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**Part Seen Imagined Part:
An Art Practice as Research Approach to Digitally
Reconstructing Charles Rennie Mackintosh's Baptismal Font**

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at the Glasgow School of Art

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Abstract

This project explores human responses to cultural heritage destruction and demonstrates the possibilities of combining state-of-the-art heritage visualization techniques with art practice as research methodology, a promising but significantly unexplored field. Charles Rennie Mackintosh's baptismal font (originally built for the Abbey Close Church in Paisley in 1906, which was destroyed in 1965) is the focus of this research. The font was significantly damaged in a major fire at the Mackintosh Building at the Glasgow School of Art in May 2014. It is the best surviving artifact from those that were damaged in the fire. This research tells the mostly forgotten story of Mackintosh's font through creative response, a short film entitled 'Part Seen Imagined Part' (appropriated from an early Mackintosh drawing), critically discusses art practice as research in relation to archaeology and heritage visualization, and reflects on the various ways humans interact with and impact cultural heritage. A number of 3D reconstruction methods and other technical processes that were used are also explained including photogrammetry, white light laser scanning, and free modeling in 3DS Max.

Acknowledgments

My thanks to Dr. Mhairi Maxwell for her support supervising this project and helping with data collection (as well as the sandwich). I would like to thank Jared Benjamin for his assistance and perseverant attitude towards data collection. I am grateful to Dr. Stuart Jeffrey for his encouragement to pursue this study from an artistic approach. Thanks to Dr. Peter Trowles for providing repeated access to Mackintosh's baptismal font and some crucial bits of knowledge. I will never be able to repay my parents for everything they have done for me including tirelessly proofreading not one but two of my theses. My thanks to Diane Grace as well for being my de facto creative advisor and sounding board for both of my master's projects. Finally, I owe a debt of gratitude to Mackintosh himself for leaving the world a truly stunning body of work.

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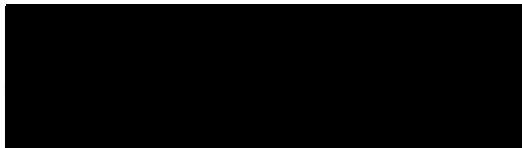
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1. Introduction

Sudden loss of cultural heritage can be profound whether at a local level or causing global effects. The recent Mackintosh fire at the Glasgow School of Art (GSA) was such an event. International response to the fire and other devastating losses at even greater magnitudes within just the past year including the earthquakes in Nepal, Islamic State militants destroying some of humanity's most significant early heritage at Palmyra in Syria and the Mosul Museum in Iraq clearly demonstrate that heritage is important—to all of us. To maintain the human vitality of heritage, these events must be responded to because, according to Young (as quoted in Besley), a scholar on Holocaust memorials,

“Through telling and remembering of their own stories that monuments become more than immovable objects in the cultural landscape, are re-invigorated and can become actively connected with broader discourses and debate in the public realm. He calls this process recording 'the biographies' of monuments, explaining that it “expands the texts of these memorials to include not only their conception and execution among historical realities, but also their current and changing lives, even their eventual destruction.” (Young in Besley, 2005: 39)

We can honor and reflect on these precious objects and make sure their losses are not in vain with our own efforts, whether humble or glorious, to continue on the forward path as we carry the past with us.

It is in this righteous vein the project was conceived. Luckily, recent technological advances can make heritage come back to life in ways that would be impossible even a generation ago. Technology is commonly being used to visualize the past, in order to bring it into the present and preserve it for the future. This project is a small example in a pantheon of exemplary heritage visualization work being done to counteract ongoing damage and threats to cultural heritage. One such project is Project Mosul which is using photogrammetry techniques (very similar to those used in this project) to digitally resurrect and share these priceless cultural heritage artifacts with the world in an online museum (Chaterji, 2015). Their words describe the value of digital visualization techniques for saving heritage:

“While these 3D objects can never replace the artifacts that have been destroyed, they can serve as a starting point to keep the memory of these objects and their meaning alive. The

3D objects may initially serve in helping identify stolen items and aid researchers working on the destroyed items. Virtual reconstruction is not an end in itself, however, but the start of a reengagement with the meaning of these objects. It is hoped that the virtual representations will give an additional tool to the communities that wish to think about, learn about, and work on the preservation and dissemination of these important elements of a national, regional, and global history, and to return a sense of agency to those left helpless in the face of the destruction of their heritage” (Project Mosul, 2015).

Technology alone is not enough to resurrect these objects. Human elements must be reintroduced to restore their soul. This thesis demonstrates that art practice, a most fundamental human approach for reflecting, understanding, and responding to the world, can be an effective solution to this problem.

While I view the product of this research, a short film, as a work of art, it is also closely associated with interpretive visualization, which fellow artist and heritage visualizer, Watterson, describes as,

“The communication of archaeological information and/or interpretation which has been manipulated in order to be presented in a graphic form, either as a representation (2D or 3D; realistic or abstract) or as a means of effective communication of a complex idea or theoretical debate ... it must be a representation of data or information which has been manipulated to produce a visual for a pre-determined aim.” (2014: 36)

1.1. Context

1.1.1 My Perspective

This project is much more personal than most research projects because of its art practice as research approach. This written document is a close reading of my project and is told with a more personal tone than is normally utilized in academic writing to acknowledge the personal and subjective nature of this work, to respect my voice as an artist, and honestly recount my experience developing this project. It is important to acknowledge my personal point of view since it had such a strong influence on its development.

For me, this project was as much about learning about Mackintosh for myself as it was memorializing him and creatively responding to the font. As an outsider the name Mackintosh was not truly meaningful to me before arriving in Glasgow. Once there I began to understand his importance and the esteem he was held in, in the city and in the world beyond, shortly after.

Furthermore, I had only briefly been to the Mackintosh building once, and it was not until I was back home, halfway around the world in Minnesota, tracking new stories about the fire that I became a digital witness and followed the story closely, although admittedly this is largely because I knew I would be attending GSA soon after.

What really made me appreciate the significance of Mackintosh and the impact of fire were the spontaneous conversations I had with regular people outside GSA—taxi drivers and even a store clerk who helped me buy a pair of shoes—as they remarked on the tragedy of it, unprompted, after I told them I went to the Glasgow School of Art. I actually wrote about the fire and my hope for an opportunity to become involved in the recovery process through my academic program in my Saltire Scholarship application. Because, as tragic as the fire is, it is a unique research opportunity that rarely occurs (thankfully) and should not be wasted, and the ability to digitally resurrect the past and help preserve it for the future are some of the greatest strengths of and what drew me to heritage visualization in the first place. I was excited about the opportunity to work with one of Mackintosh's works for this project but gave myself permission to change my mind if I did not feel personally engaged with any objects after I saw them in person. However, after seeing the baptismal font, sadly bandaged up and tucked away in a dank basement, yet quite beautiful and resonating a quiet power in its transformed state, I knew I had my project. My personal intent is to humbly honor Mackintosh with my work, demonstrate how new life can come from tragedy, and include myself in the community that was moved and felt the urge to respond to this event.



Illustration 1: My first glimpse of Mackintosh's baptismal font

1.1.2 The Baptismal Font

See Appendix section one for a short biography of Charles Rennie Mackintosh.

While not a major Mackintosh work, this baptismal font is one of a handful of ecclesiastical jobs in his oeuvre. The font was designed towards the end of his most prolific and successful era of work (Sharples, 2014). Mackintosh designed the font to be used for baptismal rites at the Abbey Close United Free Church in Paisley while working for the Glasgow-based architectural practice Honeyman, Keppie and Mackintosh, of which he was made a partner in 1904. The church was originally built in 1827; James Begg, a Glaswegian merchant, commissioned the font as well as a pulpit, screen, and electric light fittings for the church in 1905. The project was completed in 1906. According to the job book, written in Mackintosh's own hand, James Bryce & Sons were the furniture contractors hired for the job. James Bryce quoted the font at £4.7.6d on 24 October 1905 and a £2 payment for the silvered pewter font bowl was recorded in the job book 2 July 1906. Mackintosh submitted this commission as part of his submission to become a Fellow of the RIBA in 1906.

The baptismal font is made of polished ebonized pine and is 113.8 x 53.7cm in diameter and 3 feet 6 inches in height. Mackintosh references the Holy Trinity of Christianity in its simple design, yet it is elegant with a number of subtle details. Its triangular body is a case made of three sides with

connecting legs. Each side has a small raised square framing a motif, all of equal size, yet each quite distinct. One side bears a floral scene relief that resembles his stylized floral drawings and watercolors, a raised inverted triangle on another, and the third has a three by three grid of pierced squares cut through its side, one of Mackintosh's favorite geometric motifs. The top is a simple wood ring which would have held the pewter font bowl.



Illustration 2: Original Condition of the baptismal font Source: Hunterian Museum Archives

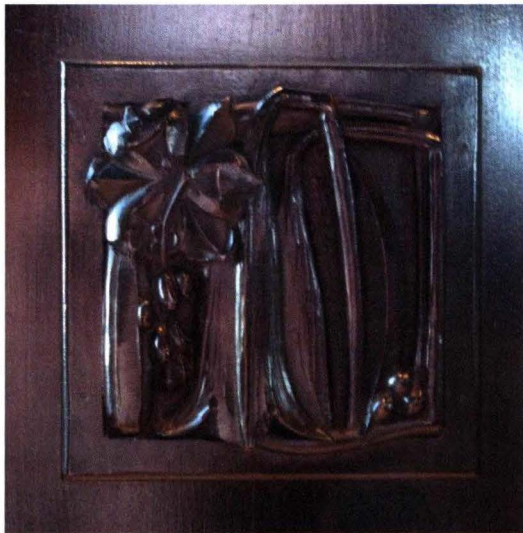


Illustration 3: Floral motif on one of the sides of the font Source: Hunterian Museum Archives

The Glasgow School of Art acquired the font after the church was demolished in 1965. Unfortunately due to Mackintosh's name being out of favor at this time, as well as different attitudes and values toward heritage preservation, the other Mackintosh furnishings as well as the pewter bowl that rested in the font were lost. Furthermore, very few records of the font exist. It is briefly written about in Howarth's (1977) and Bilcliffe's (2009) Mackintosh tomes. Bilcliffe's catalog includes a black and white image of the font and an additional detail of the flower motif. The most complete record is available at the Hunterian's online archive (Hunterian Museum, 2014) which includes the only known color photo of the object, a (somewhat blurry) detail photo of a floral motif as well as relevant pages from the work book. No other line drawings of the font, photos of the other furnishings, photos of the font in situ at the church, or even the interior of the church itself are known.

1.1.3 The Fire & Its Aftermath

On Friday 23 May 2014, fire broke out in the basement of the west wing of the Mackintosh Building, largely considered to be Mackintosh's masterpiece, as students were installing their work for the opening of the Senior Show that evening at the Glasgow School of Art. The fire was contained without injury and 90% of the building was saved, but not before Mackintosh's iconic library was completely lost as well as 150 out of 300 Mackintosh works of art. The fire “felt like a death,” according to Dr. Robyne Calvert, an art historian and Mackintosh specialist (Havergal, 2015). The fire was especially devastating because Mackintosh's building had long been the heart of the Glasgow School of Art, beloved by not only the students and staff that passed through its halls for over a hundred years but by generations of Glaswegians as well.



Illustration 4: Current condition of the transformed baptismal font

Mackintosh's baptismal font had long been kept in the storeroom located above the library in the Mackintosh building and therefore also fell victim to the fire. Notably, almost all objects in the building either survived without damage or were completely destroyed. Nearly 100 pieces of furniture in the store room were lost (Brooks, 2015). Out of all the Mackintosh furnishings that sustained damage in the fire, the baptismal font is by far the best intact.

Since being removed from the Mackintosh Building after the fire, the font (as well as other damaged objects) is being kept in the nearby McLellan Galleries building. The font was documented by AOC Archaeology, the company in charge of object conservation, after being removed from the fire, but no stabilizing treatments have been applied yet to prevent deterioration. Its future is unknown at this point. Conservation treatment is essential for its survival, yet funds are not currently available. Furthermore, decisions about whether to preserve it in its current transformed state or attempt to restore it to resemble its original condition must be made.

The tragedy profoundly effected the Glasgow School of Art, the city of Glasgow, and beyond. Yet, as tragic as this event was, as Havergal states, “after death comes new birth” (2015). If anything good can come from the fire, it is the renewed international attention and reverence brought back to the Mackintosh name as well as the new ways to study his work that would not have been possible before. New knowledge is already forthcoming since the Mackintosh Building's inner workings

have been exposed, revealing some of his methods for the first time (Havergal, 2015).

1.2 Research Design

This research project is divided into two main parts. The first is the technical data acquisition and processing stage. It stems from state-of-the-art technical methodologies used in heritage visualization to digitally record, archive, and publish cultural heritage objects and sites. Data sets from this stage are then used as the foundation of the subsequent art practice as research stage, its product being a creative response to the font, a short film, as well as an exegesis which critically reflects on the artistic work.

1.2.1 Research Question

The overarching research question that drove the project was: **How can technical visualization methods and art practice be combined to tell the story of Mackintosh's baptismal font?**

1.2.2 Research Objectives

- To demonstrate the value and significance of Mackintosh's font and argue why and how it should be saved
- Demonstrate how art practice can be integrated into established visualization practice to benefit cultural heritage interpretation
- Demonstrate uses and value of developing 3D data sets beyond archival recording
- Digitally record the font using photogrammetry and white-light laser scanning to create at least one suitable archival-quality 3D model of its current condition
- Create a 3D digital reconstruction of the baptismal font in its original condition based on historic records and acquired 3D data sets
- Develop a short film that creatively responds to the story of Mackintosh's baptismal font
- Provide an accompanying written record that describes the theory, decisions, and processes used and critically reflects on the nature of the work

1.2.3 Thesis Structure

Chapter two reviews relevant literature with focus on art practice as research, the debates on its usage in heritage visualization and archaeology, and discusses embracing impermanence within cultural heritage with focus on themes of meaning, memory, memorial, absence, and transformation.

Chapter three explains the technical methodologies including technologies, work flows, software and processes used throughout the project.

Chapter four is the exegesis which describes the development of the project from an art practice perspective.

Chapter five concludes the thesis, which includes my personal recommendation for what GSA should do with the baptismal font, as well as my ideal scenario to present this film.

Appendix items include a short biography of Mackintosh and software and technical procedures not covered in chapter 3 Methodology as well as a scene by scene account of the film that explicates the process and decisions made during production (an extension of the chapter 4 Exegesis).

2. Literature Review

This literature review is intended to explicate the interdisciplinary nature of this study and situate it within both heritage visualization and art practice approaches. It will establish the legitimacy and relevancy of an art practice-led research methodology for this project before outlining the perceived tensions as well as the opportunities within heritage related fields. The latter section of the review will discuss embracing the impermanence of cultural heritage in relation to meaning, transformation, absence, memory, memorial, and creative response.

2.1 Expanding Research Methodologies

Traditional research binaries (objective v. subjective, empirical v. hermeneutic) have long separated science from the arts (Barrett & Bolt, 2007: 4). The scientific method and quantitative studies have long been favored by academics and researchers because of their empirical, tangible results. Yet now many modern researchers, like Judy Norris, embrace qualitative research after realizing, “how much life was squeezed out of human experience when we attempted to make sense of it in a numeric, non-contextual way,” (Norris, 1997:89). Research began to fundamentally change in the later 20th century and many became excited by the “messy” prospects of qualitative research because they “reshaped entirely the debates around 'appropriate' scientific discourse, the technical and the rhetorical conventions of writing, and the meaning of research itself”(Lincoln and Denzin, 2003: 7 in Barrett and Bolt, 2007: 149). Furthermore, humanities has recently begun to reconsider its long history of undervaluing images in favor of text as research materials and products (Watterson, 2014: 20).

