immediately aware of the impossibility to grasp the thing, let alone share the thing. The thing-in-itself is so impossibly impressing on us, that we are incapable of processing it, so, we cry, we laugh, we laugh until we cry, we smile big dumb smiles until we cry, and so on.

So, we can't share it. Now what? We often seek out more experiences, putting ourselves back in those scenarios and bringing others along in the hopes of having similarly intense experiences. Or we attempt to translate it, to transcribe it from our feeling of experience to another medium. We often try to describe it in literal prose, and this often ineffective and underwhelming (see Harman's anti-literalist position) (Harman 2020a; 2022). If you can list all the reasons that you love someone, then you probably don't actually love them. Love is a feeling and does not translate into literal language

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well. Instead, transcription into another medium seems to hold the most promise. This is what we refer to as inspiration, and it is worth noting that we typically don't say "we were inspired" if we haven't actually done anything. To be inspired implies that we were affected to act in this way or that. This is where the arts come in, non-literal/aesthetic or non-typical methods in media driven by some 'third table' emergence experience.

This very exploration is an inspired endeavor, inspired by interactions with physical and digital cultural objects alike. This dissertation considers these objects, how others have considered these objects in non-literal, aesthetic ways e.g., Saunders, Chapman et al.; then considers the origins of a non-literal, aesthetic approach toward objects in OOO and process philosophy; synthesizes these considerations in a light and playful point cloud metaphysics; then I add my own exploration that unpacks both my own processes for creation of digital cultural objects (my best practices and workflow for photogrammetry/photoscanning and laser scanning) and my own exploration of these objects in non-literal, aesthetic ways. This is the connective tissue of this dissertation and its organization.

A specific approach to this dissertation brings in the application of OOO as pointed lens to focus on things we habitually overlook. We can consider the mundane, every day, throwaway objects of our digital cultural reality. These are objects like texture images, fisheye thumbnails, panoramic thumbnails, and capture sequence time lapse videos. How are such objects expressions of 'third table' emergences? These are objects either commonplace or ignored by those that capture and create digital cultural objects through photogrammetry/photoscanning and laser scanning. They are largely

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secondary, unconsidered in themselves, and they surprise us when we find them, provoking us to take a moment to consider them – or at least they provoked me to take a moment and consider them. They may appear briefly as signifiers of the scan project at large, as with the panoramic thumbnails, which are hardly, if ever, considered distinct from the scan project they represent. Such an image appears with the scan project in FARO Scene, and similar panoramic images accompany each scan position – the panoramic image displays as a preview on the FARO scanner upon the completion of a scan in the field (Figure 30). This indicates to the operator that the scan successfully captured the scene/object.

Figure 30 Panoramic thumbnail preview image for Scan Position 01 of Chiesa di Sant'Agostino in Castiglion Fiorentino, Italy. Laser scan by Mark Gastelo, Bob Warden, and the author; imaging by the author.

While low resolution, the panoramic image previews contain the entirety of the scene in a single image. Warping the paradoxical coin so that we can see both sides. This warping of the scene in a kind of machine-image, or seeing like a machine, is a trend for the mundane objects I have indicated in this study: the texture image, fisheye thumbnail,

panoramic thumbnail, and capture sequence frame animation (time lapse). Each contains

the entirety of the project or model in a single image (video in the frame animation case)

and is not held to an efficiency determined by the operator, but by the machine (though,

subsequently, this means determined by the programmer i.e., human).

Figure 31 Fisheye thumbnail preview image for Scan Position 01 of Piazza Garibaldi in Castiglion Fiorentino, Italy. Laser scan by George Terrill and the author; imaging by the author.

The fisheye thumbnail appears in Autodesk ReCap Pro (Figure 31). This is done either by importing individual scans into ReCap for registration or by exporting a scan project from FARO Scene directly to a ReCap project. In the former, once imported, the software will generate fisheye thumbnails to represent each scan position as they are processed/indexed in ReCap. These fisheye thumbnail images can then be found in the support files folder for the ReCap project. This is similarly achieved when exporting a scan project (not a project point cloud) from Scene to ReCap. As with their panoramic image counterpart in a Scene scan project, the ReCap fisheye image warps the "coin" of the scene so that everything is visible in a single image. Why is this warping/distortion so interesting? It might be novel at best, but this does provoke an interesting consideration to the paradox of the coin and its two sides that cannot be viewed at the same time. Similarly, a scene, a physical one, that is, cannot be viewed entirely by an occupant all at once. However, we should check our species-being here – I am assuming a human real object in this case. While seemingly reduced to representative icon, the panoramic and fisheye images, the warped image style of the panorama and fisheye lens, amplify the human eye through the machine eye. A machine eye created by humans, yes, but not something we would consider "a human".

The remaining two mundane object types (texture image and capture sequence frame animation) hold more tangible insights than the relatively novel insights of the "machine eye" of the panoramic and fisheye lens. The former examples are immediate capture products from the engagement between the human-scanner cyborg and the scene/object: the lens opens, light hits the sensor, the software applies the color in this or

that warped image. The texture image takes considerably more effort by the human-scanner cyborg and the human-software cyborg. While the use of 'cyborg' here might seem trivial, and while I admit (to the best of my knowledge) I do not have some internal technological/inorganic prosthesis/augmentation, we haven't *not* been cyborgs since the first time we (humans) used stone tools, made our mark on a cave wall, or etched it in a tree, or even masked ourselves in various garments.

Shelving the tantalizing discussion on our inherent cyborg-ness, and pausing on the sophisticated, yet still mundane, texture image, I want to discuss the capture sequence frame animation. As the capture sequence frame animation (time lapse) displays immediate raw data for photogrammetry/photoscanning, this mundane object contains maybe the most immediate of the mundane content. However, the images must be stacked and rendered to video in post-production, and this is not necessary for any subsequent modeling of the cultural object. The idea to create a frame animation of the capture sequence began with the ritual of quickly skimming through my images after a photogrammetric capture sequence to review my images for overlap and sufficient coverage. The more I practiced this ritual, the more it incentivized a well-overlapped, organized, and intuitive capture sequence in practice. In teaching others how to cognitively manage and then review their images, I advised my students to imagine a flipbook (which sometimes required further explanation on what a flipbook is) or video; the smoother the video, the more likely they had sufficient overlap between images. Unlike the more machine-eye of the previous examples, the capture sequence frame animation expresses a more experiential perspective, the experience of the human-

scanner (camera) cyborg. The mundane object then expresses both aesthetic experience

of the cyborg as well as a more literal raw visual of the scene/object captured.

Figure 32 Texture image, generic mapping with mosaic blending, from surface model (.obj) export out of Agisoft Metashape - textured photogrammetry surface model created by the author of Biological Sciences Building - West, Texas A&M University, College Station, Texas, United States.

Of the mundane objects created during the scanning process, the texture image is

the object that has surprised and captivated me the most with its fragmentary, mosaic,

and digital aesthetic (Figure 32). The texture image appears upon exporting a "model"

from photogrammetry/photoscanning software such as Agisoft Metashape, Autodesk

ReCap Photo, RealityCapture, etc. This texture image exists as a .jpg file, an image file.

This combined with an .mtl file, which is a 2x2 matrix, assigns the texture information

(color value, RGB) to the corresponding surface position (spatial value, XYZ). In other

words, the texture image relates through the .mtl matrix and onto the .obj (the surface

model), resulting in the textured surface model (Figure 33).
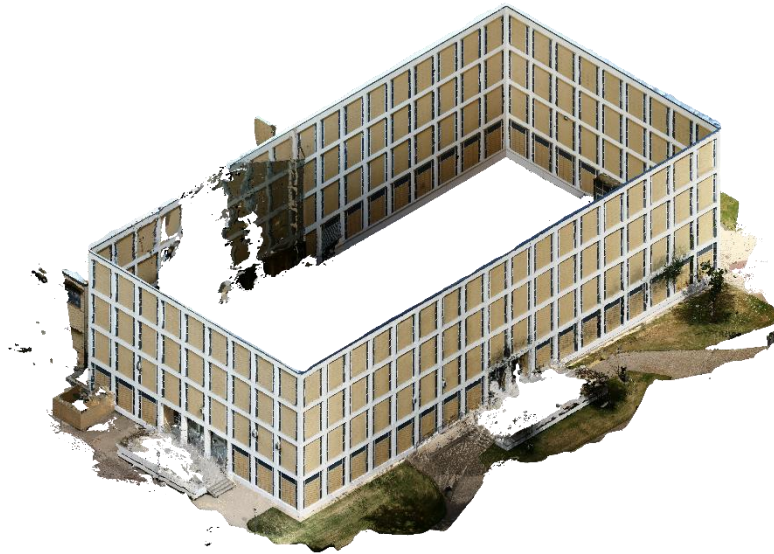
Figure 33 Textured photogrammetry surface model created by the author of Biological Sciences Building - West, Texas A&M University, College Station, Texas, United States.

Compared to the single (although large) point cloud file e.g., .xyz, .pts, .e57,

formats, which store both position and color values in a single file, this three-file system

is conceptually cumbersome – but we will leave that discussion for another document. Furthermore, the three-file export described is particular to Agisoft Metashape, with slightly different results occurring in other software. For the purposes of this dissertation, I will focus on the specific outputs of Agisoft, as that has been and continues to be my photogrammetry/photoscanning software of choice. Furthermore, I find the aesthetic qualities of the texture image outputs from Agisoft more compelling than those from Autodesk ReCap Photo, for example – however, I welcome others to find the latter more compelling and investigate those objects in non-literal/aesthetic ways.