2.1.1 Art Practice as Research

This quantitative/qualitative binary, however, is not sufficient to encompass all forms of research. That is why groups of researchers have established a third research paradigm known as practice-led or art practice as research. While the act of making art as a way to understand and communicate with the world may be as old as humanity itself, only recently is art practice gaining acceptance as a research method in its own right within academia. Barrett, a leading proponent of practice as research, defines art practice as the “production of knowledge or philosophy in action” where knowledge comes from “action and reflection” (2006:1, 5). The disruptive potential of art practice as research, according to Barret, 'lies in its capacity to generate personally situated knowledge and new ways of modeling and externalizing such knowledge while at the same time revealing

philosophical, social and cultural contexts for the critical intervention and application of knowledge outcomes' (Barrett 2006: 2). Processes and methodologies are intrinsically intertwined and as critical to research as the outcomes themselves (Barrett and Bolt, 2007: 3). Methods flow from practice, which engenders knowledge, and then informs further practice in an iterative loop that builds on itself (Barrett and Bolt, 2007: 9).

While proponents argue practice-led research has the potential to extend the 'frontiers of research' (Barrett and Bolt, 2007: 1), they concede it is "still to be fully understood and realized" and is viewed with skepticism within traditional research methodologies because "outcomes of art research are *necessarily* unpredictable" and often cannot be quantified because of "complex experimental, material, and social processes through which artistic production occurs" (Barrett and Bolt: 2007, 3). Accordingly, creative arts research can be problematic because it may be difficult to situate within more easily definable and established areas of knowledge (Barrett and Bolt, 2007: 7).

2.1.2 Art Practice in Heritage Visualization & Archaeology

Today few people within cultural heritage and archaeology actively involve art practice as part of their research methodologies, (Watterson 2014: 14), but collaboration between archaeologists, cultural heritage practitioners, and artists is slowly moving towards established practice (Jeffrey, 2015; Russell and Cochrane, 2014; Watterson 2014). According to Hansen, "the archaeological position appears to be the tentative suggestion that art may have a role to play in archaeology, but this role is not defined clearly," (Hansen, 2008: 31). According to Watterson, Russell and Cochrane this is because the definition of art is not well understood, and therefore people interpret its value differently. Art is often perceived as "good to look at", rather than "good to think with" (Cochrane and Russell, 2007: 5; Watterson, 2014: 32). Furthermore, as Jeffrey notes, with few exceptions such as Watterson, synthesizing art practice with digital archaeology and cultural heritage remains largely unexplored (Jeffrey, 2015; Watterson 2014: 14). Despite numerous unresolved issues, practitioners are increasingly recognizing the largely untapped value in reflexive creative practice, which can be a "parallel" pursuit alongside more traditional methods to aid investigation, generate new knowledge, and "validate significance" within cultural heritage (Renfrew, 2003: 195; Watterson, 2014: 36). There are very recent indications that a widespread sea change toward integrating art practice alongside digital research methods is coming. In 2015, the European Commission published their report 'ICT ART CONNECT, Activities Linking ICT and Art: Past Experience – Future Activities' as part of its 2020 digital agenda, which broadly encourages integrating art into

CT and scientific fields as an “essential” element to stimulate innovation and expand research at all levels including both academic and commercial contexts (EC, 2014). It calls for openness and collaboration within these fields (EC, 2014: 6) and goes so far as to promote adding artists to traditional scientific research teams (EC 2014: 5, 66) and encourages formal recognition of artistic research as valid practice on the same level as scientific and engineering research (EC, 2014: 7).

Although distinct, art practice shares many fundamental similarities with archaeological research. Hansen found that art practice epistemology is effective for discovering and developing research questions within archaeology (Hansen, 2008: 217). Artists often even ask questions that are “fundamentally archaeological” and can help further explore the nature of archaeology, such as how the archaeological record is not seen as a “singular unique narrative of truths” but rather as “fluid expressions of modern beliefs in temporalitive and human agencies” (Russell and Cochrane, 2007: 4), and how the practice is often a study of “absence” rather than a “recovery of material remains” (Bailey, 2008: 241).

Artists see the world and approach problems differently than others, and according to Sullivan, “look very closely at artifacts in a way that others do not” (Sullivan, 2010: 9). These unique advantages can be used to advance cultural heritage research. Furthermore, artists are not tethered to common research paradigms and instead thrive in nebulous areas that are deeply personal, hard to quantify, and which encourage abstract thought, emotion, and ambiguity. Such characteristics are innately human and should be encouraged, not avoided, in future research. Ambiguities are also prevalent in archaeology and cultural heritage research and occur because of myriad reasons from personal, social, and cultural interpretation to “technical problems like lack of documentation, unspecified structural condition and assembly, unknown material characteristics and parameters of exposure [which] require intensive investigations,” according to the EU's report on cultural heritage conservation (Chapius, Lydon, Brandt-Grau, 2009b: 4). In some cases traditional methodologies may never lead to sufficient answers by themselves; the flexible and nebulous nature of art practice epistemology, however, may uncover valuable knowledge that would otherwise be lost or remain unexplored. Such an expansive approach is critical because the ultimate aim of archaeology and cultural heritage is a holistic understanding of humanity, not just what happened in the past (Renfrew, 2003 in Hansen, 2008: 24).

The unique ability of art to integrate and build relationships between subjective and objective knowledge is one of its greatest strengths and can be exploited within cultural heritage visualization

and archaeology to aid research and subsequent publication (Watterson 2014: 52). Watterson dissuades against “masking” subjectivity, an implication that it is a weakness, and instead encourages subjectivity within *transparent* interpretation (Watterson, 2014: 36). Jeffrey notes that audiences inherently understand and view art as subjective knowledge; this can be used to help audiences interpret complex visual information and distinguish between theory, interpretation, and objective truth (Jeffrey, 2015). Presenting more complex, artistically-inspired visualizations that combine different types of information can support Russell and Cochrane's call to their archaeological peers to “accept the humanistic challenges and expressionist potential of archaeological research and narrative” that can be facilitated with art practice (Russell and Cochrane, 2007: 4).

Artistic methods can not only aid understanding as an outcome but also by facilitating experiences with cultural heritage objects (Hansen, 2008: 217). Approaching artifacts from creative or imaginative perspectives that involve “serious play” can help archaeologists better understand their finds and related processes, and discover aspects that may otherwise go unnoticed (DeSilvey, 2006: 334; Reilly, 2002). Even Mithens, an artist-turned-archaeologist and critic of art practice as research, concedes to certain benefits of integrating art practice with archaeological epistemologies because of how the “essential differences” of art can help archaeologists “unlearn” their archaeological preconceptions to think out of the box and help their understanding of materials by making connections beyond functional concerns (Mithens, 2004: 161, 166). An example of “serious play” that brings a distinct art-based, non-archaeological approach to traditional archaeological material is Bailey's artistic work in which he wrapped Neolithic stones in polka dot fabric (Bailey, 2008: 329). While this process may seem a bit silly, the drastically different presentation forces the viewer to change their perception of these stones, which may lead to deeper reflection and new understanding.

Significant debate and resistance about accepting creative practice within cultural heritage visualization and archaeology comes from its inherently “messy” nature that conflicts with traditional scientific and technical methods. Many think the innately subjective nature of art is problematic such as Mithens who questions if current art practice is useful in archaeology because artists are allowed to “indulge in self-expression” while archaeology “seeks to discover what happened in the past, when it happened and why in the format of objective knowledge” (Mithens, 2004: 166). However, valuing objective knowledge over other kinds of discovery is needlessly limiting and removes the humanity from research. In archaeology, according to Russell, solely

focusing on “objective knowledge” and scientific aspects “only tells half the story”, discounting what he refers to as “a hope for a past—a dream of a past” which is what seduces people toward archaeology in the first place, while also discounting new forms of knowledge that creative practice-led and interpretive experiences can produce (Russel 2008: 2).

Similar mindsets are currently undermining the general perception, efficacy, and value of digital cultural heritage. Bailey, Jeffrey, and Watterson argue that visualizations often fail to become meaningful representations of the past because of the over-emphasis on technical merit within heritage and archaeology communities (Bailey, 241; Jeffrey: 2015, 11; Watterson: 2014: 12). Purely quantifiable, data-driven methods of visualization are insufficient within heritage because, according to D'Ayala and Smars, “the geometry of the object is not the only parameter to be recorded. All specificities making the object unique are meaningful; all potential values – architectural, artistic, historical, scientific and social – are parameters to consider” (D'Ayala and Smars, 2003). Flynn takes an especially critical tone, warning that “an over-emphasis on the production of 'historically accurate' digital representations at the expense of other types of user engagement can result in a 'dumbed-down' form of heritage devoid of cultural meaning” (Flynn, 2007: 353). While the nature of this problem is now understood, effective solutions are often elusive, especially because of the relative infancy of the field.

Art practice holds promise for interjecting some much needed humanity into digital heritage visualization research. However, according to Bailey “exciting possibilities” and “potential... in the articulation of art and archaeology for movement into a new intellectual space all together,” can only exist if artists are allowed and willing to take risks (Bailey, 2008: 238). This argument can be extended into heritage visualization practice as well.

2.2 Embracing Impermanence & Changing Meanings

The endless pursuit of physical permanence is one of the greatest ongoing battles in cultural heritage. This is because the physical state of an object dictates not only its function but its social and personal value (Gross, 2002: 33). The social value of objects in today's western cultures are tied to the idea that, according to DeSilvey, “the degradation of cultural artifacts is usually understood in a purely negative vein; the erosion of physical integrity is associated with a parallel loss of cultural information” (DeSilvey, 2006: 318). However, history proves that permanence, despite all efforts, is ultimately an illusion that can be shattered at any moment. So while noble efforts to conserve cultural heritage should vigorously continue, perhaps a more fluid approach, one that accepts and

even embraces impermanence when confronted by it, should be adopted because, despite strongly negative connotations, there are transformative benefits in the decay, and even destruction, of cultural heritage that impact meaning, memory, and memorial, and may even lead to revitalization (DeSilvey, 2006: 327). Furthermore, consideration of cultural heritage objects from an alternate perspective as processes rather than permanent objects can also help further understanding of the “more ambiguous aspects of material presence (and disappearance),” according to DeSilvey (DeSilvey, 2006: 324).

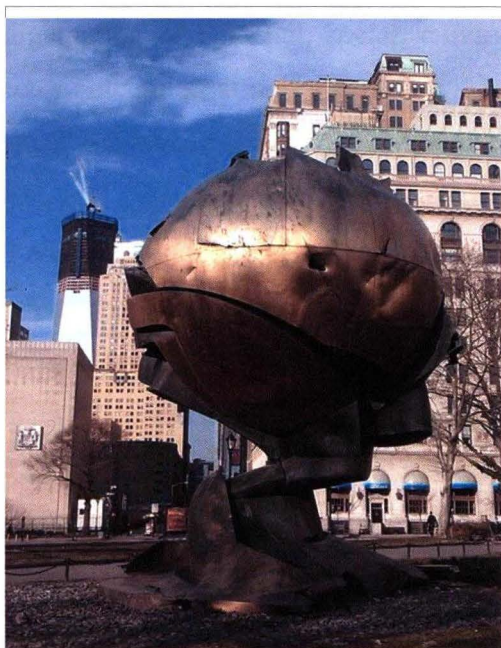
Meanings of cultural heritage objects change over time because they are, according to Cameron and Kenderine, “part of an ongoing conversation in an evolving society...artifacts are not just social, they are also cultural; they have a past meaning that informs a current use,” (Cameron and Kenderine, 2007; 203, 339; DeSilvey, 2006: 326). Current technological advances combined with museological and heritage practices support massive conservation efforts to largely freeze or restore objects and sites to specific moments in time to retain their cultural memory and social value. However, these values, narratives, and biographies are all products of human intervention and often controlled by concentrated powers whose beliefs reflect a certain period in time; therefore preservation efforts destroy cultural traces at the same time as preserving them (DeSilvey, 2006: 324, 326).

The destruction of cultural heritage is a process that has a social impact on the same level as its preservation (Hansen, 2003 in DeSilvey, 2006: 324). This process is not equivocally negative because transformation is impossible without change. Death is fundamental to life, and death creates new life. A shift in focus away from the object itself towards a process of remembering and shifting value that evolves over time, which simultaneously vacillates between “resonances of death and rebirth, loss and renewal” (DeSilvey, 2006: 328). In heritage, according to DeSilvey, destruction often leads to a “different kind of knowledge” that can “contribute to the recovery of memory” (DeSilvey, 323, 318). This is supported by Gross who argues that “objects have to fall into desuetude at one level in order to come more fully into their own at another” (Gross, 2002: 36) and that “decay itself itself may clear a path for certain kinds of remembrance despite its (or because of its?) destructive energies” according to DeSilvey (DeSilvey, 2006: 326). That is not to say that the object itself is not important, but rather that the value of an object is often not determined by its physical condition and can be deeply personal (Gross, 2002: 30-31).

The rapid development of Project Mosul demonstrates these principles. Outraged by such a horrific

attack a global rescue community—including CyArk, the Initial Training Network for Cultural Heritage (ITN-DCH), 4D-Ch-World, and Europeana—was quickly assembled and is now generating new forms of knowledge through digital reconstruction and public display online museum (Chaterji, 2015). These objects are no longer corporeal, but their significance has not changed, and possibly increased because their destruction gives them additional layers of meaning. Furthermore, although tragic, without such initial destructive actions, it is likely these efforts, at least to such a large degree, would not have been enacted, nor would the world pay so much attention. While these objects no longer physically exist, they can now be studied by scholars and general audiences digitally around the globe.

In the wake of traumatic events, objects are often transformed into “memorial objects” which “safeguards, prolongs, or preserves social memory into the future,” according to Besley (Besley, 8-9). Memorial objects are often in a state of “arrested decay” where they are preserved in their physically damaged state, usually as a visual testament to the larger trauma they witnessed (DeSilvey, 2006: 326).



*Illustration 5: Transformed Koenig Sphere in Battery Park, New York City. Photo: 7mike5000
Source: Wikimedia CC 3.0*

A significant example of this is the Koenig Sphere, a 25-foot sphere created by German sculptor Fritz Koenig that stood in front of the World Trade Center for 30 years as a “symbol of world

peace.” It is the only work of art that survived the 9/11 attacks. Now dented but intact, it is transformed into as much of a memorial object as a work of art and remains an important social and cultural symbol. Not only was a documentary made about it after 9/11, it was reinstalled in Battery Park where thousands have visited it. Many want it returned to the WTC site and some even call for it to be a “centerpiece” for the memorial complex (Burke, 2013).

The new life and value of memorial objects, particularly those in arrested decay, comes from human interaction with the object at the nexus of biography, meaning, memory, and imagination (2). They engage in a dialogue with audiences that moves interpretation of the object beyond its physical properties into experiential realm that stimulates more profound engagement (44-45) (EC, 2014: 11; Hansen, 2008: 217). This is because memorial objects, like the Koenig Sphere, are layered with multiple meanings and interpretive possibilities that defy singular, static definitions that go beyond what was originally intended by their creators and often even by those who worked to save them (Besley, 2005: 38; DeSilvey, 2006: 330, Young, 1993: 3).