What is so compelling about the texture image in concept? The quality that first draws me to the texture image as something to be considered autonomously is its somehow ordered-chaos quality of a mosaic, minimally distorted, blurred in some areas, and fragmented, yet cohesive (Figure 34). This is separate not from its various contexts per se but separate from its utility in the three-file system of a textured surface model. We cannot talk about the texture without acknowledging the physical cultural object that is scattered across the mosaic, at least by name. The discussion then naturally turns to geographical, cultural, and survey context of such an object. All these relations are part of, yet do not exhaust the reality of the texture image – its various contexts are essential to its reality, but they are not *all* of its reality.
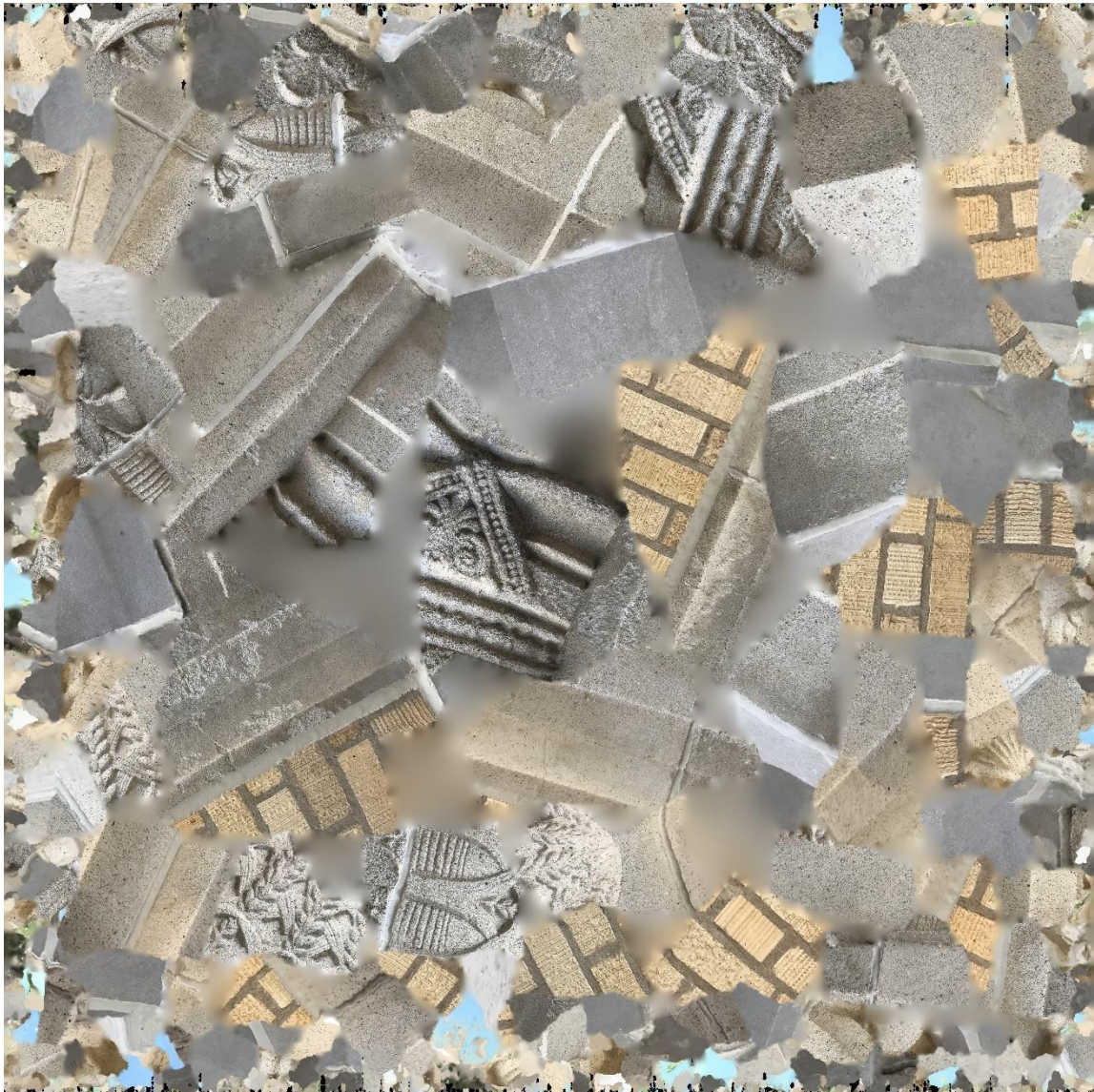
Figure 34 Texture image, generic mapping with mosaic blending, from surface model (.obj) export out of Agisoft Metashape - textured photogrammetry surface model created by the author of decorative sculpture on the south entrance to Scoates Hall, Texas A&M University, College Station, Texas, United States.

We should discuss the peculiarities of the texture image from Agisoft as well as

the texture image from ReCap Photo. Both Agisoft and ReCap Photo compose their

texture images with similar sized and shaped fragments. It is the composition itself in

each of these texture images that differs. Agisoft composes its texture image with all

texture fragments in a single, square image. Upon close examination, some blurring and

stretching of color values occurs between more resolved fragments – the Agisoft texture

image interpolates color values from adjacent, though not directly touching fragments.

The "more resolved" fragments in the texture image become more apparent if taken into

an image editing software like Gimp or Photoshop, and then applying an edge detection

or normal mapping filter (Figure 35).
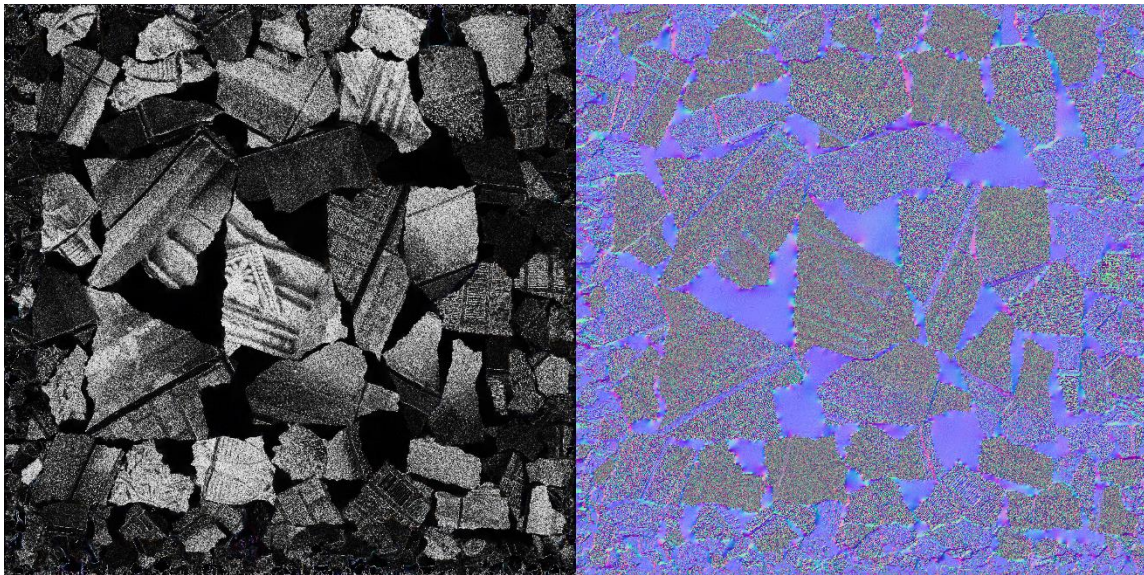
Figure 35 Edge detection filter (left) and normal filter (right) - texture image, generic mapping with mosaic blending, from surface model (.obj) export out of Agisoft Metashape - textured photogrammetry surface model created by the author of decorative sculpture on the south entrance to Scoates Hall, Texas A&M University, College Station, Texas, United States.

Large fragments organize in the center of the image, with progressively smaller

fragments adding to the composition from center to the periphery. This composition in

Agisoft pertains to a specific "mapping mode" for the texture creation, in this case, the

"generic" mapping mode. Other mapping modes include orthophoto, adaptive orthophoto, spherical, and single camera (Figure 36). Regardless of mapping mode, Agisoft generates one texture image file upon exporting the model as a .obj, or the texture image file can be exported singularly by using "export texture."

Figure 36 Mapping modes in Agisoft Metashape - (left to right) generic, orthophoto, adaptive orthophoto, spherical - texture images from the textured surface model created by the author, of Igloo di pietra by Mario Merz (1982) at the Kröller-Müller Museum in Otterlo, Nederland.

Also regardless of the mapping mode, *all texture data is composed in a single image*. While novel, as a singular digital fragment, this observation makes the texture image immensely interesting from a digital perspective, archaeological perspective, and archival perspective. The texture image achieves what no single image used in the creation of the model is capable of, viewing the entirety of the scene/object in the same image. Even the conventional orthographically projected views of the scene/object e.g., elevations, sections/profiles, plans, isometric/axonometric, miss the concavity and plastic details of some scenes/objects. Perspective projection views and orbital and fly through videos are also hard pressed to view all texture data. The efficiency of the texture image is largely why it is the format and component of texture mapping.

Considering this texture image as digital debitage, a digital fragment or pot sherd, a digital archaeology in the future might examine the "tool marks" of certain field methods and hardware and software indicators. As previously noted, even the closely related and competitive software, Agisoft and ReCap Photo, have their idiosyncrasies in terms of software programming i.e., we can infer from looking at their respective texture images side-by-side which texture image came from Agisoft and from ReCap Photo. Closer examination of the texture image may indicate further insights such as hardware i.e., camera type and quality, and methodology e.g., photogrammetry/photoscanning, laser scanning, structured light scanning, etc.

This also, hypothetically, makes it an efficient archival method. What of the spatial XYX values? These texture fragments that compose the image are cut in certain ways and likewise will fit together only in certain ways, *based on the geometry of the surface mesh*. Not a goal of this study, but a future avenue for research could be the development of an AI/machine learning program that can reverse engineer texture images to create the source textured surface model or even the original images. If such a program existed, archival materials, both digital and physical, may look very different. They may not resemble a machine aesthetic, but *an aesthetic made for the machine eye*.

While Autodesk ReCap Photo's texture image composition provokes less immediate attention in its aesthetic qualities, these same profound archaeological and archival hypotheticals still hold true. ReCap Photo's texture image is distributed over multiple images. The precarious layout of the texture fragments on the images makes a kind of literal analogy to an archaeological artifact display or a strange bug board. The

fragments are placed in a programmatic efficiency, with the largest fragments being

placed across the bottom of the images before continuing with subsequently smaller

fragments moving up the image.
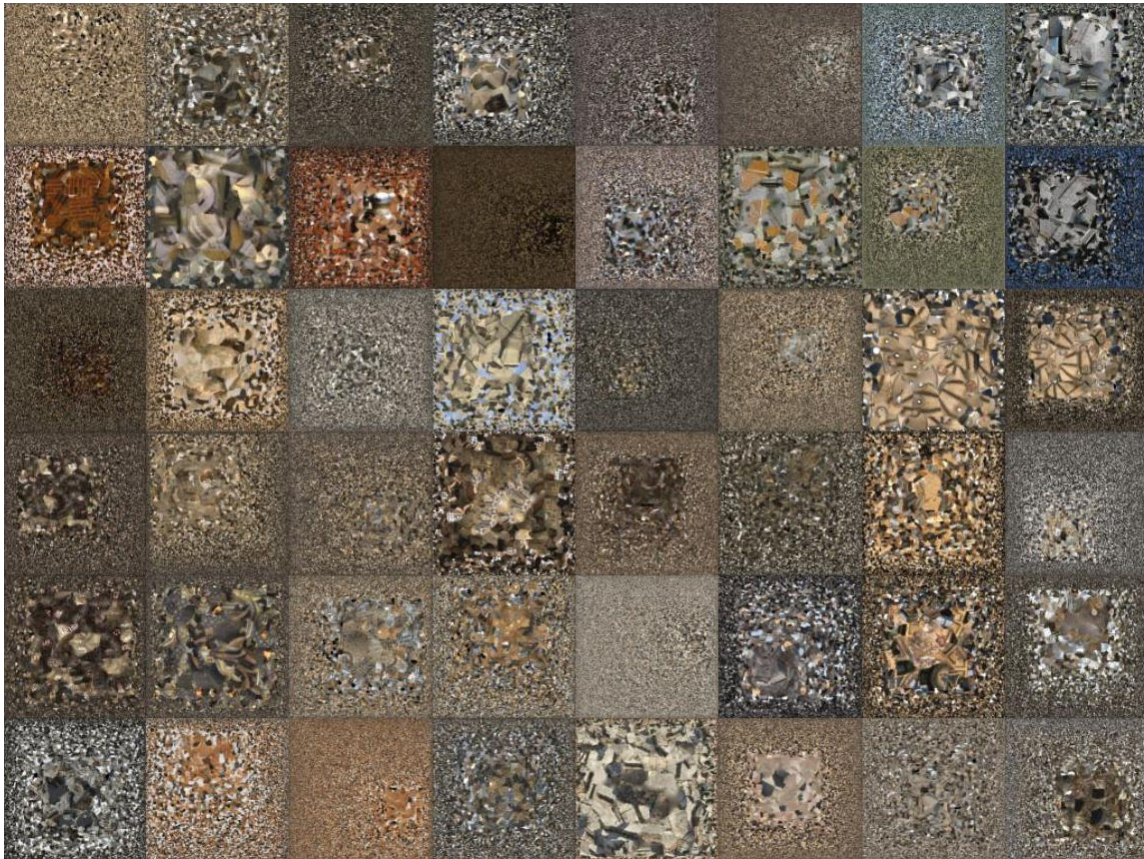
Figure 37 Texture image mosaic – some of Italy. Texture images from textured photogrammetry surface models created by the author from Castiglion Fiorentino, Cortona, Florence, Milan, Perugia, Ravenna, Rome, San Gimignano, Siena, and Venice.

One way we can aesthetically approach the texture image would be to comprise

all the texture images created by the author into a mosaic – no filters, no image editing.

This should comprise all geographic context encountered by the author: Belize, Italy,

Texas, England, Bermuda, etc. This then becomes a kind of tapestry or quilt of the

author's relation with physical cultural objects. In Harman's terms, this would be myself as the real object and the physical cultural object as the sensual object within a new relational object, scanning (whether with a camera or a laser – though, the texture images in this study have all been created with a camera i.e., photogrammetry/photoscanning). This author-biased quilt can then be reduced to each respective geographic context: a quilt for Belize, a quilt for Italy, and so on (Figure 37). This is geography on the scale of country boundaries, so we can further reduce the quilt to the scale of the city – all texture images from digital cultural objects with physical cultural object alibis in the same city e.g., Castiglion Fiorentino, Rome, etc. This becomes subsequent quilts for Castiglion Fiorentino, a quilt for Rome, and so on. If we reduce to the building scale, we quickly get single texture images for singular scenes/objects, meaning we no longer gets quilts per se.

However, the dataset for Belize does offer multiple scenes/objects per building scale scene/object since these are archaeological contexts. We can consider archaeology as a relation between a human object and a human-made object e.g., the Mask Temple or the Jaguar Temple at Lamanai in Belize. Though that is not quite specific enough, particularly for the contexts of Xno'ha and Tz'unun in northwestern Belize – these were *living* archaeological relations i.e., excavations were active, and the human-made object was not fully apparent. The human-made object's presence was changing as excavations progressed.

So why do these things, these quilts/tapestries show us? What do they express? These mundane, throwaway, everyday objects are created from a relation between the

human-scanner cyborg (camera or laser) and physical cultural object. To get to the

texture image, we have a thread of relational objects that must occur. I will use

Harman's structure laid out in "Vicarious Causation" and *Architecture and Objects*, and

elsewhere, of the interior of the new relational object, a specific type of object (Harman

2007; 2022), and take the architectural/archaeological digital survey process and filter it

through this OOO framework. We can then consider how this merger feels and how that

points to the texture image as a compelling, non-literal and aesthetic expression of these

relations.

In indicating baseline objects for this exercise, we must be careful, as this can

get to infinite redux quickly. For relative simplicity, these will be our baseline objects

for considering the necessary relations: human and nonhuman (Figure 38).

nonhuman ○ ○ **human**

Figure 38 Relational structure - subscendent nesting. Base relational objects: human and nonhuman objects.

 The first relation is between the nonhuman object and the human object. This first

relation is the creation of the cultural object (Figure 39).

cultural object ●-●
nonhuman ○ ○ **human**

Figure 39 Relational structure - subscendent nesting. The cultural object emerges from the relation between nonhuman object and human object.

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The next relation is the reclamation object (or ruin) (Figure 40), created by the

reclamation of the cultural object by the nonhuman object e.g., natural processes such as

erosion, decomposition, bioturbation, etc.
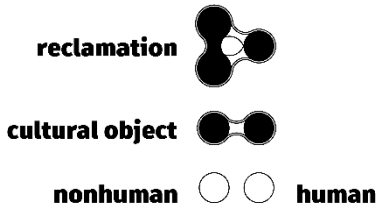
Figure 40 Relational structure - subscendent nesting. The reclamation object emerges from the relation between the cultural object and a new nonhuman object.

Now, some new human object relates to the reclamation object, and the survey object

emerges as a result (Figure 41).
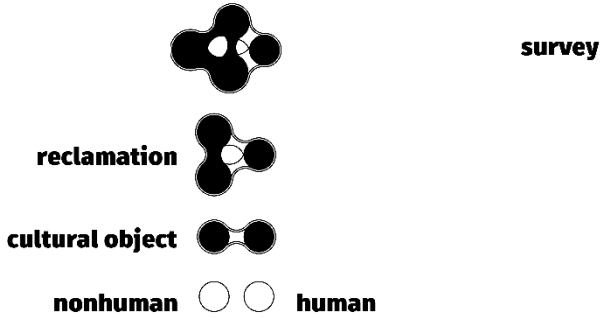
Figure 41 Relational structure - subscendent nesting. The survey object emerges from the relation between the reclamation object and a new human object.

Parallel to this survey relational object, a human object and nonhuman object relate, and

while still a cultural object is created from this relation, this object is a tool object (more

on the distinction [if any] between cultural object and tool object in another text).

Furthermore, the human object and cultural-tool object, specifically non-digital (more on

that later), relate, creating a cyborg-1 object (Figure 42).
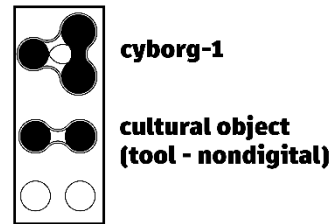
Figure 42 Relational structure - subscendent nesting. The cyborg-1 object emerges from the relation between the human object and the cultural object (tool - nondigital).

Next, the survey object and cyborg-1 object relate, creating the archaeology object – the

tool-nondigital in this case might be a shovel, trowel, or pick axe (Figure 43).

Figure 43 Relational structure - subscendent nesting. The archaeology object emerges from the relation between the survey object and the cyborg-1 object.

Similar to the cyborg-1 object, parallel to these relational objects, some human object

and nonhuman object relate, creating a cultural object that is, again, a tool object, but a

digital tool object – hardware in this case e.g., a total data station, laser scanner, or

digital camera. This forms cyborg-2 (Figure 44).

cyborg-2

cultural object
(tool - hardware)
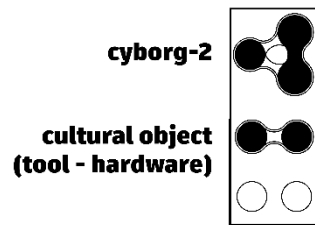
Figure 44 Relational structure - subscendent nesting. The cyborg-2 object emerges from the relation between the human object and the cultural object (tool – digital: hardware).

The cyborg-2 object and archaeology object relate, creating the digital archaeology

object i.e., the application of the digital tool-cultural objects by some human object to

some archaeology object (Figure 45).
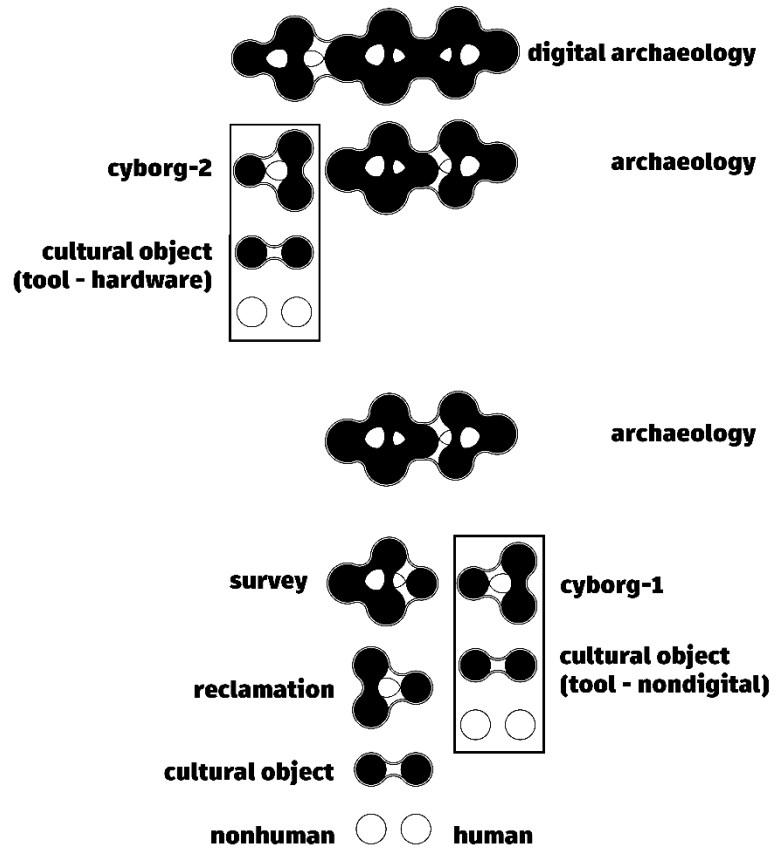
Figure 45 Relational structure - subscendent nesting. The digital archaeology object emerges from the relation between the archaeology object and the cyborg-2 object.

Next, again, parallel to these events, cyborg-3 emerges from the relation between some human object and a digital tool-cultural object, but this time, it is software rather than hardware (Figure 46).

cyborg-3

**cultural object
(tool - software)**
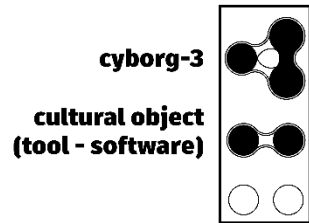
Figure 46 Relational structure - subscendent nesting. The cyborg-3 object emerges from the relation between the human object and the cultural object (tool - digital: software).

This cyborg-3 object and the digital archaeology relate, creating the point cloud object – this is a specific case for digital tool-cultural objects such as total data stations, laser scanning, and photogrammetry (Figure 47).
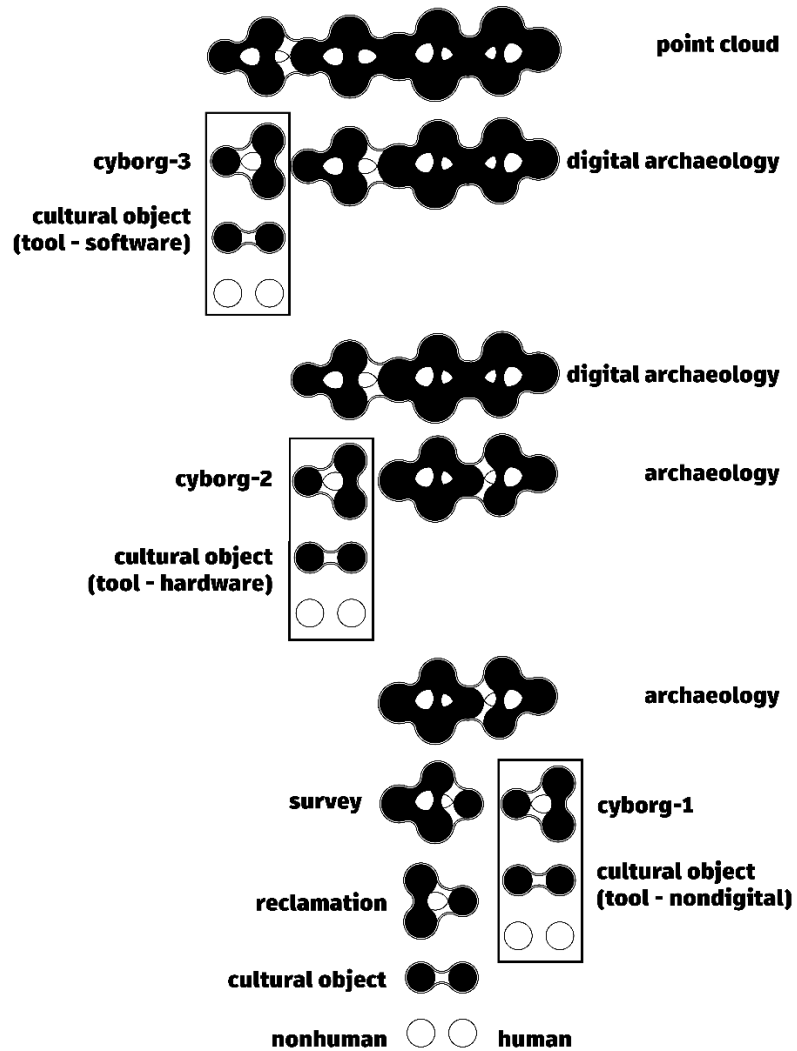
Figure 47 Relational structure - subscendent nesting. The point cloud object emerges from the relation between the digital archaeology object and the cyborg-3 object.