Memory, both personal and public, is critical in dialogic processes. Memory is not created in a vacuum but rather is an amalgamation of personal, social, cultural, values and experiences that ultimately comes from a person's perception at any given time. Memorial objects themselves are reflections of the time in which they were created, their aesthetics values, their place within discourse, media, and materials, etc. (Young, 1993: 2). For original memorial objects in arrested decay or objects created to fill an absence, oftentimes memory “is based on chance and imagination as much as evidence and explanation” because of missing information (DeSilvey, 2006: 28). According to Kuchler, this can be a powerful experience in itself because it engages the viewer by requiring them to use their imagination to complete what they are seeing while also reflecting on “absence and incompleteness” (Kuchler, 1999: 59). One of the most powerful examples in existence is the memorial sculpture *Shoes on the Danube Bank* in Budapest, Hungary conceived by Can Togay and sculpted by Gyula Pauer, which depicts a long row of shoes on the riverbank. This simple scene is a tribute to the Jews that were lined up, ordered to take off their shoes, and then shot and carried off by the river during WWII. The presence of the shoes makes the absence of their wearers haunting and profound.



Illustration 6: Shoes on the Danube
Photo: Nikodem Nijaki
Source: Wikimedia CC 3.0

Woodward identifies “sympathetic” connections with the “creative” and “imaginative invention” that are stimulated by people's minds and memories when entering into a dialogue with damaged objects of significance (Woodward, 2002). While this can be an ephemeral act that is limited to one's imagination, others, like the artists of the Shoes on the Danube mentioned above, channel these sympathetic emotions into sustained engagement through creative response. Another recent example of such an occurrence are the giant Buddhas of Bamiyan in Afghanistan that were destroyed by the Taliban in 2001 that were recently brought back to life using 3D projections created by Chinese documentarians Janson Yu and Liyan Hu (Blakemore, 2015). Their empty niches were temporarily transformed by ethereal Buddha forms cast in light—a powerful and somewhat haunting visual statement. Another example is the film made by Ross Birrell that creatively responds to the devastating fire at the Glasgow School of Art (Booth, 2015). Birrell's film in particular shaped the artistic approach to this research.

Following these examples, the rest of the thesis will provide an in-depth account of memorializing and transforming tragedy through synthesizing technology with creative response.

3. Technical Methodology

This chapter describes the technical methodologies, materials, and work flows used at all stages to complete the project. Following the guidelines of the London Charter (Denard, 2009; 2012: 66), processes are described to ensure transparency, aid analysis, and benefit future projects and research. The next chapter, the exegesis, describes the artistic process and reasoning in detail. While I consider this to be primarily an art practice as research project, the technology drove the project in many ways.

The most significant aspects of the technical methodology are reviewed below. For a full description of the methods and software used see Appendix section 3.

Content Types and Software

Process/Context	Software Used	Distributor	Output File Format
Photogrammetry	Photoscan 1.1.6 Standard	Agisoft	.OBJ (models) .TIFF (textures)
Mesh Cleanup	Meshlab v1.3.3	FGT at the University of Pisa	----
Laser Scanning Capture & Processing	Artec Studio 10	Artec	----
Photograph Editing	Adobe Photoshop CS6	Adobe	.PSD, .TIFF, .PNG
3D Modeling & Animation	3D Studio Max 2016	Autodesk	.OBJ (models) .TIFF (textures)
Illustration	Adobe Illustrator CS6	Adobe	.AI
Film Production	Adobe After Effects CS6	Adobe	.MPEG H64
Basic Audio Editing	Adobe After Effects CS6	Adobe	.MP3

3.1 Photogrammetry Data Acquisition & Processing

3.1.1 Data Capture

Data capture took place over one day in the ground level galleries at the McLellan Galleries. Photogrammetry was the primary method used to record Mackintosh's baptismal font with the objective of producing a realistic 3D model for use in the film and as an archival record. Photographs were taken with a Nikon D5200 DSLR camera and a Nikon NIKKOR 35mm prime lens. Photos were recorded in .JPEG Fine and .NEF formats. After testing several settings, the font was recorded using the automatic, compulsory no-flash photo setting since it produced sharp, well-lit images without considerable fuss. Hand-held photography was predominantly used; however, a generic tripod was used to assist photographing the interior of the font. Ambient light was sufficient, so no additional light sources were used. The font was photographed while laying on its side and turned once to document all three sides. Once all necessary photogrammetry recording was finished, the stability of the object was carefully tested by standing it on its base as it originally sat. After it was determined the font was stable in this position, some additional photographs were taken.

Photogrammetry was done in multiple 360 degree passes around the object at a variety of distances and angles to capture both the dimensions and surface details of the font. Extra care was taken to photograph the multitude of surface features, mostly resulting from fire damage, in close detail to ensure high visual accuracy of the photogrammetric model. As a general rule, photographs were taken with at least 60% horizontal and 25% vertical overlap to ensure there was enough data overlap to enable the Agisoft software to stitch the photos together without any gaps. That day nearly 600 photographs were taken, but not all of them were included in the final data set. Due to the automatic settings, some photos were taken with shutter speeds under 1/60 of a second, which led to some blurriness that made them unsuitable for inclusion within the data set. The automatic settings also caused some photos to be overexposed; however, subsequent errors were easily corrected by editing the model texture in Photoshop (further exposure control could be manipulated in individual photographs in the future). If recording was repeated, manual camera settings and/or a tripod should be used throughout to ensure better quality photographic results.

3.1.2 Processing & Results

The photogrammetric data set was processed using Agisoft Photoscan Standard Edition version 1.1.6. Surprisingly, the initial test of dumping all the JPEG format photos in the program as a single

chunk and running through all the stages at low quality settings produced very good results. Agisoft created a complete model without any significant alignment errors and few extraneous artifacts (sections of the floor) that were easy to clean up without significantly damaging the mesh. Minimal editing was also done in Meshlab to close six holes and correct any invalid normals so the model could be imported into 3DS Max. The surface texture was sharp and realistic; the color was distorted, however, as an overexposed and oddly purplish hue. This was corrected in Photoshop. Since the font was originally uniformly stained black and mostly remained so after the fire, it was not difficult to edit the texture to better simulate the actual surface quality.

	Low Poly Model	High Poly Model
Cameras Used	572	1155
Cameras Aligned	534	781 (some photographs are duplicates)
Chunks	1	7
Total Vertices	4, 987	2,417,956
Total Faces	10,000	4, 817,168
File Size (MBs)	1	342.3 OBJ 53.2 TIFF

Replicating the results of the test model at higher quality was, however, quite cumbersome and labor intensive. The data set was run through all processing stages at higher settings in Agisoft to test several strategies, which produced mixed results. The best results came from a hybrid method based on previous tests. The final model was produced by individually processing the two sides that Agisoft had the most trouble processing (the grid and flower sides), and then combining them with more complete models. This process built on itself, so the final data set had seven chunks that included four photo sets and three merged chunks (a few chunks were also created but deleted because the percentage of aligned cameras was too low).



Illustration 7: Chunk 1 of final high poly model

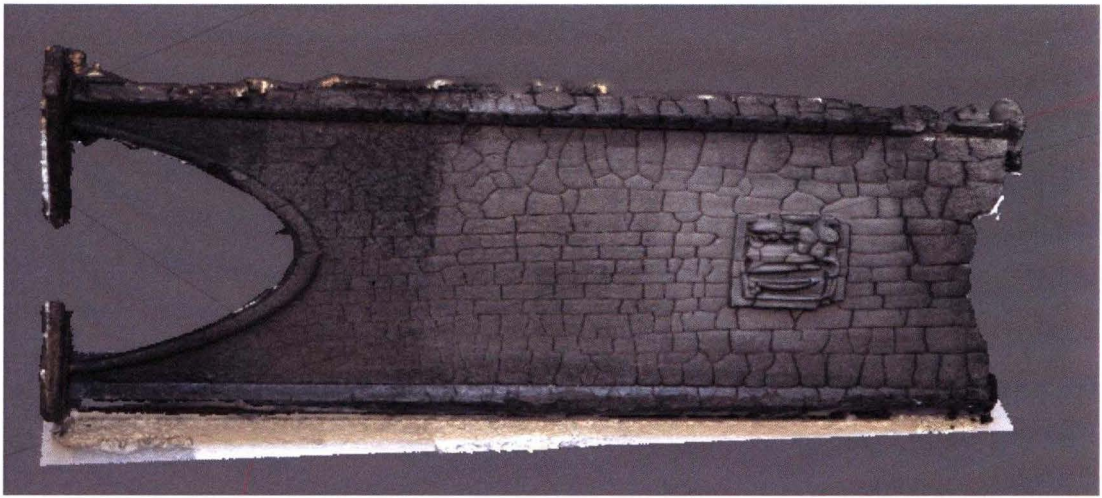


Illustration 8: Chunk 2



Illustration 9: Chunk 3

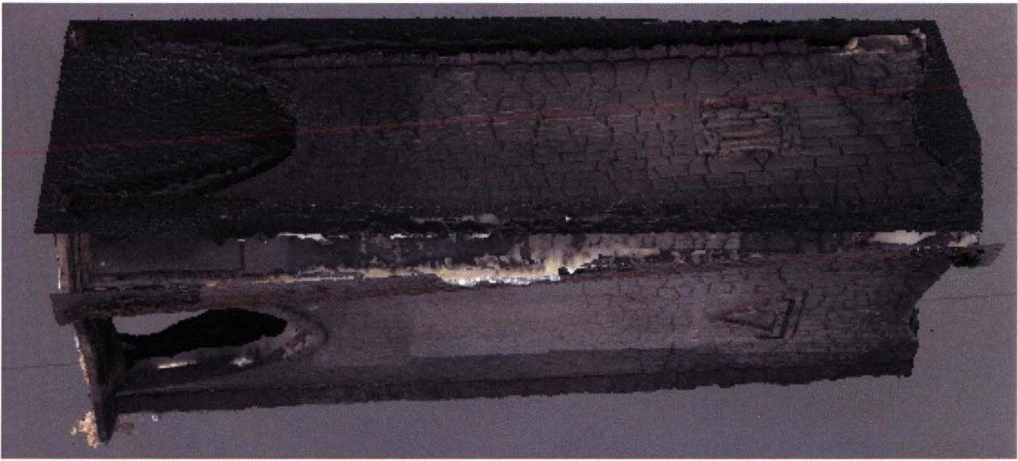


Illustration 10: Merged chunk 1

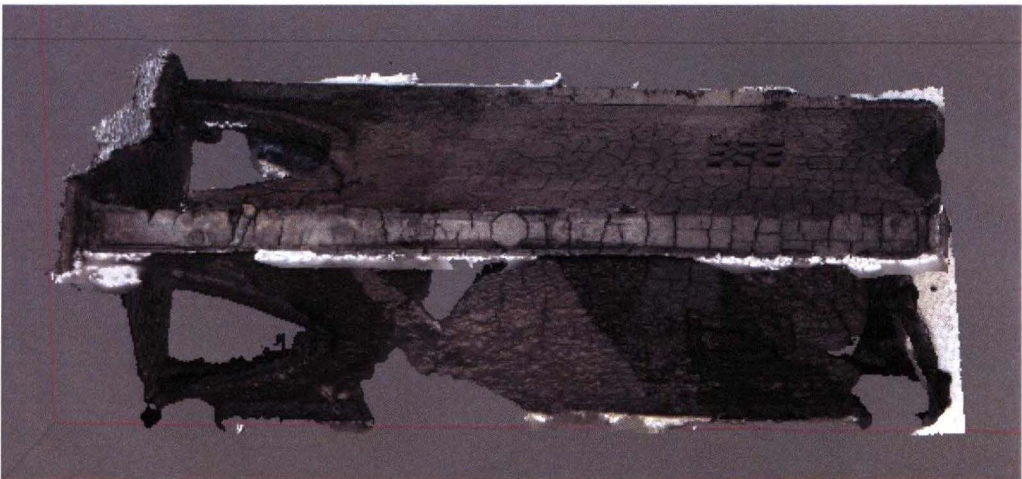


Illustration 11: Chunk 4

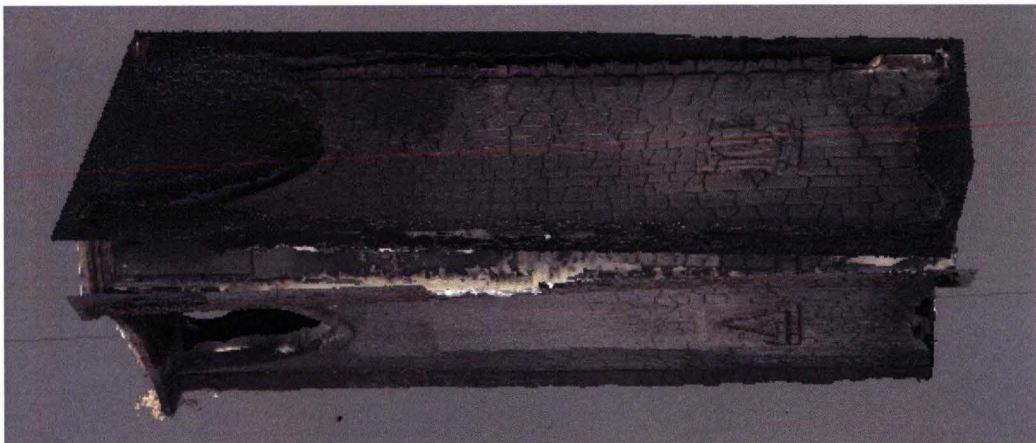


Illustration 12: Merged chunk 2

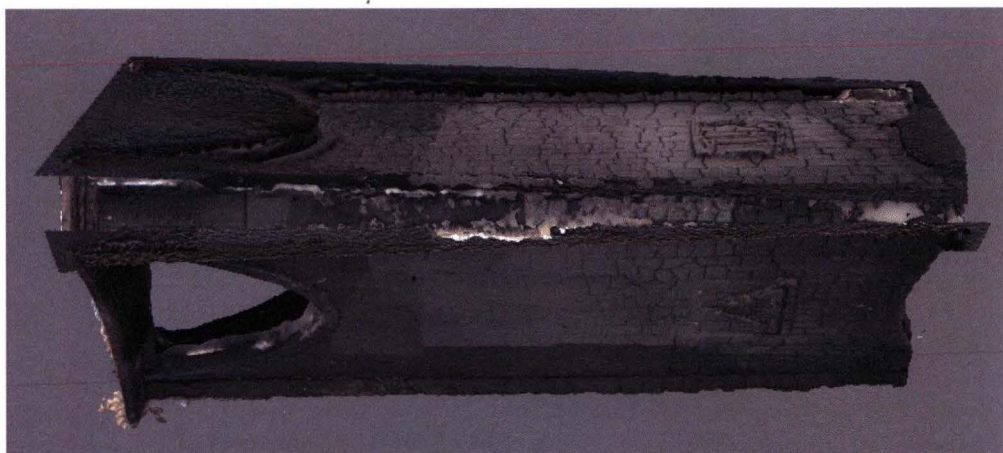


Illustration 13: Merged chunk 3 - final



Illustration 14: Final high poly model texture map

Less successful tested strategies included dividing cameras for each side into their own chunk as well as dividing top, middle, and bottom sections of the font into their own chunks as well as moving photos that could not be aligned into other chunks to be reprocessed. However, arbitrarily subdividing the photo set into roughly equal chunks produced roughly the same results as more thought-out methods and were sometimes better. Some attempts had to be aborted because of enormous processing times (42+ hours from alignment to texture processing).