The final two objects created in this exercise are the surface model object and the texture image object. The point cloud object and the same cyborg-3 object relate, creating the surface model object (Figure 48).
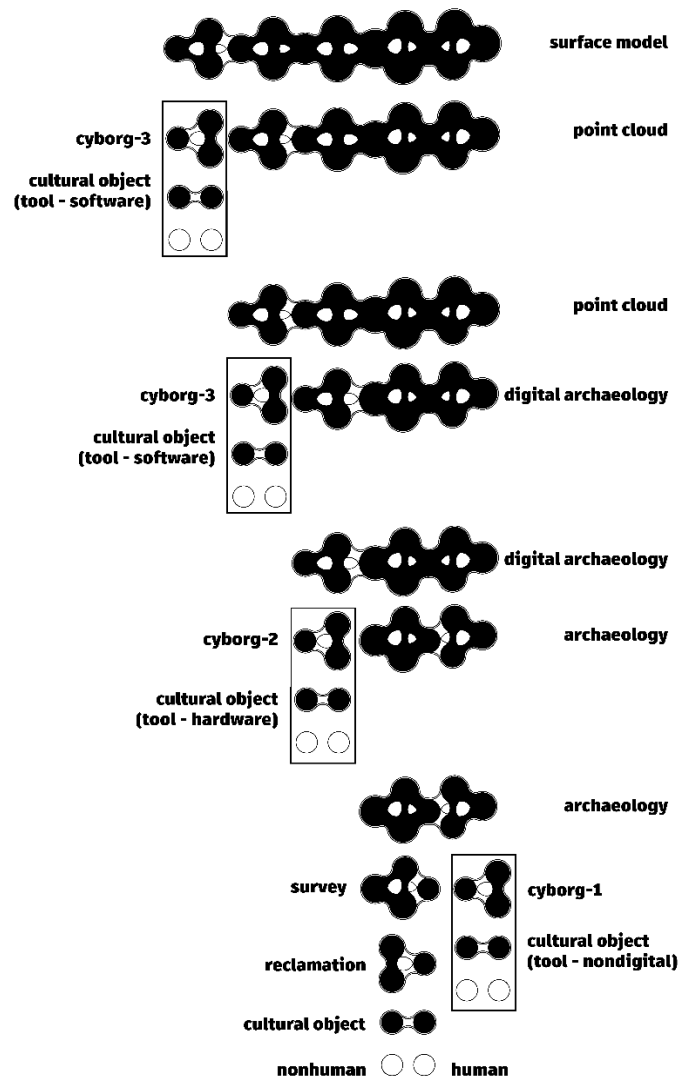
Figure 48 The surface model object emerges from the relation between the point cloud object and the cyborg-3 object.

The surface model object and the same cyborg-3 object relate, creating the texture image object (Figure 49).
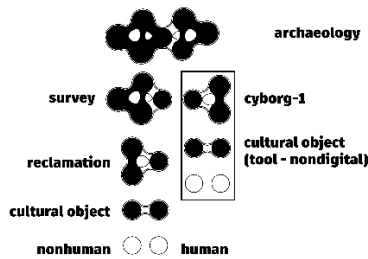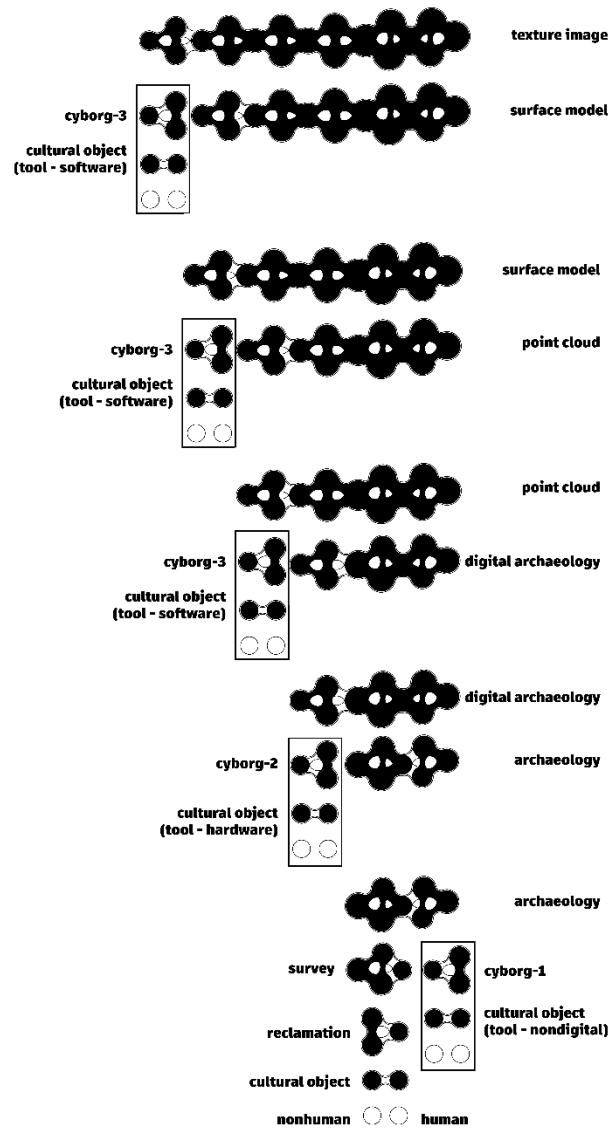

Figure 49 Relational structure - subscendent nesting. The texture image object emerges from the relation between the surface model object and the cyborg-3 object.

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If you have stayed with me this long, many thanks. Despite its monotonous repetition, I hope this exercise makes clear the depth of all objects and that all objects are relational objects. That is, all objects are the emergent thing of some relation between other objects. As I have established so far, and will continue to expand on next, this relation emanates a multitude of new, digital objects and subsequent relational objects.

We could also consider our erroneous data, misalignments, noise, etc. By 'erroneous' I mean the digital cultural object does not resemble, at least not to even a moderate degree, its physical cultural object counterpart. This can be interpreted as a Heideggerian approach to considering digital cultural objects via Heidegger's tool analysis i.e., the broken hammer (Heidegger, Stambaugh, and Schmidt 2010; Harman 2002). We tend to not pay much attention to the hardware or software, our tools in digital cultural survey or architectural survey. They work "correctly", we take that for granted, and we focus on the content i.e., the digital cultural object, which we often indicate as indistinguishable from the physical cultural object even though they are distinct. We will leave that line of thinking rest, as I discussed this earlier with our two Villa La Rotondas. When things break, there is a brief glimpse into their being – when tools work as intended, they become background. Even so, their being is not "gone" when they are "working properly." I draw a tone of cynicism and snarky callousness with the terms "correct," "proper," and the like, to indicate that despite their very human entanglements, everything, all objects, have discrete beings that are withheld from any relation, even human (Harman 2022; 2018). Just because we brought objects into this

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world does not mean we have any right to take them out of it – all objects deserve respect outright, while not necessarily all objects earn trust. Even if we make an object, it now exists as a unified, irreducible entity, just like we do.

These errors in creating digital cultural objects highlight the deeper being of the software and hardware. Errors are the expression of pushing these tools to their breaking point. Expression of strained solutions when pushed to the fringe of their capabilities convey a brief glimpse into the reality of the tool. It is much like the concept of the glitch, creating peculiar and compelling expressions of failure that would have been difficult or near impossible to intentionally create (Apperley 2015; Berry and Dieter 2015). This is not necessarily an avenue that should be advocated for i.e., finding breaking points of tools, as this indicates a troubling and unhealthy approach to engaging with human and nonhuman beings. However, errors happen, and they can be considered as opportunities to appreciate the glimpse of being that was experienced as well as instrumental value in learning from these errors to address them.

The literal consideration of errors quickly deteriorates into the previously mentioned "troubling and unhealthy approach" to engagement. A non-literal, aesthetic approach may fare better in avoiding such a pitfall. This would be an approach that considers errors *as they are* not *why they are* i.e., considering errors for what they are rather than why they happened. Alignment errors are the most visual culprit in creation of digital cultural objects using photogrammetry/photoscanning and laser scanning (Figure 50). "Walls" intersect through "floors" and "ceilings" in ways that obviously are not the case in the physical cultural object alibi. Certain components of a scene/object

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are scaled differently, mismatching their physical dimensional correspondence i.e., if

two objects are 1:1 in physical space, and in digital space the ratio is 5:1 (Figure 51).

Elements in the scene/object, or even the entirety of the scene/object, may duplicate in

digital space, causing a cloning effect that does not hold true in physical space (Figure

51).
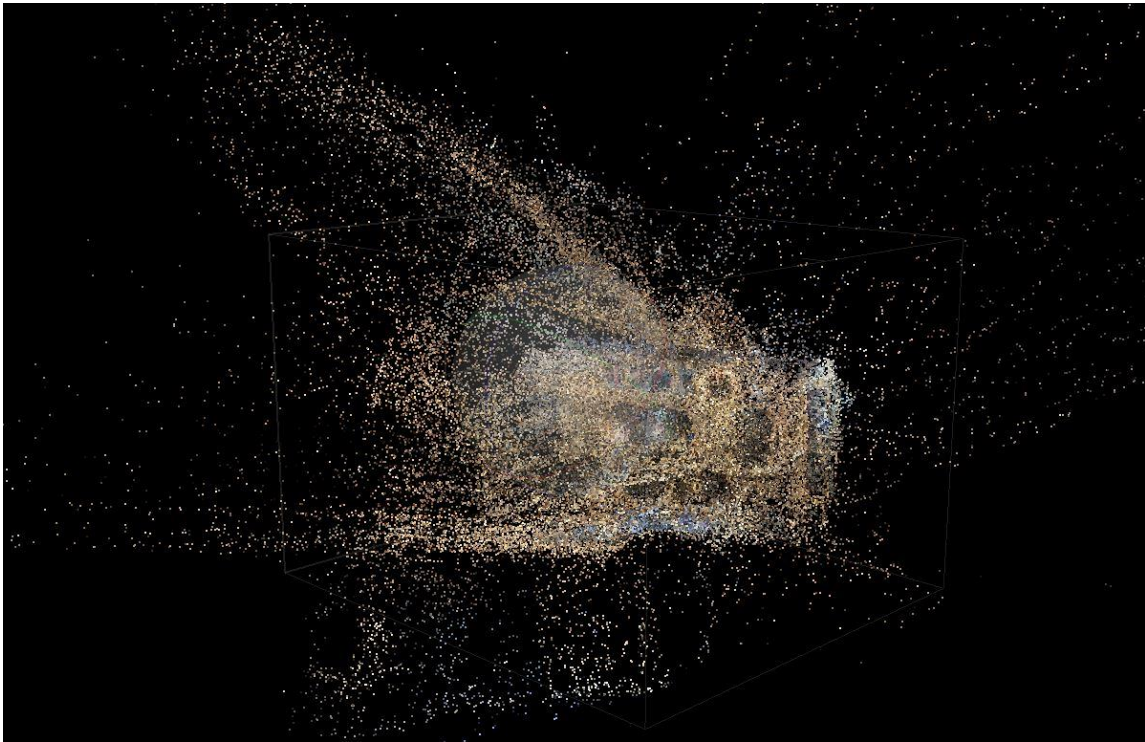
Figure 50 Misalignment error - sparse photogrammetry point cloud of Sala del Senato in the Palazzo Ducale in Venice, Italy. Visit facilitated by ItalArt and Sharon Jones, photogrammetry and imaging by the author.

Figure 51 Misscaling and duplication error – dense photogrammetry point cloud of tribunal archaeological remains at the Roman Forum and Archaeology Museum in Assisi, Italy. Photogrammetry and imaging by the author.

Noise is another common type of error found in the creation of point clouds using photogrammetry/photoscanning or laser scanning. Like misalignments, misscaling, and duplication, which are read as a "broken" result, "incorrect," needing to be "fixed," noise is seen as a result to be "cleaned," "reduced," "removed," etc. As my tone may seem to imply, I do not agree with the typical disdain toward noise in photogrammetry/photoscanning and laser scanning. Noise often occurs in relation to the scanner's (camera or laser) engagement with reflective, transparent, and smooth surfaces (Willkens 2019) (Figures 25 and 26). There are methods to mitigate this, such as allowing windows to get and remain dirty during scanning or coating reflective/transparent surfaces in some semi-opaque film (Stoian, Silviu et al. 2021). In

terms of architectural survey practice, these solutions, or other considerations to reduce noise make sense – we are required/pressured/compelled to produce sharp, refined captures of the physical scene/object. While we likely can gather visually that something is reflective, transparent, or smooth even with alterations to mitigate noise, there is something more honest and authentic about the presence of noise in the model data.

We have noise made from the relation between laser/sensor and material and we have noise made from the tools themselves, whether hardware or software. The noise caused by environment, the laser/senor-material relation, indicates a shortcoming of the tool by the human standard of our perceived physical environment i.e., we do not, as humans, see such noise in the physical space. So, when this presents itself in digital space, we attempt to cast it out as demons possessing our innocent data. Noise, in the laser/sensor-material sense, is an authentic reaction within the medium of the point cloud, indicating an essential quality of the physical cultural object that translates in a particular way into the digital cultural object, becoming an essential quality of the digital cultural object (Figures 25 and 26). Noise, in the tool (hardware or software) sense, is (like the misalignments, misscalings, and duplications) an authentic reaction within the medium of the point cloud indicating an essential quality of the tool that translates in a particular way into the digital cultural object, becoming an essential quality of the digital cultural object (Figure 52).

Figure 52 Halo / dome error – colorized laser scan point cloud of Buffalo Gap, Texas, United States. Project led by Greg Luhan and the Department of Architecture, Texas A&M University, lasering scanning and imaging by the author.

We could also consider unintended outputs, whether that be from using inputs in ways other than intended or unintended outputs from using intended input methodology. As opposed to erroneous data, both scenarios for intended outputs, and thus unintended objects, yield 'correct' outputs. By 'correct' I mean the digital cultural object resembles, to a high degree, its physical cultural object counterpart. Unintended outputs can occur from processing raw input that that input was not intended for e.g., processing images taken from a photographer/tourist perspective rather than for photogrammetric purposes (Figure 15). This can also include processing archival images/photos to see if a model can be produced of a scene/object that no longer exists physically, has been damaged, or to create a model with a specific time period aesthetic (Wilson et al. 2016). We can also have unintended scenes/objects in laser scanning, when distant, partial surfaces unintentionally appear in the registered point cloud; this is almost inescapable with laser scanning, particularly exterior laser scanning.

Beyond the mundane, erroneous, and unintended, we can take a bolder approach to expressing 'third table' emergences, by engaging the digital cultural object in a maximal-hyper-duomining kind of way. Now, that is quite a heavy and thick 'kind of way', since I am implying much in those three hyphenated, adjective terms. Maximal is opposed to minimal, or *maximalism* over minimalism. Minimalism has a bias-standard-tradition power structure inherent in it i.e., someone is deciding to present only this or that as important to the composition. If we are considering expressing digital cultural engagement, or as we discussed with Morton and Langer, the beauty experience or direct aesthetic experience, respectively, it can be advantageous that the expressions take on a maximalist approach – all the things, all at once (see Dan Kwan and Daniel Scheinert's *Everything Everywhere All at Once* [2022]).

In a way, the use of the word, 'hyper' may seem redundant, and it may very well be. Although… what is more maximal and hyper than using two words that go to the extreme of the concept of 'most'? Maybe using an infinite number of words would be more maximal or hyper, but let's just make the case that more-than-one, particularly more-than-one of 'the same thing', is the potentiality for *towards* an infinite multiplicity. I say, 'towards' infinity, because, as per Morton, it is easy to count to infinity; it is hard to count to an immensely large finity (Morton 2013a). In this way, we want to consider and explore expressing digital cultural engagement in a hyper way, considering digital cultural objects in the ways we might consider *hyperobjects* – this is an object that is massively distributed in time and space (Morton 2013a). This concept applied to our

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digital cultural objects requires us to look within and without of the object, but how do we do this?

We can use Harman's idea of duomining (much to Harman's likely dismay) in a maximalist sense to approach the digital cultural object as Morton's idea of a hyperobject. If we downward reduce (undermine) and upward reduce (overmine) simultaneously, then we saturate an expression of the feeling of engaging the digital cultural object with measure (undermined parts) and meaning (overmined effects) to the point where we no longer see the trees. We now see the swirling maximally duomined hyperobject forest.

However, this forest does not access the essence or reality of any digital cultural reality. And essence and reality are not what this dissertation is about; it is about the expression of feeling, the expression of direct aesthetic experience. It is about connecting the feeling of engagement to those that did not feel that feeling, and this is on the most basic level the aim of artistic expression. However, as I cannot point to this feeling, even through non-literal/aesthetic expression, non-literal/aesthetic expression of this experience increases the likelihood of similar 'third table' emergence experiences in others.

With a maximal-hyper-duomining approach engaging the digital cultural object to express a 'third table' emergence, what sort of actions constitute these maximally and hyper duomining engagements with the objects? Referring to the title of this dissertation for our most general terms of these engagements, we have measure and meaning. Measure aligns with undermining in our duomining approach, and we can begin this

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approach by literally maximizing and hypering measurements of a thing, inundating the digital cultural object with dimension callouts. This is in line with our conventions for design representation, whether it be architectural design/survey, engineering, archaeology, or historic preservation documentation/survey. We undermine the objects in our various discoursal surveys by adding graphic scales and dimensions callouts, adding keys and annotation, quantifying objects within the object. This undermining is useful and necessary, it is an imperative approach to knowledge about these objects in architecture and archaeology. This importance exists whether we are documenting dimensions of material objects or if we are designing dimensions of immaterial objects.

In an approach to the exploring expressions inspired by 'third table' emergence experience, we do not need to outright dismiss engagements with objects that could be deemed undermining, overmining, or duomining. If we amplify these engagements by maximizing and hypering, then the undermining, overmining, and duomining qualities of these engagements can be affected, perhaps in a way that is no longer a reduction of the object to its parts or effects.

What can we do to the thing? We can, as mentioned before, inundate it with measurements, dimension callouts. We can callout features and materials with labels. So, now we have number text in dimension callouts and alphabetic text in feature and material callouts. What else can we amplify in terms of measure? Or rather, what other parts do we have to the thing?

Let's get very specific about what thing we are considering. Let's consider an image of the point cloud of a building, or, even more specifically, a digital (as in not

printed) image, orthographic projection, elevation view of the point cloud of the interior of a building. We should note orthographic projection and elevation view since we are considering dimension callouts in the digital image. Since we have a digital image, we have metadata for that image, so how can we make that present? How can we superimpose metadata, the digital parts, to the digital image so that the engagement no longer reads as a 'superimposition'?

Considering a maximal-hyper-duomining approach as a non-literal, aesthetic approach to digital cultural objects, the approach I am currently exploring focuses on the image, or rather, the image of the point cloud or surface mesh. This approach begins to lean into two indicted issues or tensions regarding my initial attempts at non-literal, aesthetic approaches to digital cultural objects e.g., the texture image itself, the manipulation of the texture image, the use of the texture image in semi-literal simulcasting ways, comparison of texture image mapping methods and so on. This indicated a continuation of the problem of image in architecture, in that I became immersed in the qualities of the texture image itself and presented the image in an array of ways, taking the problem of the image to hyperbole. This immersion and hyperbole indicated another issue / tension in my approaches, the fetishization of the image or the object. Fetishization appears to be a compelling thread to pull, as my readings of Harman's vicarious causation, metaphor, and cell; Morton's beauty experience; Langer's semblance; and Einstein's spooky action at a distance all seem to reminisce of a kind of fetishization. Where is the line drawn between fetish and beauty, appreciation, agreeability, love, infatuation, interest, value, etc.? Furthermore, a non-literal, aesthetic

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approach must be aware of formalism, or Kantian formalism, where the object is considered devoid of its various relations i.e., the thing-in-itself. Now this is not exactly clear, where I would argue that Kant's thing-in-itself (the 'third table', real object, essential object) *does* need to consider its various relations – those are a component to its being. Formalism tends to consider the painting, sculpture, any object really in terms of its aesthetic qualities alone, detaching the thing from its social and political and otherwise relations to other things. Considering objects in a non-literal, aesthetic way raises the tension of divorcing the object from its various contexts, relations. If the thing-in-itself is not divorced from all context, relations, as I am claiming, then how I ensure presence of such contexts and relations in non-literal, aesthetic exploration of the digital cultural object is important.

Returning the current approach to a maximal-hyper-duomined object, if you want to ruin an artwork, then explain it literally, or, better yet, explain how it's made. Naturally, that is exactly what I am going to do. This first attempt at a maximal-hyper-duomining approach to non-literal, aesthetic expression of digital cultural objects focuses on Igloo di Pietra, a stone sculpture at the Kröller-Müller Museum's sculpture garden in the Netherlands (Figure 53).

Figure 53 Side profile, textured surface model created by the author, of Igloo di pietra by Mario Merz (1982) at the Kröller-Müller Museum in Otterlo, Nederland.

Why select this digital cultural object? It is an outlier in my expansive dataset, in terms of geography and cultural area. I have a large dataset to pull from for Italy, Belize, Texas, and even Barcelona. Since it is an outlier amongst these datasets, it seems advantageous to explore this digital cultural object first.