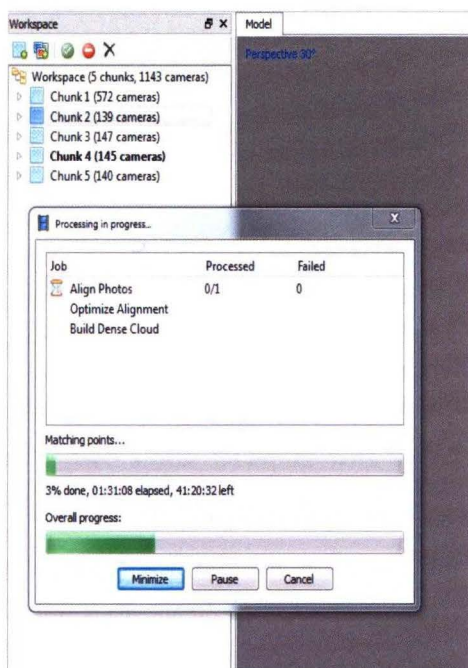


Illustration 15: Weirdly high processing time

Problems largely occurred because the software had difficulty aligning the flower side and grid sides of the font together, which repeatedly led to drastically skewed model outputs. This repeated misalignment may be caused because the font had to be turned once while laying on its side to record all three sides, and the software tried to align matching points from the floor (while not part of this project, masking floor sections in all relevant photos could be another [laborious] method to test to possibly produce good quality results that need little post-processing cleanup).

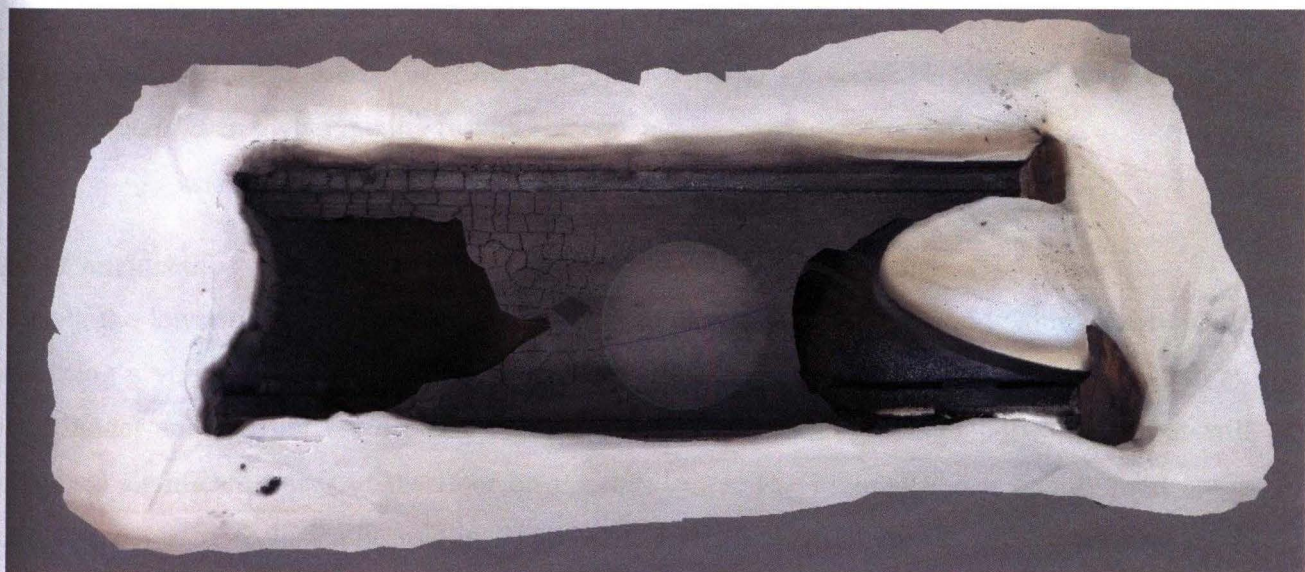


Illustration 16: Example of a common misalignment problem

Although obtaining a high quality, high polygon model was ultimately successful, considerable floor fragments are still attached to two sides. Cleanup was tested using both the basic options in Agisoft and more sophisticated functions in Meshlab, but neither produced ideal results. Numerous holes were always created along the legs and interior arches of the font while trying to remove the extraneous floor segments. The high poly archival model contains no significant cleanup in hopes that better methods are available to remove these artifacts in the future while also better preserving the integrity of the mesh.

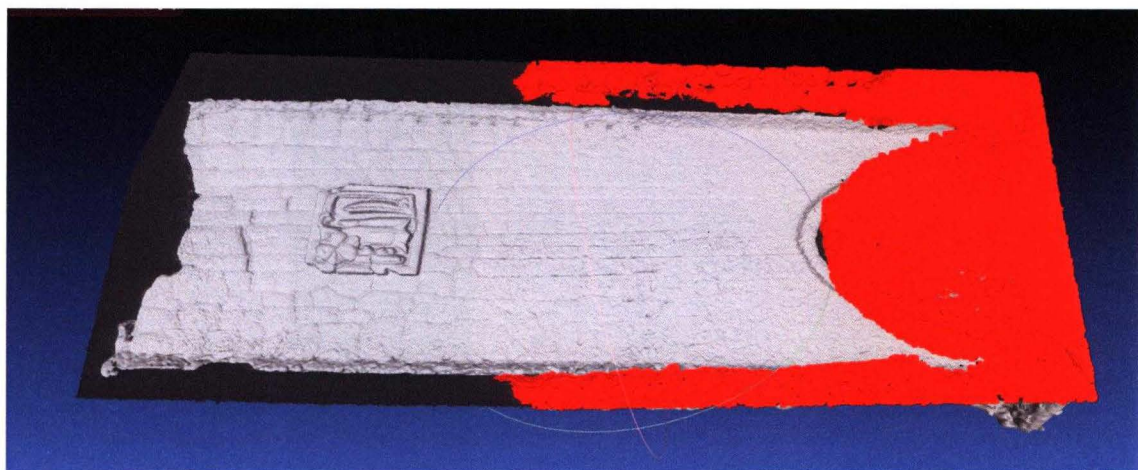


Illustration 17: Cleanup test in Meshlab

Photos were routinely processed in their native JPEG file format. A TIFF format photo set was created (through batch processing the set of .NEF photos in Photoshop) and tested; however, it

failed to produce a better model and significantly increased processing time. Therefore JPEGs were the standard file format used. The successful aligned photo set could be repeated with TIFFs to possibly obtain even higher quality results.

3.1.3 Conclusion

Overall, the lower quality model had a good balance between geometric and texture quality while still being a very manageable file size for subsequent animation in 3DS Max. It was close to an ideal model and did not require any significant cleanup, unlike the high poly model that still contained significant traces of the floor on multiple sides. The original higher quality model was also too large to realistically use in 3DS Max, and the texture quality of subsequent mesh decimations was unacceptable for the film. Therefore, the lower polygon, “lower quality” model was actually used in the film. Both models were exported in OBJ file formats with TIFF texture files. It is intended for both models to be archived for future use.

3.2 Digital Reconstruction in 3DS Max

A 3D digital reconstruction of the baptismal font was produced in 3DS Max 2016 using the 3D photogrammetry model and the photograph of the original font from the Hunterian Museum's online archive as the source material. The font was modeled in sections that mimic its physical construction based on the information available with small exceptions (e.g. a seam is apparent on the base of the font where two parts were joined, but in the 3D model it is one solid part; interior leg supports are also not modeled).



Illustration 18: Digital reconstruction of the font in its original condition

Selecting the most appropriate texture material and configuring its settings in 3DS Max proved to be more challenging than anticipated. Getting the color texture was problematic since there was limited data and no control image of the original surface under neutral lighting conditions exists. The original color of the font can only be judged by the Hunterian's photograph; however, it is far from ideal.



Illustration 19: The only existing color photo of the font from the Hunterian Musuem

It is not a true archival photograph and was photographed under bright, high contrast lighting conditions without a neutral backdrop. From the photograph it is obvious the surface of the font was quite glossy and caused significant sharp hotspots. The font also appears to have a warm, reddish undertone to its ebony stain; however, that could be caused by the ambient color and lighting conditions in the room or camera distortion. It was very difficult to judge how black the font should be (although guesses can be made based on his other work), especially since the details would blend into the surface. Attempts were made to highlight the details using directed lights and higher quality settings, but they were largely unsuccessful (sometimes resulting in artifacts of ugly blotchy black lines and spots where light highlights were too bright).

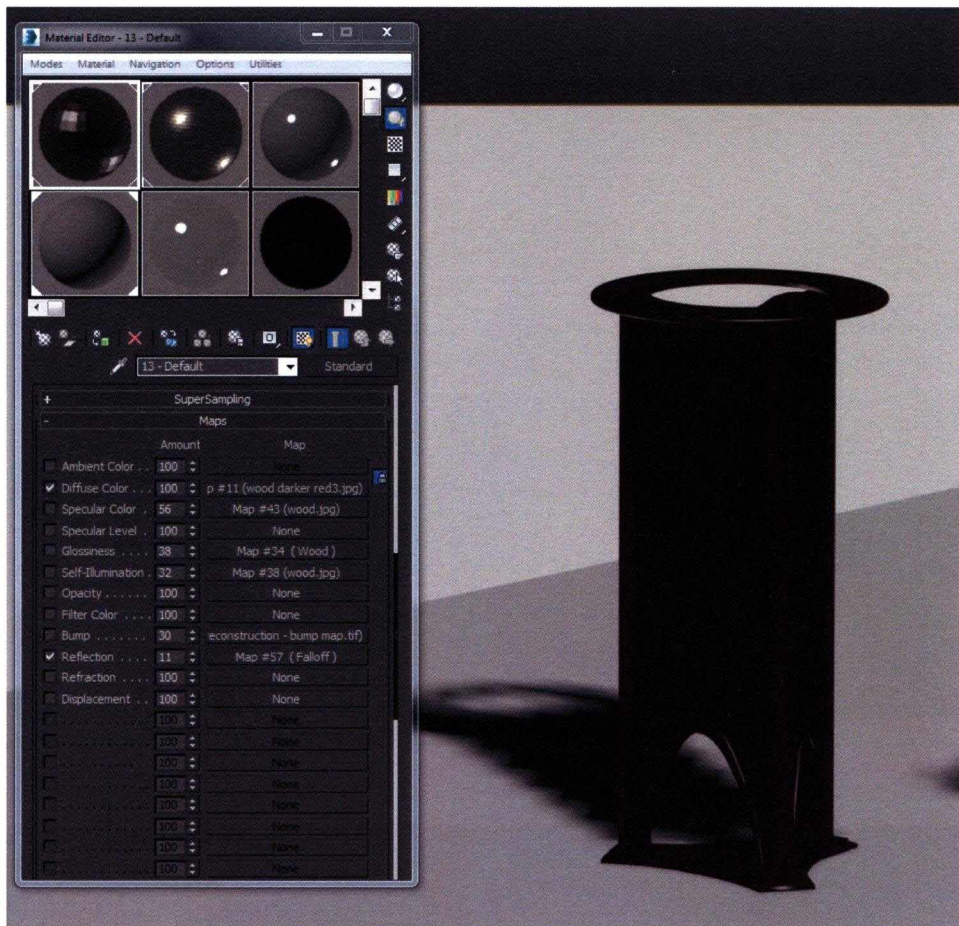


Illustration 20: Material settings for the font in 3DS Max

It was difficult to find the appropriate balance between lighting of the font with the larger scene. Generally I could only make one look good at a time. I could light the scene in an aesthetically pleasing and interesting way, but it would wash out the details of the font, which was unacceptable.

I also eventually realized how much the ambient lighting conditions in my physical environment had a significant effect on what I saw (night v. day, how much and what kind of light was in the room). This also made me consider how lighting conditions would affect viewing my film in the future without any clear answers forthcoming. In the end all these variables were rather overwhelming, and they made me change my mind a lot. I am convinced I was unable to create optimal lighting conditions under which to work.