This approach will yield something along the lines of a gif (graphic interchange format). But we're getting ahead of ourselves. The object is chosen. In what medium does this object exist? The Igloo di Pietra was captured using photogrammetry/photoscanning in October of 2016, specifically an iPhone 5s camera. 43 images were taken. These images were then processed using Agisoft PhotoScan (at the time). The images have been reprocessed for this dissertation in Agisoft Metashape, creating both a dense point cloud and a textured surface mesh of the Igloo di Pietra. The point cloud and surface mesh originate from the same "model", so their "natural" and edited bounds are consistent i.e., XYZ and RGB values for points (point cloud) and triangles (surface mesh) are the same (with the small caveat that the triangle color values are interpolated between RGB for the points that comprise its vertices).
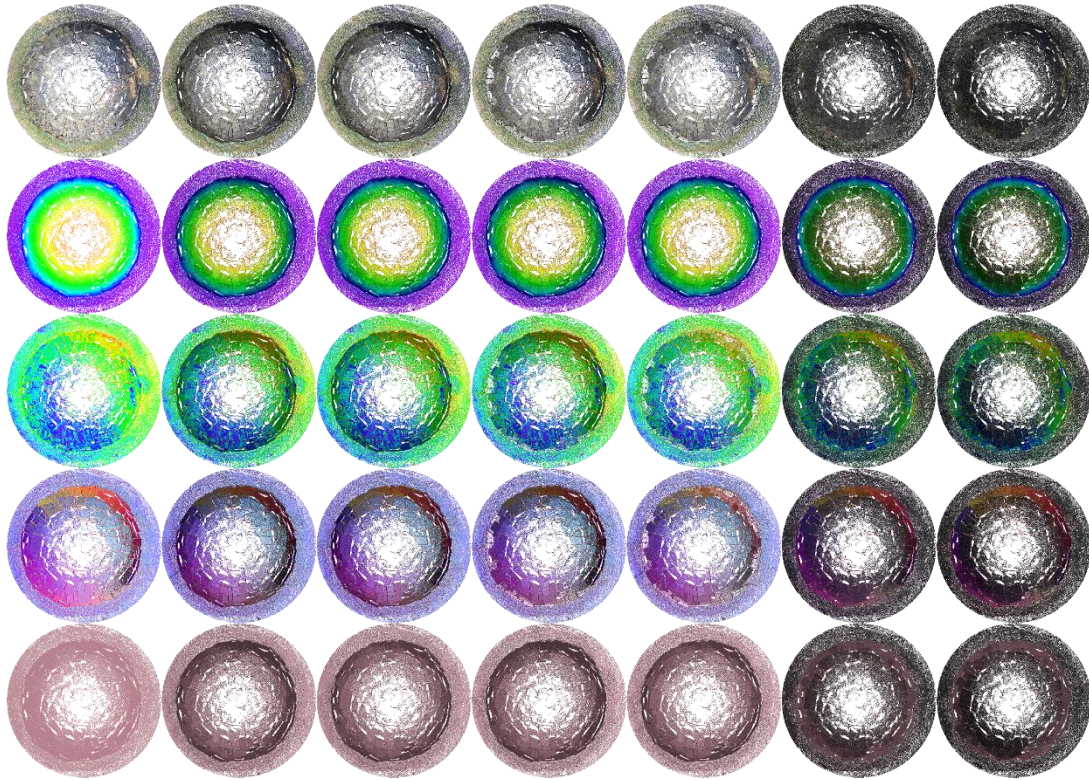
Figure 54 Igloo di Pietra 35 - Maximal-Hyper-Duomining. 35 different filters, lighting, shading, and highlighting combinations of the top elevation of the photogrammetry point cloud of the exterior of the Igloo di pietra by Mario Merz (1982) at the Kröller-Müller Museum in Otterlo, Nederland.

As one can imagine, there are various software we can import such media into, and subsequent alterations and filters unique and not unique to that software. We will start with Autodesk ReCap Pro (ReCap), commonly used for visualizing point cloud data, linking those data to programs like Autodesk Revit for BIM, etc. ReCap helps us limit options of manipulation, so that we do not get hung up in the filtering stage of this approach. ReCap has five filter settings: RGB, Elevation, Intensity, Normal, and Scan Location; three lighting settings: Single, Double, and None; two shading settings: Lambert and Phong; and three edge highlighting settings: Default, Transparent, and

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None (Figure 54 and Figure 55). Before continuing, it is important to note that calling

out these inner workings in themselves is not the intended value of this dissertation.

However, the value in this approach is its potential to be applied to any new tool i.e.,

software or hardware, to engage with not only the tool's useful applications but the

tool's wider *capabilities*.
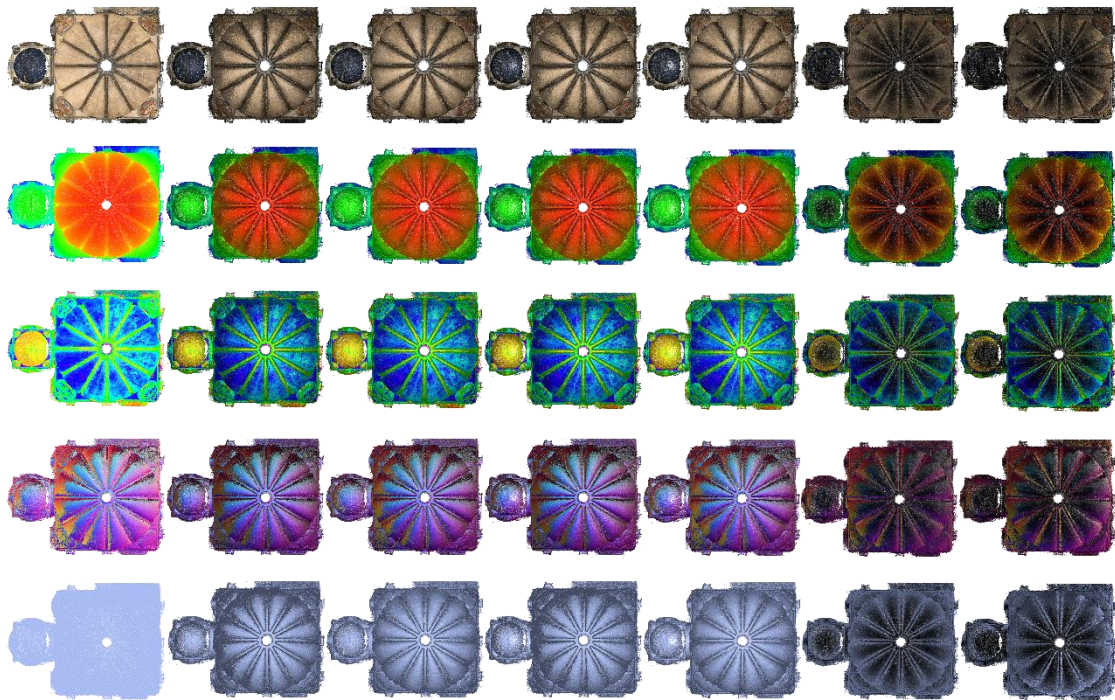
Figure 55 Sagrestia Vecchia 35 – Maximal-Hyper-Duomining. 35 different filters, lighting, shading, and highlighting combinations of the top elevation of the photogrammetry point cloud of the interior of the Sacristy of San Lorenzo in Florence, Italy.

While considering these settings appears to establish an easily calculated number

of potentialities for rendering the point cloud, some adjustments of one setting while in

another yield no visual difference e.g., when lighting is "None", shading of "Lambert" or

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"Phong" makes no difference – as one might infer from the setting names of "lighting" and "shading" (if there is no lighting, then there is no shading). There are 35 unique renderings one can produce in ReCap, and if we consider a typical frame rate for a video at 30 frames per second, we can include all unique renderings of a *particular view* of an object in roughly a one-second gif.

Looking beyond the single view gif, we can add multiple views, multiple gifs to a single composition, with the 35 unique renderings in matching sequence or mismatched sequence. The effect should be dizzying, disorienting. We can also augment measure and meaning onto the gif. Now the digital cultural object *phasing* through renderings in a second is being overlain with dimensions and narratives pertaining to the object.

Further beyond this maximal-hyper-duoming object… What if this gif object were not an image? What if the object phased through its renderings while undergoing an orbit animation or a fly through? Phasing while it spun in time and space. Whether digital or physical, what if we could hold the object and turn it around and over in our hands. In doing so, different renderings became present upon engagement and movement with the object. What if the object presented different renderings upon being engaged and turned around, but there existed no correlation between the rendering and the way in which it was engaged? In other words, one could not engage with the object in a certain way and anticipate a certain *reaction* from the object in terms of its renderings.

Imagine I have an array of gifs, running through various filters, lighting, shading, and highlighting. These could be the same view of a digital cultural object, a point cloud

or a surface model. Imagine I have carefully composed this mosaic or quilt of these dancing images – they are not really animations, but they are not quite static images, hence the 'gif' designation. What is possibly wrong with this? This seems to confine and control the object through the image, through the ways I have created these gifs. They sit in their square and dance away until I go to the next slide or close the video player. Admittedly, while I think this is compelling and interesting to compile and view, I think this a constricted way to engage the digital cultural object. What is more in line with the concepts of OOO and a broader post-anthropocentric philosophical movement would be image objects or model objects (physical or digital) that are *stubborn*, *sassy*, *temperamental* – objects that do not react in predictable ways, objects that have an *uncertainty* to the way they respond to another object relating to them.

This is by no means the end to such an exploration, both in the immediate and near-distant future. A simple and self-serving hypothesis and answer to this dissertation remains similarly stubborn, sassy, and temperamental. My hypothesis was that engaging the everyday, mundane, erroneous, and unintended outputs from the creation of digital cultural objects would inspire an exploration of expressions pertaining to those objects. And, as I have done, I have felt so compelled to explore expressions of digital cultural objects after considering the everyday, mundane, erroneous, and unintended outputs from their creative methodologies: photogrammetry/photoscanning and laser scanning. Furthermore, this exploration has affected how I discuss the methodologies themselves and the point cloud medium itself. My language in their description has become metaphorical, as we saw in point cloud metaphysics. We see this same language in the

photogrammetry/photoscanning waltz and 'being water' when engaging with physical cultural objects through digital cultural survey techniques. This has even affected and clarified making the distinction between the physical cultural object and the digital cultural object, that both have unique qualities and properties to them, while indicating the hierarchical relation of digital object to physical alibi. They are discrete, but one cannot exist without the other. This asymmetrical relation alludes to the essential object in cultural objects, that it is more likely found in our being surprised in an attentive experience of the sirens call from any of the cultural object's various simulcasts. We cannot prescribe 'third table' emergence experiences from digital cultural objects, but we can be sincerely attentive and engaging and hope that the sirens call surprises us in unforeseen ways.

CHAPTER VII

CONCLUSION: BEING PRESERVATIONAL

Inspired by connections with physical and digital cultural objects, this dissertation considered these objects, the approach of others to such objects in artful ways, and the origins of an artful approach to objects through OOO. Then, I explored my own processes for creating digital cultural objects with photogrammetry and laser scanning. Finally, I explored these digital cultural objects in a non-literal, aesthetic way, considering the mundane, erroneous, and unintended to derive further artful expressions inspired by 'third table' emergence experiences.

We began this study with discussions on the artful point cloud, the point cloud considered for its peculiar qualities, its aesthetic qualities, and the peculiarity of those aesthetic qualities i.e., the novel qualities of the point cloud medium, the aesthetic qualities of the content of the point cloud, and the strange nature when these qualities appear together. Andrew Saunders puts forward an extensive catalog of these point cloud expressions and expounds on the peculiar qualities of the point cloud in his diaphanous bodies, verduta per angelo, spheroidal cosmologies, and figured voids (Andrew Saunders 2018). I have expressed my admiration and inspiration in Saunders' endeavor, going so far as to recoin some of his terminology to align with my own work and observations into the terms textured voids and solid voids. I admit that my terms as well as Saunders' terms work best with regards to the point cloud of the interior i.e., the interior shell of buildings. There appears to be a gap, an excess, an opportunity to develop further

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terminology for the multitude of scenes/objects we encounter in digital cultural survey, building exteriors and landscapes being a few we can indicate immediately. Saunders' terms and mine are not some taxonomic structures to be applied or that all point cloud objects must fit within. There are all kinds of cultural objects that, when related to the point cloud medium, will demand their own terminology that other cultural objects might also relate.