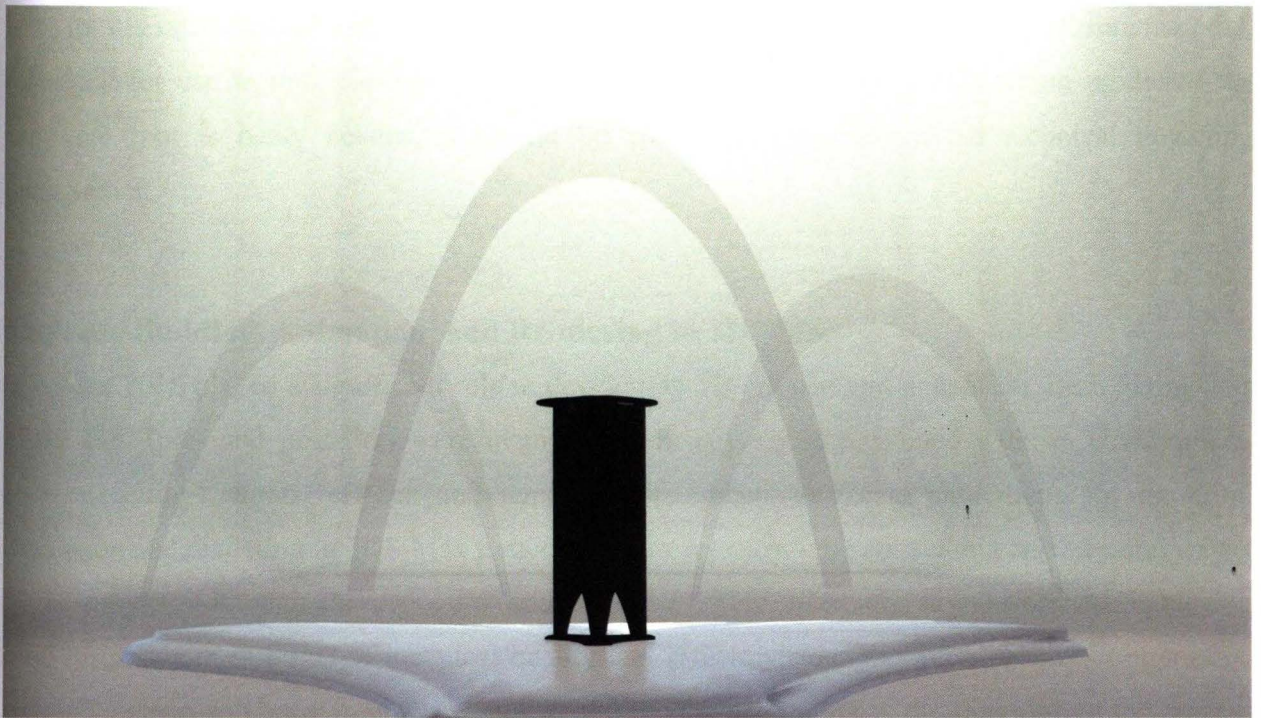


Illustration 21: Example of good atmospheric light but washed out font model

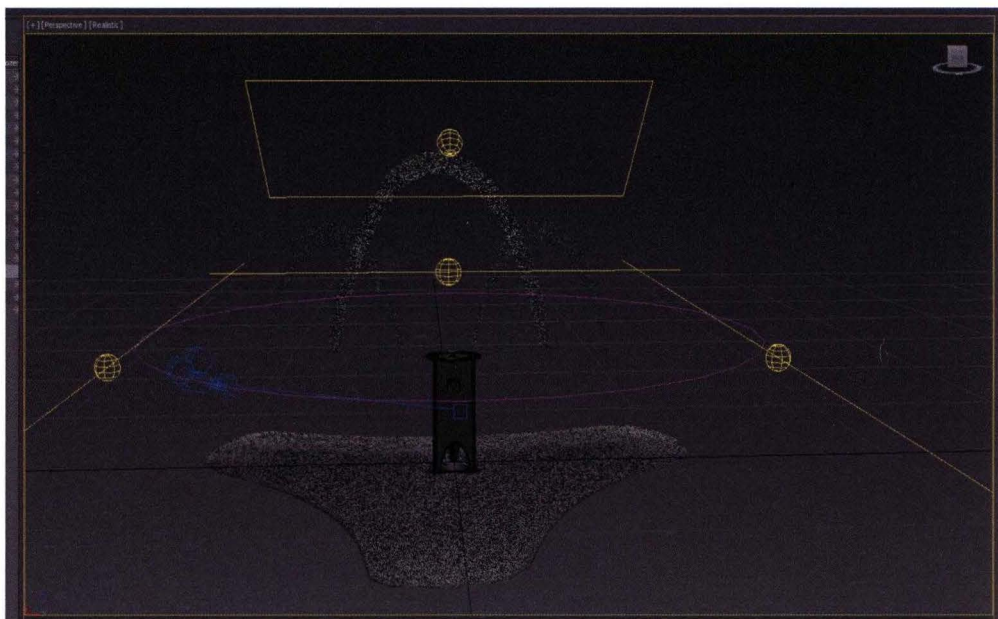


Illustration 22: Example test scene with lights

While the 3D model was sufficient for use in the film, it has several weaknesses that prohibit it from being an archival quality model. There is some pulling in the panels of the model which could not be eliminated. The exact cause could not be found; however, it is probably due to some weaknesses in the geometry, perhaps in the arches at the bottom and/or top. The sides were modeled several times, but each one eventually had the same planar distortions. The UVW maps are a mess, but since they are mostly disguised by the black surface color the problem was mostly ignored after

some mostly unsuccessful fussing. Further work could also be done to optimize the texture material, especially for use in multiple lighting conditions. If a complete 3D reconstruction model of the baptismal font is badly needed, it should be created by an experienced technical modeling professional.

3.3 Scene Building, Animation, and Rendering in 3DS Max

3DS Max 2016 played a significant role in developing 3D content and animation. Both 3D models of the font (pre- and post-fire) were manipulated in space and combined with an environment, physical settings, lights, effects, and temporal movements to create animations for the film. Animation and rendering in 3DS Max turned out to be the most time consuming and stressful aspect of the project. Although the processes and objectives were relatively straightforward, achieving ideal results, both in terms of technical quality and artistic vision, was problematic. Furthermore, only having one computer to process, model, and render, and compose the film slowed the process down considerably.

Art practice by its nature is a reflective and iterative process. As part of the artistic process I spent a lot of time playing around with various variables in 3DS Max (visual settings for the font based on the plot and tone of scenes; the numbers, positioning, color, and intensity of the lighting; contrasting levels of light and dark, highlights v shadows; the ambient color of the scene; positioning of the stage and arches; the position of the font; the position of the camera in relation to the font; animating the scene/font v. animating the camera (such as orbiting around the object with the camera or spinning the font itself 360 degrees).

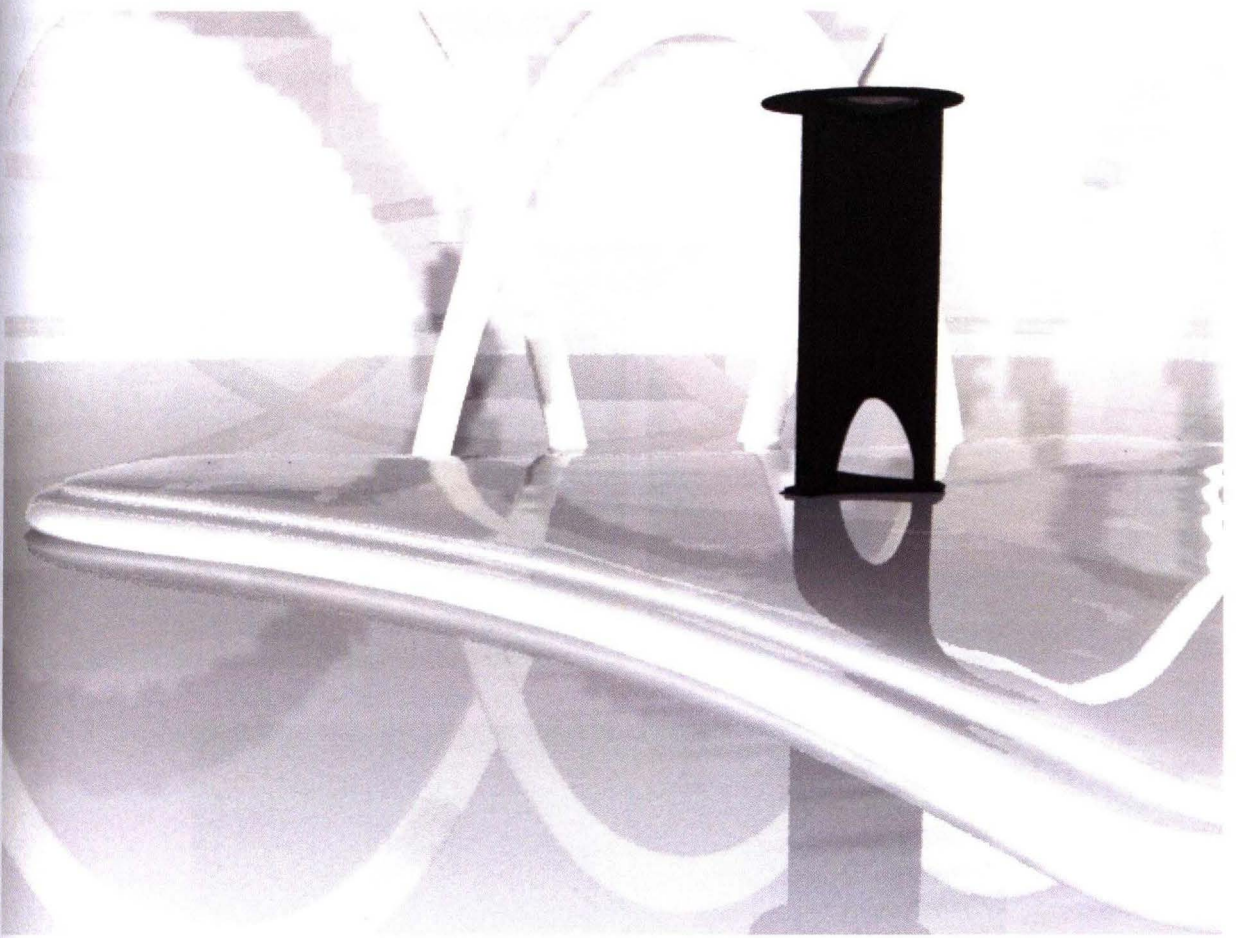


Illustration 23: One of my favorite concepts that was eventually discarded because excessive

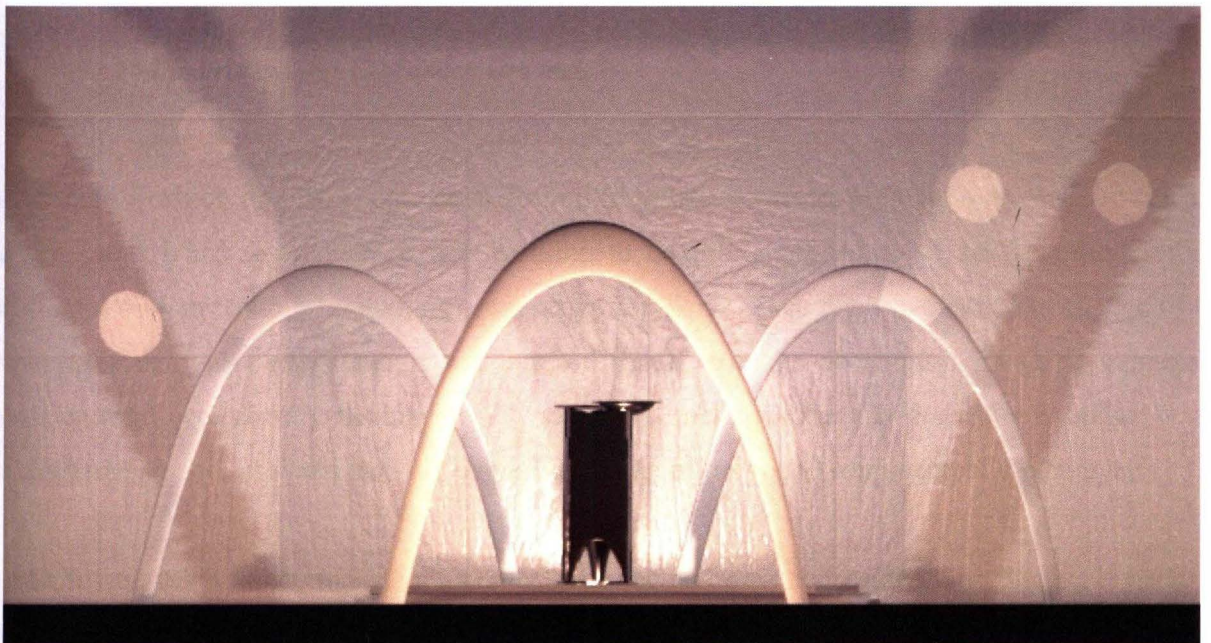


Illustration 24: Another iteration that was discarded due to rendering and bad representation of the font

I spent a lot of time exploring 3DS Max's capabilities to determine how to build scenes around the font and find tools that could help me tell my story, although I ended up discarding most of them when my project shifted to rely more heavily on illustrations as content. For example, I experimented with combining atmospherics and animation to produce different iterations of the fire scene, but ultimately I felt like the aesthetics did not fit into the larger film.

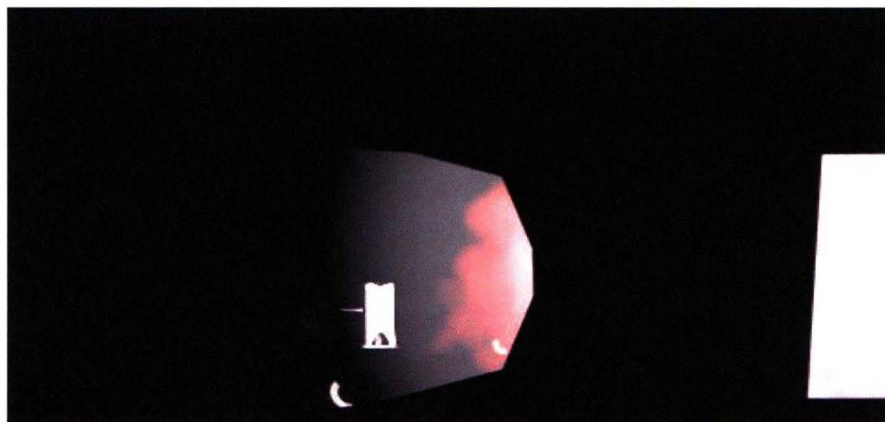
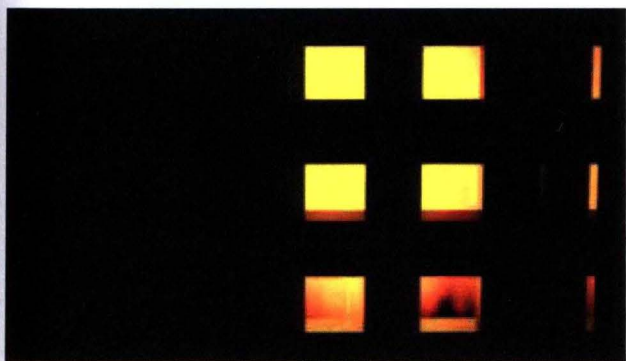


Illustration 25: Discarded fire tests

Rather than working in a flow state as is desired in artistic practice, progress was made in fits and starts because I had to frequently stop working to Google a procedure or configuration setting, watch a tutorial, or troubleshoot an error message. Similarly, since the movement and change of the scenes over time was important, it was often difficult to make decisions with static scenes, so rendering (and occasionally adding music) was sometimes necessary to determine whether or not the aesthetics, mood, movements, and overall intention of the scene was successful conveyed.

Due to artistic work flows, and other technical pipeline and time constraints, I tried to scale back my ideas and play with a number of settings and ideas in order to find a balance between artistic concept and technical capacity. While I had some awareness going into this that rendering would be challenging and time consuming, I did not yet understand to what extent. Some scenes looked quite

promising aesthetically, but had completely unrealistic rendering times (an early test took 46 minutes to render one frame). A lot of tweaking the lighting and materials, and exploring their relationship to each other, was done to optimize scene rendering because numerous lights, reflective surfaces, and consequential light bounces that illuminate the scene, especially at higher qualities, takes significantly longer to render.



Illustration 26: Good ambient light but overshadowed font

I even tried a few extremely stripped down scenes where I manipulated the environmental settings in place of scene lights and kept objects to a bare minimum (font, stage, three arches), but I was never happy with the results. After several failed attempts experimenting with stripped down scenes, I went back to an earlier, more complex scene that used a lot of high contrast shadow and light to add visual interest to the scene. It took over 28 hours to render, even at lower settings that included eliminating a few lights, setting the basic render settings to normal, dropping the reflection/refraction bounces, and turning the Final Gather completely off. The lower quality is especially apparent in the harsh, somewhat pixelated shadows in the background.