We can begin to see this rich diversity in the relational object between the point cloud and the cultural object in *Art of the Point Cloud* (Chapman et al. 2018). Here, Chapman et al. present a range of cultural objects and approaches to these objects with the point cloud medium. We have octopi, elephant statues, buildings, bridges, trees, people, rooms, knees, shipwrecks, railroad museums, cars, film, and more. For some of these entries, their technological approach is the focus of discussion e.g., the synchronized cameras to capture the deep-sea octopus suspended in water. For others, the scene and the story become the focus, serving as relational bridges between the point cloud expression and narrative e.g., Mama, Where the City Can't See, Traveling Light, etc. Some even explore the relation between operator and machine, where the human operator, as part of the human-scanner cyborg, recognizes the non-instantaneous nature of the tool and applies this observation in a playful way e.g., Me and I. *Art of the Point Cloud* presents a collection that entertains the peculiarities of the point cloud beyond our image (photography medium) and video (film medium) inundated zeitgeist. This indicates a consideration of the point cloud, not an 'on photography' (Bazin and Gray

1960; Zeimbekis 2012; Benson 2013), or 'on film' (Mulhall 2016), but a gap that alludes to an 'on the point cloud' discussion in terms of ontology, aesthetics, and epistemology.

From the artful point cloud, I introduce a current anti-literalist philosophy in object-oriented ontology (OOO) by discussing two of its main proponents: Graham Harman and Timothy Morton. I contend that considering the point cloud medium through any philosophical lens will yield interesting results from the relation between medium and philosophy. However, I argue that OOO's position as a non-literal, aesthetic approach to reality, where we cannot point at reality literally, but we can get at reality non-literally holds value for an aesthetic exploration of the point cloud. Furthermore, OOO's flat ontology, where all things equally exist even if they do not exist equally (DeLanda 2016; Bryant 2011; Harman and Wiscombe 2021), provides an ample framework to bring in the outcasts generated in creating point clouds: the mundane, erroneous, and unintended. Two foundational principles in Harman's philosophy, the quadruple object and undermining/overmining, allow for an approach to aesthetic relation in his later concepts of the 'third table' and vicarious causation. For Harman, OOO is about the tension between an object and its qualities, and he sets up this framework using the quadruple object: an object has both a real object (RO) and sensual object (SO) component, as well as real qualities (RQ) and sensual qualities (SQ) (Harman 2011). With this structure, Harman explores how literal (knowledge) and non-literal (metaphor) relations occur (Harman 2018). Harman's metaphor approach is a later version of his earlier concept of vicarious causation, or how things touch without touching (Harman 2007); this later becomes theatrical engagement (Harman 2020a) and

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'the cell' (Harman 2022). Vicarious causation is instrumental for exploring attentiveness and inspiration between objects, and this also alludes to an approach to the 'third table.' The 'third table' is the essential object, real object, or what Immanuel Kant referred to as the thing-in-itself (Harman 2012; Kant and Weigelt 2007). Harman comes to the 'third table' from Sir Arthur Eddington's claim that there are only two tables in reality: the table in terms of its parts, and the table in terms of its practical effects (Harman 2012; 2019). For Harman, these are undermining and overmining, respectively, and these are the only two forms of knowledge, reducing reality to the literal: we can downwardly reduce a thing to its parts through undermining, and we can upwardly reduce a thing to its effects through overmining. While these forms of literal reductivism cannot get at the 'third table,' Harman argues that the arts and aesthetics can, which brings in the non-literal structure of metaphor as a non-discursive approach to cognition. The necessary clarification I put forward with regards to the 'third table' and vicarious causation is that, yes, we can 'get at' reality, but that we must be attentive to something, that something must also be radiating, and reality must surprise us. Furthermore, it is imperative to note that we cannot 'point at' reality. We cannot prescribe access to reality, through vicarious causation or otherwise, but we can increase the likelihood reality will emerge and surprise us through vicarious causation.

This begins to lay the theoretical framework by which we can approach the point cloud, the mundane, erroneous, unintended, and the artful. Harman's concept of vicarious causation has many parallels beyond Harman's metaphor, theatricality, and the cell. Susan Langer's concept of semblance as direct aesthetic experience is a precursor to

Harman and OOO and lies at the core of reality. Semblance is direct aesthetic experience (Langer 1953). This experience cannot be replicated, since reality is so real that it cannot be represented (Harman 2022). This is precisely what I mean by we can 'get at' but not 'point at' reality – I cannot tell you what the reality of the point cloud, the mundane, erroneous, unintended, or the artful is. We can try to put ourselves in the position to have semblance with things; it is not merely up to us; beauty is not merely in the eye of the beholder.

While often bringing in Kant, beauty, in this case, brings in Timothy Morton. Morton discusses beauty experience often, this kind of strange, powerful, and sad experience between objects. Neither object is in complete control of the relation, and neither object can fully grasp the beauty object it relates to (Morton 2021a). This parallels Morton's concept of beauty experience with Harman's vicarious causation and Langer's semblance, these intense and brief experiences of the interior of a new, relational object (Morton 2017). Within Morton's own texts, they bring in Einstein to add to the list of terms we might apply to this strange experience: Einstein describes the quality of electrons to affect one another at a distance while seemingly not touching each other directly, or, 'spooky action at a distance' (Morton 2013a). Morton's concept of hyperobjects provides insights into how these spooky relations happen between objects, since, as Morton concludes, all objects really are hyperobjects (Morton 2013a). Hyperobjects have viscosity (they stick to everything; we are inside them and they are inside us), nonlocality (you cannot point at a hyperobject, they only locally manifest parts of themselves), temporal undulation (they operate on vast time scales, relative to

humans), phasing (they are higher-order objects, "invisible to humans"), and interobjectivity ("they can be detected in a space that consists of interrelationships between aesthetic properties of objects") (Morton 2013: 233-234). The latter quality of hyperobjects, interobjectivity, leads to Morton's concept of the footprint or 'signs of causality,' which I abstract to the term, 'mark,' where things like dinosaurs and humans can relate across time and space (Morton 2013: 86). With all this interobjectivity, Morton calms things down with regards to how we should be, how we should approach our existence in the time of hyperobjects. For all the kind of imposing and massively distributed vibe we can gather from hyperobjects, Morton advocates for solidarity with nonhuman objects and being ecological as simple yet imperative approaches to our human being (Morton 2017; 2018). In a way, as Morton points out, we are already showing solidarity with nonhumans and we are already being ecological e.g., cats and house plants. We are already caring for nonhumans without any reason for utility; we like and care and show solidarity with nonhuman things all the time, just because we like them.

After establishing some of the main concepts from OOO, Harman, and Morton, and indicating which concepts are pertinent to this dissertation, we discuss two critiques of OOO and an alternative, process approach to a post-anthropocentric philosophy. These critiques and alternative approach are not directly related to the aim of the dissertation but provide posterity counter to OOO and its proponents. In "How complex is a lemon?" Stephen Mulhall reviews and critiques Harman's *Object-Oriented Ontology: A New Theory of Everything* (Mulhall 2018; Harman 2018). I focus on

Mulhall's issue with access to reality, where the simple frustration is some of the seemingly contradictory language in OOO regarding object withdrawal and then metaphorical access to reality. As I have mentioned earlier in this conclusion, I resolve this frustration by arguing that we can 'get at' reality, but only briefly, and we cannot prescribe this access, hence, the indirect access advocated by Harman. We do not have control over this access to reality, but we can do things that increase the likelihood of such access surprising us in unforeseen ways. The frustration comes from our inability to 'point at' reality i.e., no one can prove they have accessed the reality of something, you cannot *grasp* it, as Morton puts it.

In "The Contortions and Convolutions of the "Speculative Turn"", Thomas Sutherland critiques OOO, Harman, and the speculative turn (Sutherland 2021). While Mulhall's issues are with the content of OOO and Harman, Sutherland's issues are with their style. Sutherland finds OOO and Harman guilty of hypocrisy in their advocation of anti-anthropocentrism, while engaging in much anthropocentric concepts and dialogue to the contrary. Furthermore, Sutherland indicates a hegemonic gate keeping in terms of accessing the reality of being, that it takes a mature sense of taste to get the reality of things for OOO and Harman. I agree that we cannot escape our anthropocentrism, our species-being as humans, and I think on various occasions OOO and Harman have argued they are not trying to remove the human from ontology. For OOO and Harman, humans are another kind of object, they want to remove the notion of subject and that no reality exists without a human mind to cast meaning onto it (Harman 2013). To Sutherland's latter issue with gate keeping, citing that OOO declares itself, "to be the

only system faithful to the world of things" (Sutherland 2021: 122), that is something I find OOO and Harman guilty of. However, I think there is pressure in any discourse to make grand, declarative statements about the value of your work; if you don't speak with certainty, you are forgotten or die.

With much to critique about OOO, it is a project in its infancy as far as philosophy goes, and with time I believe it will iron out some of the unseemly wrinkles. Continuing the discussion on post-anthropocentric ontology from a somewhat opposing position to OOO, Rein Raud puts forward an alternative approach for a post-anthropocentric ontology with his process philosophy in *Being in Flux* (Raud 2021). To reduce Raud's philosophy to paraphrase, process is the object i.e., process, flux, flow, and dynamism is the fundamental stuff of reality. For Raud, what OOO calls objects, are 'cross sections' of reality, cross sections of the flow and flux of reality (Raud 2021: 111-112). Where Harman advocates for a handful of significant events shaping an object (Harman 2016), Raud advocates for reinforcing process shaping an object. It's not that all events are equally impactful, but that these seemingly insignificant events add up and make possible the impactful events Harman touts. This aligns well with one of OOO's own concepts of flat ontology. These small, mundane events can add up, leading to a higher order event, but that does not discount the value of all these small events it took to get there. This helps to steer us back to initial content considered in Chapter 6: the mundane, erroneous, and unintended. Furthermore, these small, mundane events inspire further exploration in aesthetic expressions, while holding significant value in themselves.

Given the artful point cloud and the aesthetic concepts in OOO, I establish a compelling mixture of ingredients to consider. Taking a brief breath, and loosely weaving the point cloud and OOO together, I make the point cloud an analogy to OOO's structure of reality. This largely involves an infinite regress analogy of building, building foundation, and foundation rebar. Here I want to communicate, through the point cloud, OOO's concept of the excess of objects, the excess of reality, while also indicating both Morton's concept of subscendence (the whole subscends its parts, or the whole is less than the sum of its parts) (Morton 2017: 101) and Bryant's reference to the power set axiom ("a bubbling excess within any whole or collection") (Bryant 2011: 272). With the point cloud, there is no literal depth beyond the surface that is cast from the sensor relating to the scene/object, and therefore we have shells within shells, objects within objects, worlds within worlds. This helps to explain what the point cloud is and what reality is for OOO, providing us a quaint point cloud metaphysics.

From here I establish the methodology used to create point clouds with photogrammetry/photoscanning and laser scanning. While very much in the technical weeds of things, some metaphorical language issues from this chapter that are derived from metaphor. This particularly refers to the analogy of the capture path in photogrammetry reflecting the form of the scene/object i.e., the capture path becomes a relational object, a mark, or a sign of causality, between the scene/object and the human-scanner cyborg. The particulars to taking images require less continuous flow and discrete steps, so I liken photogrammetric capture to a waltz i.e., an effective photogrammetric capture involves a waltz with the object. By the end of this heavy

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methodological discussion, I have presented the workflows necessary for both photogrammetry and laser scanning, with some specific examples of challenging scenarios, while alluding to some of the post processing explorations that will come in the next chapter.

After all this, I revisit OOO and its concept on access, which is how we conceptualize access to the 'third table.' Within the chapter, this establishes a renewed and focused theoretical framework from OOO, the concepts that will drive the exploration of expressions inspired by 'third table' emergence in digital cultural objects. This also establishes some terminological linkages between authors in OOO and some outside the project. These linkages then evolve into a broader aside on architecture, its ontology, and I argue that architecture is a unique potentiality (not a certainty) and simulcasting object where architecture can be found in various media: the idea, the drawing, the model, the building, the image, etc.

I then get into more specific language about what this dissertation is approaching through this philosophical lens, particularly exploring my interpretation of the 'third table' and aesthetic approach as increasing the likelihood of 'third table' emergence experience through non-discursive, non-literal aesthetic exploration. I reiterate the alignment of vicarious causation / metaphor / theatricality / the cell, semblance, beauty experience, and spooky action at a distance as concepts that describe that brief experiential access to the 'third table.'

I begin introducing the point cloud into this philosophical soup by expounding on the question of distinction between the digital and the physical cultural object.

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Specifically referring to the Villa La Rotonda, I describe the discreteness of the two Rotondas; we have the physical Villa La Rotonda and the digital Villa La Rotonda. These Villa La Rotondas exist equally, *even if they do not equally exist*. This latter point indicates the point that while these are discrete cultural objects with their own peculiar qualities, the digital cultural object cannot exist without a physical cultural object alibi. This further implies that the essential Villa La Rotonda resides in the physical Villa La Rotonda.

Between the various concepts on access and inter object relations, I discuss the possibility of access to reality, but the inability to point at that reality. Again, we can get at reality, but we cannot point at it i.e., we can experience the withheld reality of things, but that experience cannot be replicated. Some residual side effects from such an experience emerge in Morton's discussion on art and beauty and the beauty experience. Morton refers to the sadness that comes with beauty experience, the feeling that we are witnessing the beauty, the inner reality of another object, but we cannot grasp it (Morton 2021a). I argue that when we feel so compelled to share or insight more of these experiences in others, that is what we call inspiration. Inspiration is when we are so driven to action by some other object. It is my position that actions taken from inspired relational objects increase the likelihood of 'third table' emergence experience in others. In the specific case of non-literal, aesthetic expression, art begets more art.

First, I consider the mundane, every day, throwaway, objects generated in the process of creating digital cultural objects using photogrammetry and laser scanning. The objects considered are the thumbnail previews in fisheye and panorama, capture

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sequence frame animations, and the texture image. I make arguments that the thumbnail previews can be considered machine-eye type expressions of the relational object involving the human-software cyborg and the human-scanner cyborg. And while the resolution is too low to derive much in the case of the fisheye thumbnail, both fisheye and panorama show the entirety of the scene/object from a specific scan location. While likely a novel recognition and expression, these objects amplify the sensing capabilities of the human in a sense – they warp the state of literal reality in a non-literal way that achieves a more extensive outcome of what the literal cannot.

Next, I discuss the capture sequence frame animation. This is not a found object like the thumbnail previews. The frame animation must be created in post-production. I developed these capture sequence frame animations to demonstrate to students how a sufficient capture sequence *can* look. I argue pedagogically that if shuffling through capture images for photogrammetry looks akin to a video or flipbook, then there is likely sufficient overlap between images to create a point cloud that corresponds to the physical object of interest. Metaphysically, these animations also serve to communicate the eye, or the gaze, of the human-scanner cyborg relational object. This is not merely the gaze of the human, but the gaze of the human through the screen or the lens onto the physical scene/object. The previously mentioned thumbnail previews show a scanner gaze – an expression of the scanner-physical scene/object relational object; the human is there, but distance in this relational object. Creating the frame animation with capture images also helps to distinguish intended from unintended model outputs – a smooth,

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video-like animation indicates intention, while a disjunct and jarring animation either indicates unintention or erratic-intended capture.

The final mundane object is the texture image. It's aesthetic and literal qualities make it compelling from various angles as a found object. The texture image draws comparisons to the holographic sherd or the ceramic sherd, where the former contains all the information of the whole in its holographic fragment. In this way, the texture image contains all texture and geometric information pertaining to the textured surface model. The claim of all texture information is well-founded, but we look closer to indicate the allusion to the geometric information pertaining to the textured surface model. Recognizing, or even amplifying with edge and normal filtering, we can see the texture fragments within the texture image square. Furthermore, we can see the interpolation of texture or color between fragments. The recent version of a specific mapping mode in a specific software appears to have optimized the composition of the texture image to minimize texture/color interpolation – this is the "Generic" mapping mode in Agisoft Metashape with a "Mosaic (default)" blending mode. We can infer here that such an object, from a futurist archaeological perspective, has specific tool-marks, so to speak; this method, using this software, and these settings produce a particular texture image output. Further speculating on the recognition that this texture image contains all texture and geometric information pertaining the textured surface model, this makes the texture image a compelling candidate for archival purposes. The more elegant, though less aesthetically captivating solution has been to store digital models of cultural objects in a list or spreadsheet format, reducing the model to XYZ and RGB values. In the literal

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sense, this is a fantastic archival solution, but, as one might guess, the aesthetic sense might feel wanting in this scenario. A proposed aesthetic approach with the texture image is the creation of "tapestries" using texture images derived from digital cultural objects of a specific geography, culture, city, building, etc. In my own context, creating a tapestry with all the texture images from Italy, Belize, Spain, Texas, England, Bermuda, the Netherlands, etc. could, depending on my compositional scheme, create aesthetic zones in the tapestry, should geographies be clustered together. This tapestry would then be an expression of the human-scanner cyborg (author) and these various physical cultural objects (on the scale of the country, culture, city, building, artifact, etc.).

We then steer back into the philosophical weeds here, considering relational objects with OOO and Harman's framework as a guide. A potential thread to pull, or crack in the armor to attack, is the physical-digital and natural-cultural dualisms that prefix most of the objects in these relations pertaining to culture, archaeology, digital archaeology, etc. Can the concept of culture be reduced to a physical-natural-object + human-object relation? For lack of a better answer, I think we can; and this contradicts most of Morton and Bryant's (and others) notion of the 'end of the world' – that is, the end of the empty container world that humans are "in." But, much like we cannot have art without humans (Harman 2020a), or architecture without humans (Harman 2022), archaeology or culture are similarly specific objects that require the human as an ingredient. With this string of relational objects from physical-natural, to human, to physical-cultural, to human-tool, to survey, to archaeology, to human-tool (scanner) cyborg, to digital archaeology, etc., much like our building, building foundation,

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foundation rebar, these objects all *subscend* their parts. There is an immense excess to each of these relational objects. However, this abstract reductivism helps to approach and consider the amount of depth and thickness is within these various relational objects.

All objects being relational, we considered the erroneous outputs of object relations, that these "broken hammers" imply brief insights into the reality of the tool. We expressed the erroneous in terms of discontinuity between the digital cultural object and the physical cultural object. These discontinuities consisted of misalignment, misscaling, or duplication. Noise also shows a relational expression emanating from within the tool (in terms of the halo-dome noise) and expression of the relation between the tool and the materiality of the scene/object (the mirror reflection and glazing reflection/refraction noise).

The unintentional considers the creation of relational objects that were unintended. In this case, we considered the processing of images not intended for photogrammetry/photoscanning to create partial point clouds, meaning they show partial continuity with their physical cultural object alibi. Beyond indicating how combination of objects into unintended relation can create partial corresponding digital cultural objects, this presents examples of and adds to the potential for using archival images to create new digital cultural objects.

This section on aesthetic considerations concludes with a focused exploration into a maximal-hyper-duomining approach to expression inspired by 'third table' emergence experience. This approach aims to break the rules of OOO's anti-reductionist position to the point of hyperbole, thus creating an expression that blurs the discreteness

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of the duomined elements. This approach speculates on the maximal-hyper augmentation of measure and meaning to the digital cultural object, swarming the object in dimension and narrative in various mediums until the duomined elements become a chaotic hum. A subsequent approach to maximal-hyper-duomining used the maximal filtering, lighting, shading, and highlighting options in a specific point cloud rendering tool, Autodesk ReCap Pro, to pull more from the peculiar point cloud qualities and the subsequent aesthetics to create expressions. These took the form of serial still frames of a digital cultural object in a particular view where the filter, lighting, shading, and highlighting adjustments were crossed in an aesthetic matrix (Figure 42). The still frames were then used to create gif-like animations, adding a shimmering and dynamic aesthetic to the objects. This expressed the experience likely common to those in digital cultural survey, shifting between different filters and lighting to find the desired rendering effect for the point cloud or surface model. I then speculate on a more compelling digital cultural object, that takes the shimmering of the filter, lighting, shading, and highlighting aesthetic and *stubbornizes* it. Randomizing in a sense the behavior of the digital cultural object with regards to way other objects relate to it e.g., a human turning the object over in their hand, physically or digitally, does not yield predictable outcomes from the digital cultural object. All of this leads me to an approach to our digital cultural objects that is focused, yet open to the ways in which the mundane, erroneous, unintended, and artful qualities of our digital cultural reality might surprise us.

Being preservational is to be attentive and receptive to inspiration from unforeseen radiating cultural objects, inviting surprise in emergent cultural realities. We

can deduce many conclusions and takeaways from this exploration into digital cultural objects through expressions inspired by 'third table' emergence experiences, and we could call them any number of things. Given this dissertation's content and methodology rooted in preservation technology applied in architectural and archaeological contexts, terming the payout as 'being preservational' seems more than appropriate. As one would guess given the discussion on OOO and more specifically, Timothy Morton, this term or approach is derived from Morton's 'being ecological,' where we show solidarity and care for nonhuman objects for no seemingly utilitarian reason (Morton 2018). This 'seemingly utilitarian' combatant parallels Harman and OOO's position against literalism (Harman 2022) i.e., we can align utility with the literal and solidarity and care without intended utility with the non-literal, or aesthetic. And much like Morton's conclusion in *Being Ecological* (Morton 2018), we can also say that we are already being preservational i.e., we are already being attentive and receptive to inspiration from unforeseen radiating cultural objects, inviting surprise in emergent cultural realities.

Being preservational cannot be prescribed and the previous chapter on exploring expressions inspired by 'third table' emergence in digital cultural objects does not put forth a prescription in doing so. What I hope any reader gathers from this study is a curiosity and an allocation for exploring the mundane, erroneous, unintended, and artful in digital cultural survey. Digital cultural survey must have good measure, as this is an indicator of our attentiveness to the survey tasks at hand, but this does not exhaust the reality of digital cultural survey. Digital cultural survey must have good meaning, that is, it has a responsibility to convey meaning in relation to the people that created these

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cultural objects, but this does not exhaust the reality of digital cultural survey. Digital cultural survey requires a third, interstitial space between measure and meaning, a space beyond good measure and good meaning. This is a space without intention, without certainty, a necessary and vital space for surprising emergent qualities to erupt from digital cultural objects, surprising and inspiring us in no way we can prescribe.

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