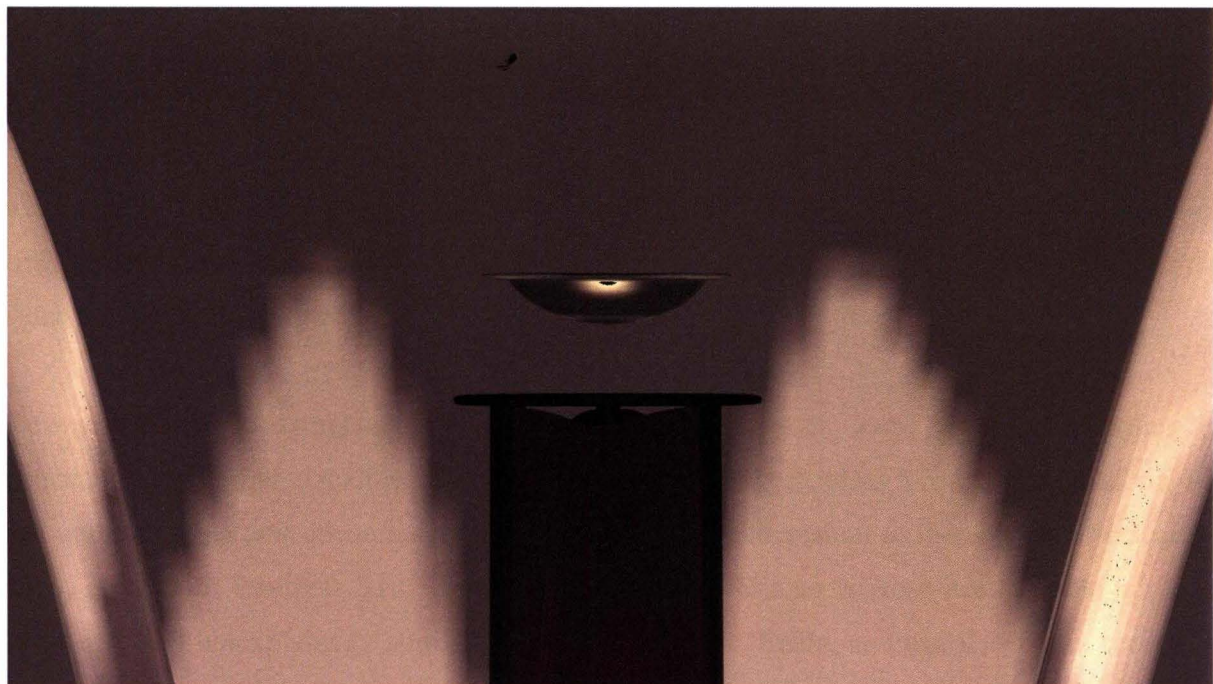


Illustration 27: Pixelated shadows in church scene from lower rendering settings

I ended up embracing the fact that my scenes would not look very naturalistic since, given the circumstances, there was no single ideal or correct version to aspire to anyway. These scenes are imaginary, almost dreamscapes by their nature, so they do not have to conform to the complex laws of thermal dynamics offered by 3DS Max and can exist without realistic shadows or an ideal number of photon bounces. However, in the future I plan to re-render the scene at a high quality and substitute the current footage.

Like art practice itself, where learning comes through trial and error, through troubleshooting these processes and working through the pipeline a number of times, I have a much better understanding of the fundamentals of 3DS Max and photogrammetry. In 3DS Max, I better understand the relationship between geometry, materials, lighting, system settings, and scene configuration and their impacts on rendering.

4. Exegesis

A scene by scene artistic explanation of the film can be found in Appendix section 2.

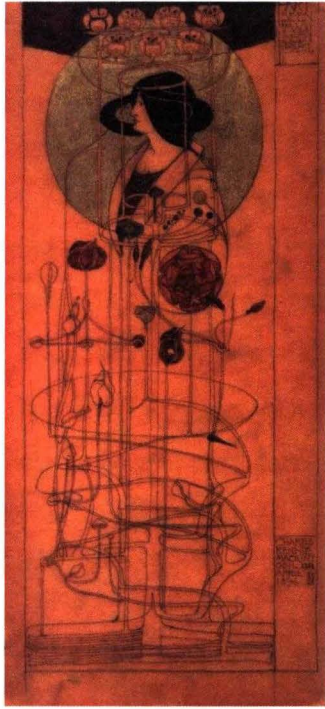
This exegesis is a reflective account that is intended to explicate my personal and artistic decision making process in the development of this film and overall project. It is the ying to the yang of the previous methodology chapter.

The exegesis is as fundamental to research as the artistic work itself because, according to Watterson, “artworks and visualizations cannot fully articulate their ideas through images alone; the critical understanding and documentation of processes are fundamental to these types of research” (Hansen, 2008: 218; Renfrew, 218; Watterson 2014: 20). While an artwork itself can be mired in mystery and left unexplained, similar to other academic fields, a critical written record is fundamental to art practice as research, and the writing process itself helps the artist reflect on and better understand her own work.

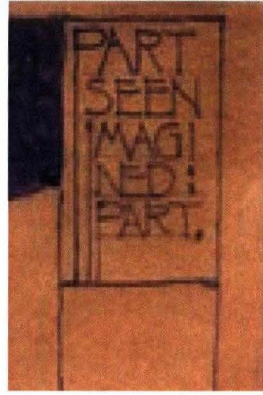
Both art practice and visualization are research processes in their own right because they facilitate an exchange between practitioner and subject that generates knowledge (Pink 2007: 21 in Watterson 19). Art practice can build on the strength of visualization to 'help us understand the past,' (Jeffrey 3) because 'exploring contemporary relationships with visual expression can facilitate broader understandings of complex relationships of the archaeological record' (Cochrane and Russel in Watterson 14).

4.1 Part Seen Imagined Part

The title of this film and thesis, 'Part Seen Imagined Part' are Mackintosh's own words, a title from one of Mackintosh's exquisite earlier drawings. I immediately latched onto this title, and eventually redrew it to be the title card for my film because it encapsulates multiple complex facets of this project so well. Art is not complete by itself; it becomes whole and takes one meaning inside each viewer's imagination. Philosopher Maxine Greene describes imagination as the place where the possible can happen, a place of “resisting fixities, seeking the openings,” where “we relish incompleteness, because that signifies that something still lies ahead” (Greene in Sullivan, 2010: 22–23).



*Illustration 28: Part
Seen Imagined Part,
C.R. Mackintosh, 1896*



*Illustration
29: Detail of
top right*

For me, the title significantly speaks to how much of this project is a product of my imagination as a necessity. Common to archaeological practice, this research is a study of absence as much it was about materiality (Bailey, 2008: 241). My hope is that the viewer recognizes this void that is caused by such absence and maybe even understands it as a product of human action—not just in terms of the fire, but many certain ways, the neglect (paired with two accounts of near-miraculous redemption) the font has experienced by being kept in storage, and again, but now actively decomposing, waiting for someone to rescue it. At this stage, I do not think this point is clear enough in the film, but it is significant enough to further develop in the future, especially since, according to Kuchler, reflection on absence and incompleteness can lead to a powerful experience for viewers which also engages them by forcing them to use their imagination to make what they are viewing complete (Kuchler, 1999: 59).

4.2 Art Practice as Research Process

Reilly describes art practice as a very careful search, which is an appropriate description of my project (2002). It began in earnest after seeing Mackintosh's baptismal font for the first time and discussing it with Peter Trowles, GSA's Mackintosh curator. From the very beginning I knew I wanted to create a film that told the unique and varied story of this object. I briefly toyed with figuring out how to try to make the project more interactive because of the nature of my master's program as well as encourage viewer engagement and explore new digital possibilities. However, I quickly decided the extraordinary circumstances and strong emotions that give new meaning and life to this object are exceptional and novel enough. Trying to innovate too much with a new digital paradigm would likely distract from the heart of the project, especially with so little time to reflect on, edit, and refine ideas. Furthermore, since this is an art project, I wanted to keep focus on the font itself rather than the technology.

I began my research by looking for any long lost records about the font for more basic visual information and possible inspiration, but neither Peter or Pamela Robertson, Professor of Mackintosh Studies at the University of Glasgow, knew of any promising leads. So I was left with having literally no clue what this church looked like, two not-ideal full length photos, and a somewhat blurry detail photo of the floral motif. I was disappointed that no preparatory drawings existed because surely Mackintosh drafted its design and created sketches to develop the flower motif. However, having such little information to go on not only made me focus on close study of the font itself, it also opened me up to Mackintosh's entire oeuvre for inspiration and understanding, which had a profound effect on the creation and direction of my work.

4.2.1 Mackintosh's Drawings

I wanted to situate this film, and especially the baptismal font itself, within Mackintosh's larger body of work. This was done primarily through desk research of Mackintosh's drawings, which became important guides and sources of inspiration for the research and film production process. From the very beginning, this project was naturally very inspired and connected to nature and organic elements found in Mackintosh's work as well as the broader Glasgow Style and Arts and Crafts movements. I intentionally looked at a wide breadth of his work ranging from graphic posters to wrought iron architectural details in order to understand the man, his artistic genius, and his distinct point of view. By studying all types of his production it was easier to understand not only his aesthetic sensibilities, but also what he valued and how he perceived and translated the world into his work. This method also helped identify his favorite and defining themes and decorative motifs

that reoccur throughout his work.

Reliance on Mackintosh's drawings for film content was an unintended natural progression within the larger research process, not a pre-planned act. Since there was such little information about the font to draw inspiration from, his drawings became the mediator I needed to develop an intimate relationship with Mackintosh and his work. They helped stimulate my artistic sensibilities and imagination in order to develop many concepts, and unexpectedly, a significant amount of content for my film. I made some early drawings that responded to Mackintosh's aesthetic as a way to intuitively understand it alongside my more traditional, literature based, research methods, but they were not created with the intention of directly leading into content development for the film.

However, in the end the drawings that are featured in the beginning and end of the film and are critical to its meaning, action, and plot. There was a sea change midway through my project when I felt like I was hitting multiple dead ends and had too much frustration with the technical modeling methods I was using. This shift also made me reevaluate and really define what are the key themes that define my project. What is critical to its success, both visually and conceptually? How can I use Mackintosh's deceptively simple style to my own advantage? How can I incorporate more of Mackintosh's own visual vocabulary to help me tell this story? It caused me to edit and simplify my ideas, which lead to a stronger, more centralized vision that really kept the focus on Mackintosh's work.

Although before I started my research, I mostly enjoyed Mackintosh's strong geometric forms like his Willow Room Tea House chairs with the strong pyramidal design in the backrest, I was mainly inspired by his collection of floral drawing and watercolors for this project, allured by their deceptively simple and elegant forms. I enjoyed the play between the organic forms with pops of color that appear in his floral drawings with the strong lines of his three dimensional work. The delicate lines of his drawn forms really spoke to me and reflect his close attention to detail and approach to creation. I was intuitively drawn to the dreamscapes found in Mackintosh's drawings—how the drawn objects often hang in blank white space—they are more stylized interpretations of reality rather than representations of reality in themselves, sometimes appearing not quite of this world. This is how I imagine the font as well in my mind, floating in white nothingness—literally in limbo—as if waiting for someone to save it (after experimenting with a few other ideas, I thought the simplicity of such a scene was the best way to display the damaged font to the viewer, so it incorporated into the film).

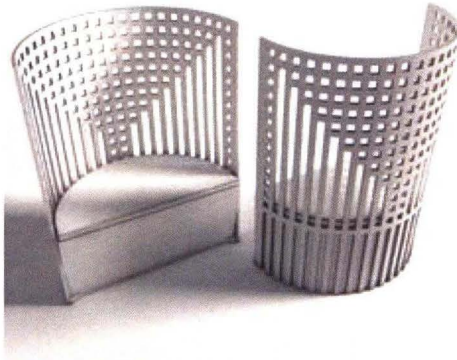


Illustration 30: Mackintosh's Willow Room Tea House chairs

There were a other few drawings of his I particularly liked and saw clear connections to the font (and others) that first made me pay especially close attention to his two-dimensional work: the strong vertical lines dotted with a few swooping curvilinear forms as well as the repetition and symmetry of forms especially stood out. I was also drawn to his drawings of nature because after studying them I am convinced they channel Mackintosh's innermost thoughts and such simple yet profound symbols of beauty and life—two concepts I wanted to emphasize as a counterbalance to tragedy.

Early on, I intentionally looked to see if he made any drawings of Scottish pines, since knowing the font was made out of pine was one of the precious pieces of information I had. It made me reflect on the whole other life the font had as a living tree before ending up as a baptismal font. This smaller story adds another cycle to the other iterations of transformation that comes from and life and death; the beginning scenes were created as a response to this concept.

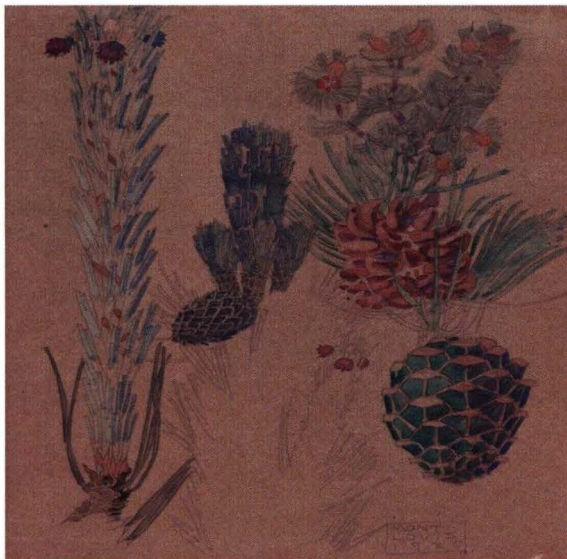


Illustration 31: The immature pine cone on the bottom right is a symbol of new life and is the starting point for the film

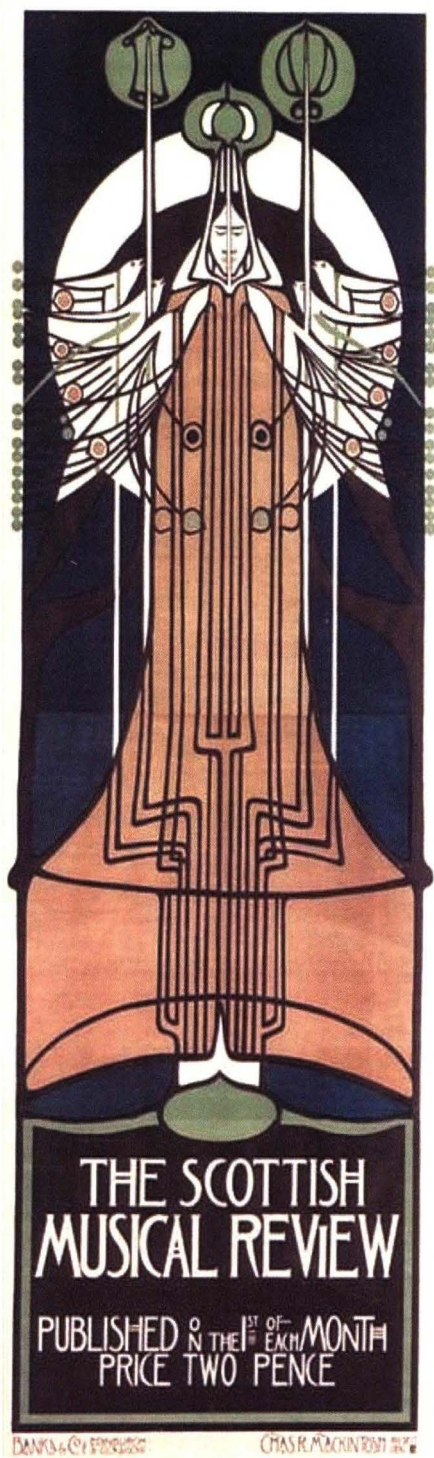


Illustration 32: One of the initial images that inspired my work

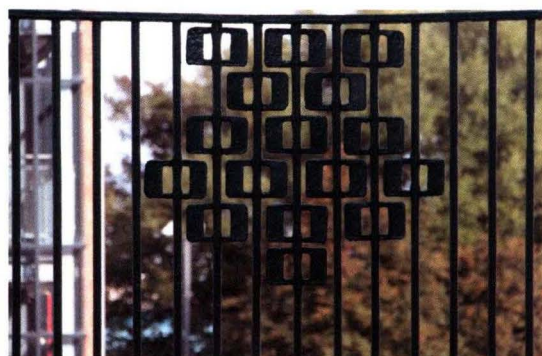


Illustration 33: This thistle seed motif was also an important early inspiration due to its organic nature, graphic pattern, play with negative space, and similarity to the pierced square pattern on the font

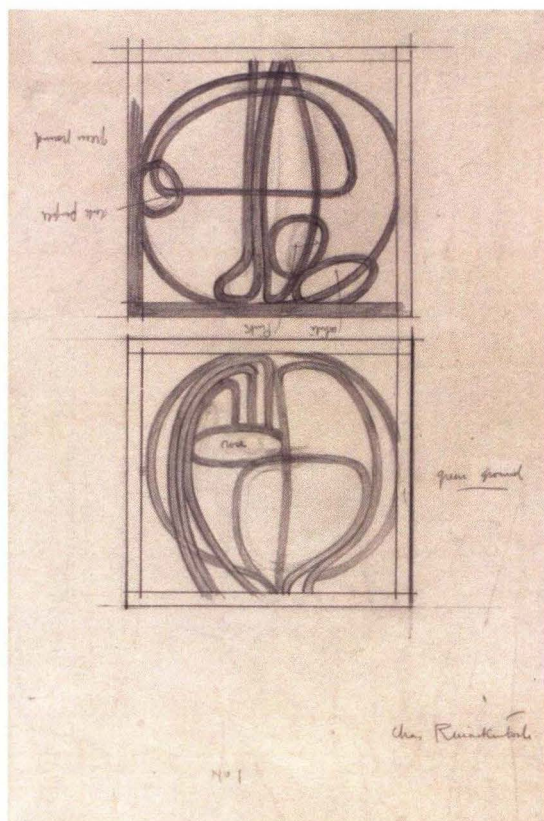


Illustration 34: This sketch for a stained glass window reminded me of the contorted forms of the flowers on the font

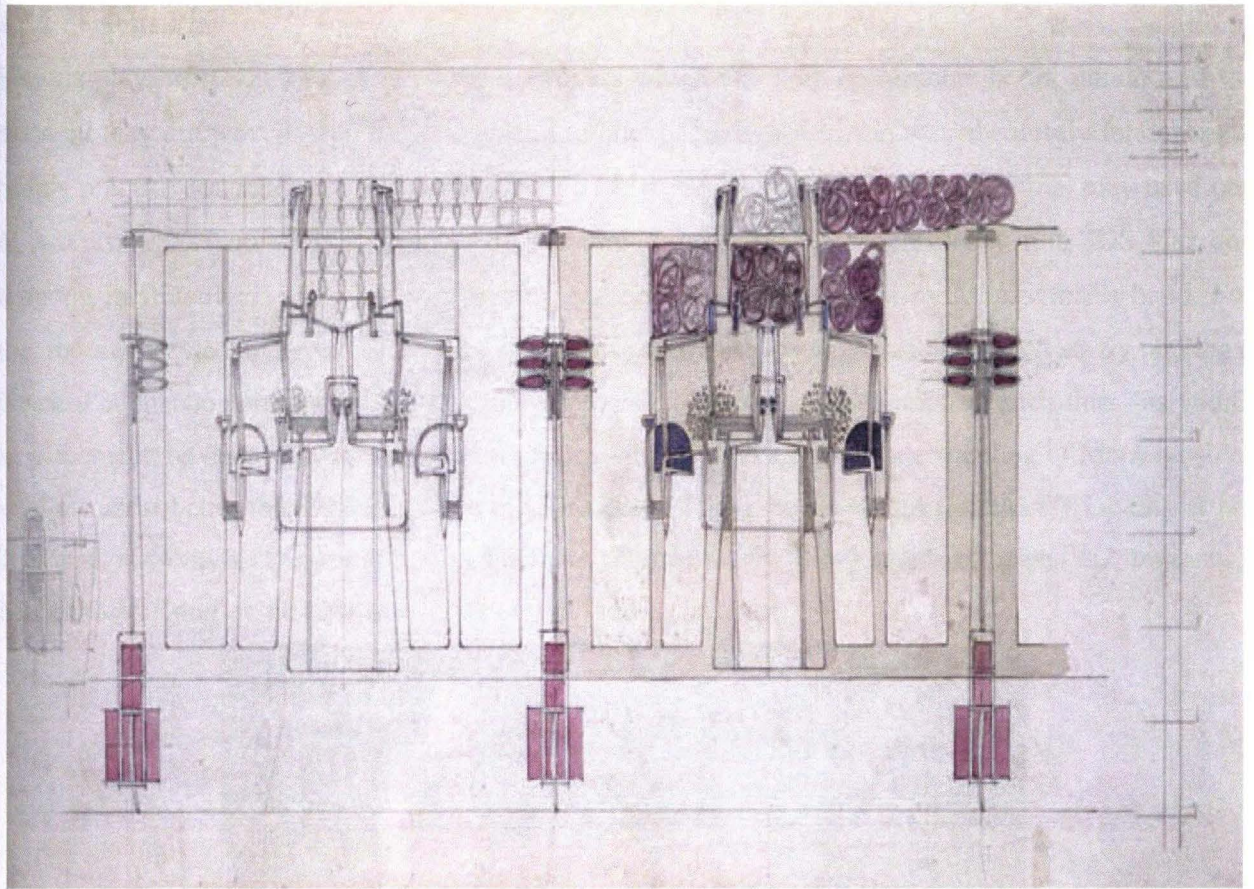


Illustration 35: Mackintosh drawing of design for frieze at Willow Tea Rooms, 1903

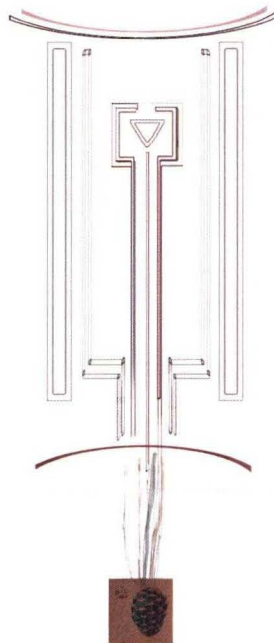


Illustration 36: Concept illustration inspired by Mackintosh's drawing aesthetic

4.2.2 Serious Play

Serious play, which is a creative research process which can help researchers better understand the material they are working with and may lead to unexpected knowledge, was absolutely fundamental to this practice-led research (DeSilvey, 2006: 334; Reilly, 2002). Most of my serious play used one of two processes: modeling the baptismal font and developing a setting(s) for it in 3DS Max and drawing in Illustrator, often actually tracing on top of the lines drawn by Mackintosh's hand. For me, redrawing Mackintosh's illustrations was a close study akin to close reading of a text. By making a physical connection and engaging in an active process in careful consideration of each line—its width, its placement, its connection to surrounding forms—it gave me a better understanding of Mackintosh as a fellow artist better than most research methods could. The practice of not just closely looking at his drawings, but through the use of my own hand to follow every willowy segment, helped me understand Mackintosh's mindset, his aesthetic, and point of view as an artist.

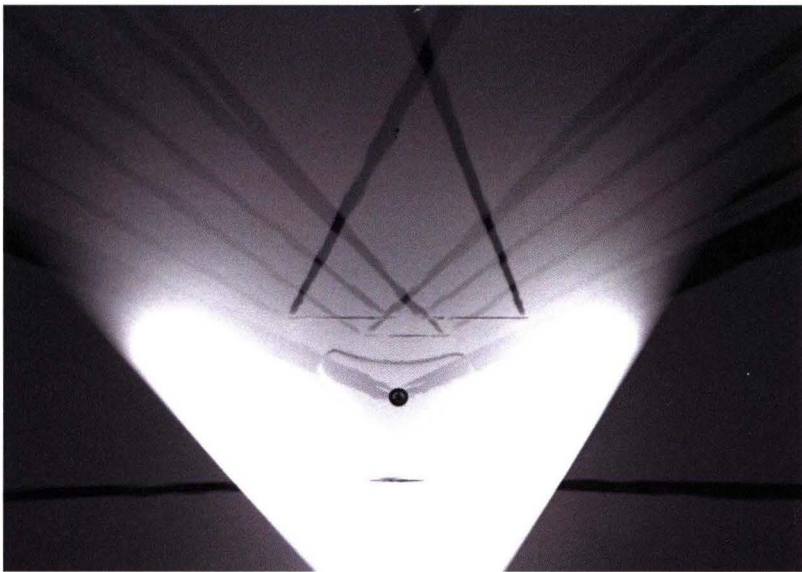


Illustration 37: Example of my experimentation with shadows and play with light v. dark

Serious Play in 3DS Max

My conclusions engaging in seriously play using 3DS Max were that there certainly are many advantages to using such a complex 3D modeling program like 3DS Max to develop visual content. I very much enjoyed exploring imaginative concepts including unexpected presentation and settings in which to place the font through certain processes like playing with shadow and light, negative and positive space, different lighting conditions, impossible views, etc. However, the number of variables and technical configurations that must be considered in order to produce footage that is suitable for a film was too overwhelming for me at this stage in my relationship with 3DS Max to develop content for this type of project. It is an area worth exploring later, however, especially when there are no time constraints to dictate outcomes.

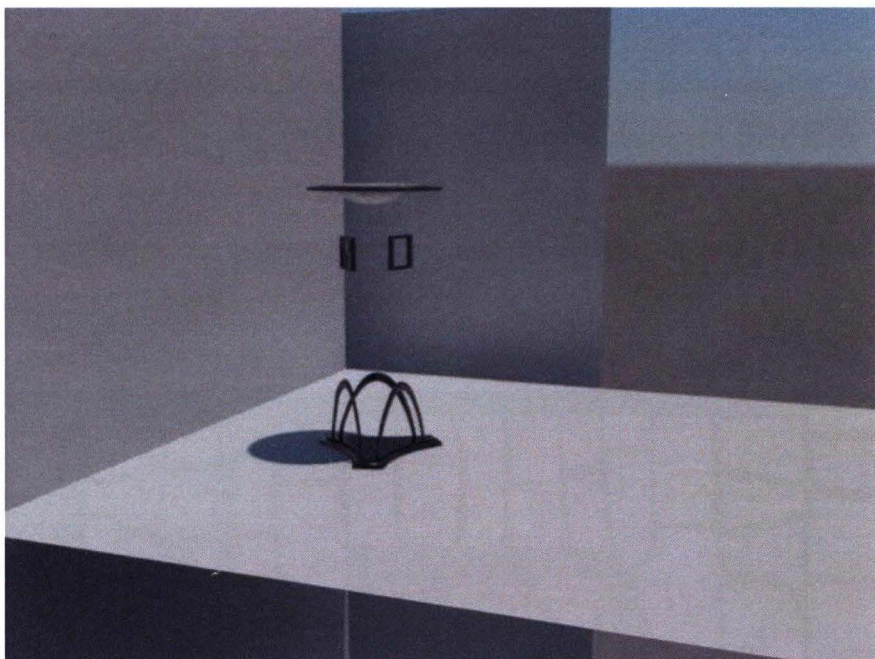


Illustration 38: One of the most abstract images to come from serious play

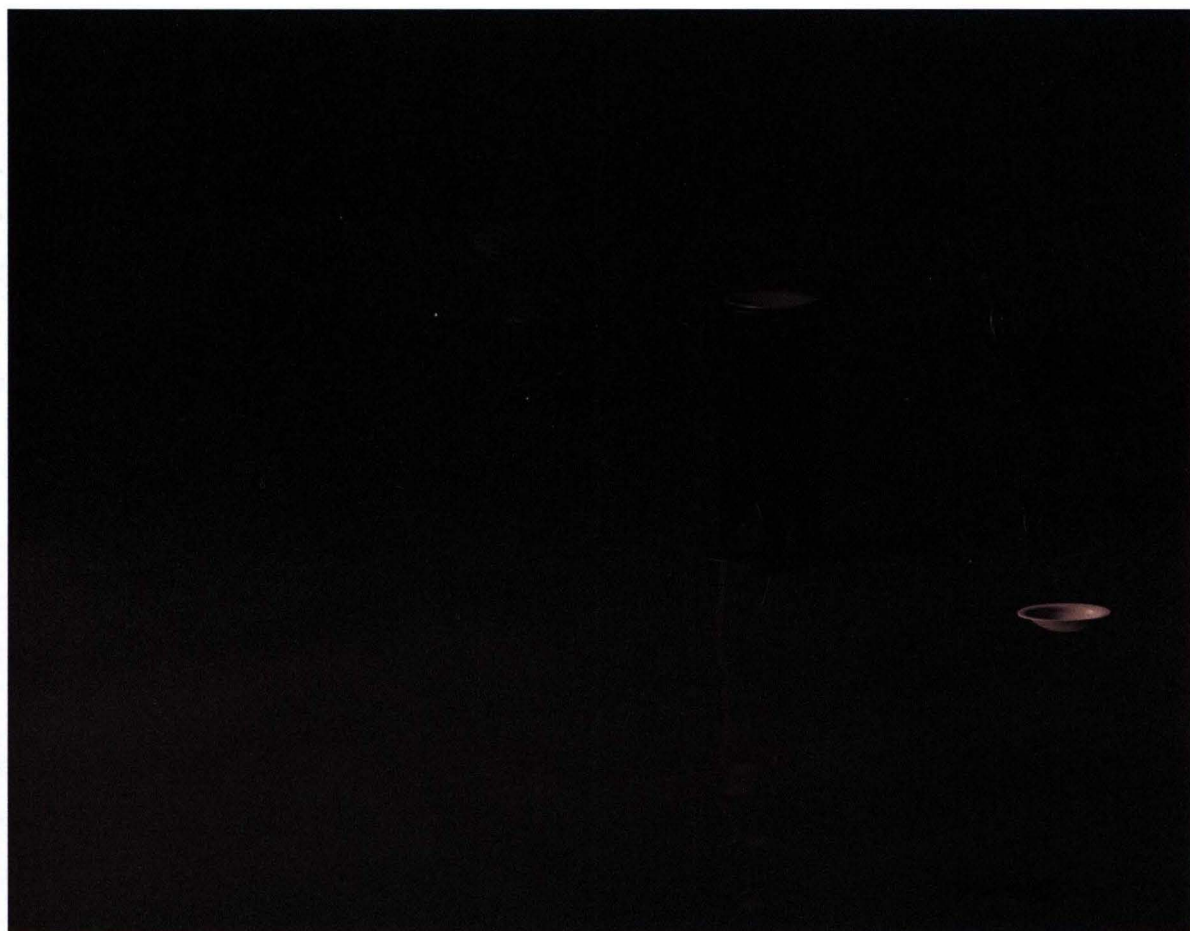


Illustration 39: Another aesthetically pleasing concept that was ultimately too dark

4.2.3 The Finale

A more complete account of content development can be found in the appendix, but since the finale scene is arguably the most important (in contention with the damaged font scene) it is recounted here. I consider it to be my most important artistic statement as well as a personal plea to consider its beauty and its significance in its transformed state, as well as its nature as a testament to the fire, in hopes that it may lead to the font being saved.

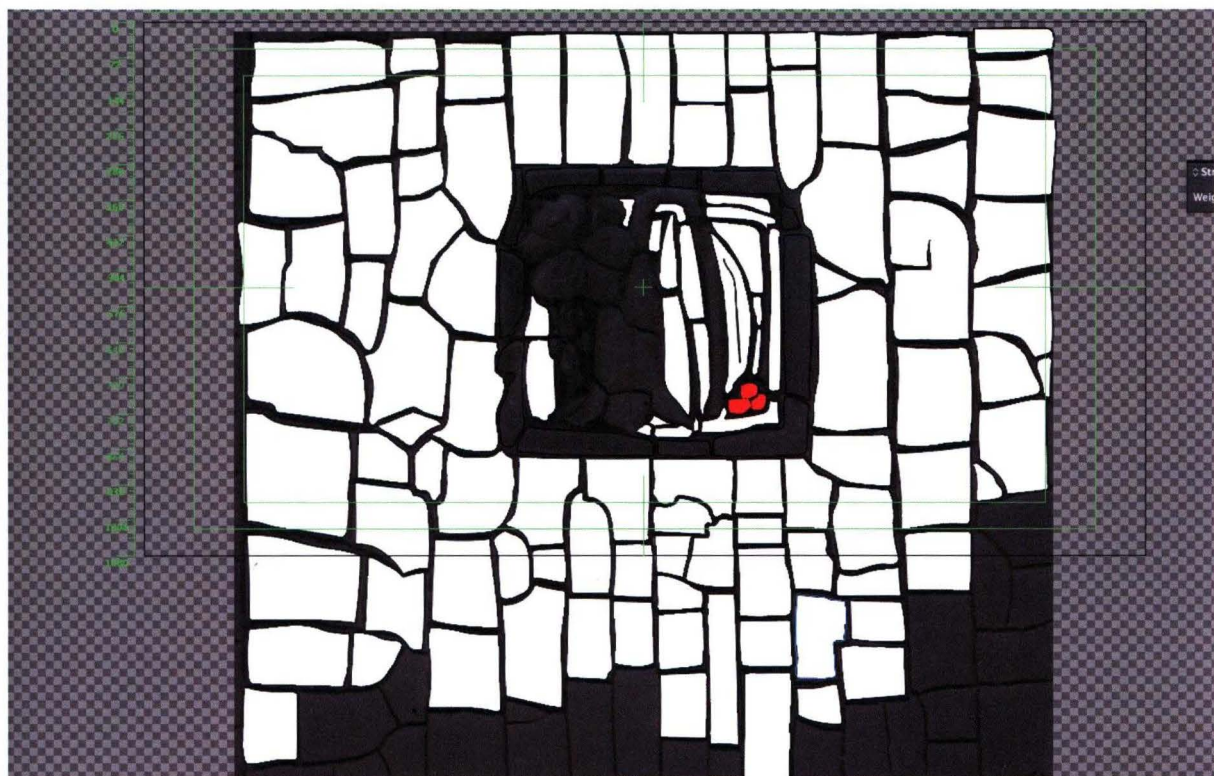


Illustration 40: One of the finale image, one of the few images that combined photographs and illustrations

This scene was one of the most complex scenes to create but was also one of the most rewarding. This general concept of the conclusion of the film came together fairly easily. To begin, as another exercise in serious play, I traced the lines etched on the font's surface, the essence which transforms its beauty. Later, I also played with inverting these intricate shapes to create a path for the riverbeds to run through. This animation was partially inspired by Peter Trowles' "riverbeds" comment about the font's transformed surface texture. I imagined these delicate streams of water bring the flower motif back to life. I decided this would be a powerful image with which to end the film—a strong, powerful, beautiful symbol of resurrected life (this is how I imagine the font in my head).

As an artist, it was a joy to work with and study this image so intimately, to trace the lines forever etched into its surface and animate the flower motif to literally bring it to life. The middle flower always caught my eye, as much because of its contorted form as its beauty. I wanted to see it unfurl, rise up, and blossom towards the sun. I played with painting the flower different colors, but I always came back to bright red because I wanted vitality, passion, and a hint of fire.



Illustration 41: The second to last image

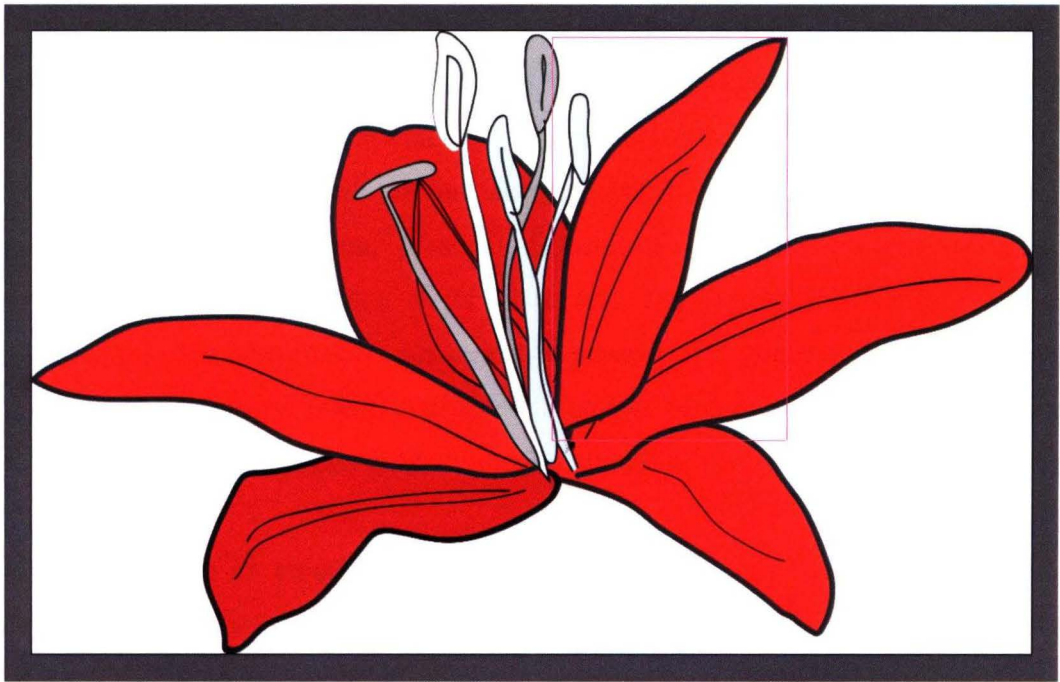


Illustration 42: The final image

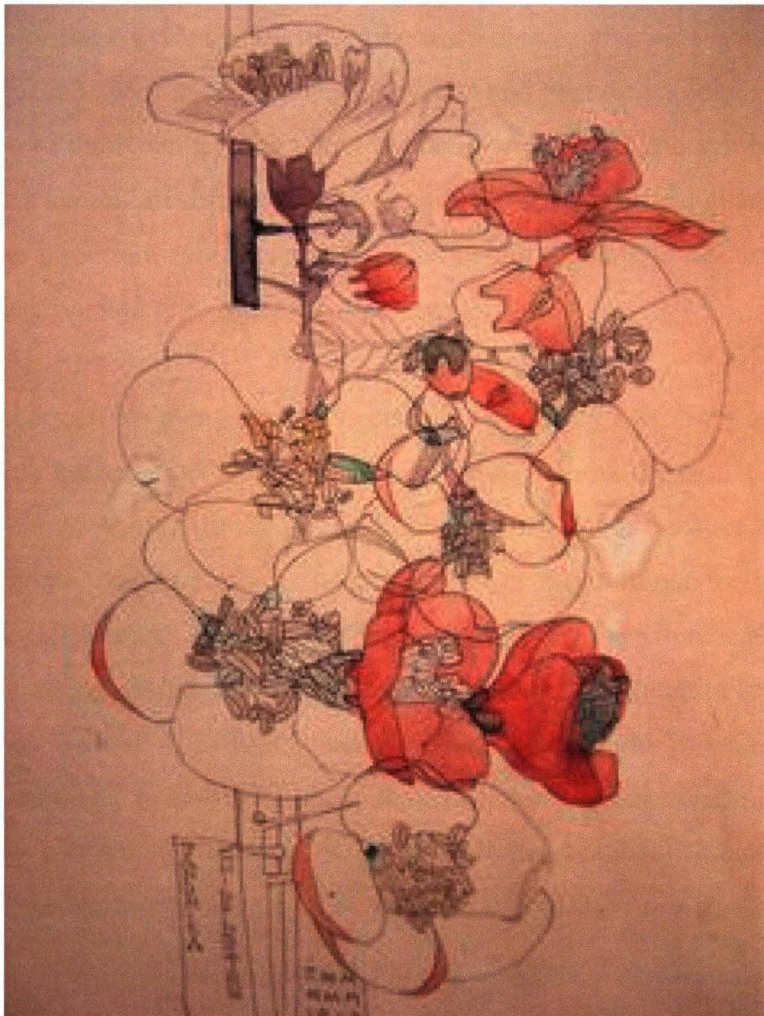


Illustration 43: The final flower was partially inspired by this Mackintosh drawing. Notice how he only colors in a few flowers which adds visual interest and really makes the forms and color pop

4.3 Conclusion: A Plea for Preservation as a Memorial Object

Overall, this project is an excellent example of how art practice can “validate significance of cultural heritage,” which in this case comes from the unique benefits of art practice-led research which enhance the intimate study of, not only the physical properties of the baptismal font, but the less tangible, more subjective, and personal aspects of it as well (Watterson, 2014: 36). My film speaks on behalf of the font, as its intercessor, and hopefully becomes a catalyst which draws much needed attention back to this object, especially if it going to be saved as a memorial object for public audiences for public audiences to engage with and develop their own meaning, memories, and personal connections to Mackintosh's art and its destruction.

My intent is to provoke an emotional response with this film and help viewers reflect on, and further appreciate, not only the font itself, but also its relationships with other Mackintosh art. I did not want the story to be too prescriptive, so people can find their own meanings; however, I wanted to show the cycles of its life as a fundamental aspect of its story as well as an analogy to both life and death. Recognition of these cycles is important because they fundamentally change and expand the meanings of this object as well as lead to both physical and phenomenological transformations. Similar to the evolution of the Koenig sphere from a public work of art and symbol of world peace to a memorial object and symbol of resilience, I want show how the physical change of the font can also transform it into an important symbol and memorial object for individuals and communities to help them process, reflect on, and remember this tragedy.

Since it survived, and because so many other objects were tragically lost, the fire actually brought new meaning and vitality to the object from my point of view. Without the fire, it would potentially be locked away indefinitely, perhaps never put on public display again because it is essentially an orphan without a true home, and art historically speaking, it is only a minor work; furthermore, its social value was essentially destroyed after it was removed from the church and put in storage. While its original form was pleasing, its unique, transformed state is hauntingly beautiful, almost divine, since it was not created with human hands. Although the font is languishing in a dark basement at this very moment, I wanted to show that, like the Mackintosh Building itself which Ross Birrell beautifully captured in his film, it is still a living beautiful thing and is worthy of investing significant resources in it to save it. By creatively tell its story my film can play a humble role in this process.

5. Conclusion

Art practice as research offers a visionary approach towards learning that is necessary to continue advancing cultural heritage visualization research and beyond. While it will never replace more traditional methods of research, present archaeological and heritage visualization scholars like Bailey (2008), Barrett (2007), Reilly (2002), Renfew (2003), Russell and Cochrane (2014), Sullivan (2010), Watterson (2014), and others encourage it as a parallel approach because of its innovative potential for research: the ability to synthesize objective and subjective knowledge, the possibilities of unexpected discovery, new methods of reflection and engagement with familiar materials and tools—all in the hopes of generating new knowledge and ensuring that the human element is preserved in research.

Despite weaknesses in the project including lack of an archival quality reconstruction of the original condition of the font (an intended outcome of this research), some roughness and unresolved issues in the film, gaps in critical engagement with theoretical research, it demonstrates the value and possibilities that art practice as research can add to existing heritage visualization methodologies. It is a novel approach for combining technical digital recording techniques with artistic practice to tell the story of Mackintosh's baptismal font. It successfully and creatively responds to available Mackintosh source material, combines multiple methodologies, and synthesizes both processes and products to create a new work of art in a classic medium with a digital twist.

I view this project as the opening of a new dialogue with Mackintosh's baptismal font, which I hope leads to further research and art production. After all, according to leading AI expert and philosopher, Marvin Minsky, “Maybe you can’t understand anything unless you understand it in several different ways, and that the search for the single truth--the pure best way to represent knowledge--is wrongheaded” (cited in Brockmann, 1995, p. 163). My hope is that the photogrammetric data set will be archived and be made publicly available, so others can expand on this initial research and develop new creative responses as well as more technical research to address and better understand the significance of this cultural heritage object.

As the person who has likely had the most intimate relationship with this work of art in a number of years, I feel it is appropriate to comment on its unknown fate. I hope that this research will help the Glasgow School of Art understand the great significance of this object due to its layered meanings

including its potential as a memorial object and its recently transformed beauty as a work of art. Its conservation is critical because, according to an EU report on preservation of cultural heritage,

“Ultimately, the preservation of cultural heritage brings together the art of building and of creation, culture and beauty, history, memory and identity on one side, and the latest conservation science and technology on the other. In an evolving world, well-preserved works of art that citizens can see and experience represent sources of dreams and innovation, to the benefit of everyone. Conserving such works of art thus implies active research and investigation, illustrating the efforts of all its actors to contribute to a more harmonious, sustainable and human environment” (Chapius, Lydon, Brandt-Grau 2009a:26)

Money should be raised and conservation efforts should begin—soon—to prevent further degradation. It should be conserved in a state of arrested decay as a testament to the destructive energies of the fateful fire, but also as a symbol of resilience and new life in the face of tragedy.

My hope is that this font will be re-installed in the Mackintosh building after it is officially reopened and be put on public display as part of a memorial to the fire. Ideally, at some point I would also like to see my film exhibited along with the font (I imagine the font installed in a corridor in the building with my film being played in a loop on a TV screen for passersby to see) to re-introduce both pieces to public audiences. I strongly argue the font should be preserved and put on public display because of the multiple new and evolving dialogues it would provoke through personal engagement with the font itself, discussions about the nature of art, cultural heritage, and material culture throughout the school, and beyond.

Humans are responsible for the creation of engagement, interpretation, meaning, memory, memorial and even physical transformation, of cultural heritage at both personal and public levels. DeSilvey expands on the dialogic interaction between person and object by stating,

“Instead of asking the artifact to speak to a singular (human) past, such a method works with an ecology of memory – things decay and disappear, reform and regenerate, shift back and forth between different states, and always teeter on the edge of intelligibility. Remembrance comes into its own as a balancing act, an ‘art of transience’ (Hawkins, 2001) which salvages meaning from waste things and reveals the complexity of our entangled material memories” (DeSilvey, 2006: 336).

These processes and conversations are truly what makes cultural heritage meaningful. So while preservation of the object itself is critical, we must also encourage multiple layers of meanings, from universal truths to ephemeral personal memories, accept that these meanings and memory may change over time, and through sustained action, continue the dialogue and engagement with these objects to keep their significance, their souls, alive for generations to come.

Appendix

1. Charles Rennie Mackintosh

Charles Rennie Mackintosh is the father and leader of the Glasgow Style, a movement that made significant contributions to the international development of the Arts and Crafts style which encompassed decorative, fine arts, and architecture. Mackintosh was born and lived most of his life in Glasgow, Scotland. He attended the Glasgow School of Art, a leading art school in Europe at this time, entering in 1883 at age 15 and attending until 1894. He studied drawing, painting, modeling, and design before focusing on architecture. While he spent most of his career as an architect and designer, he had the heart of an artist, which is quite apparent in his extensive and varied body of work (Sharples, 2014). He publicly argued at a lecture in 1893 that designers and architect should be given more artistic freedom and independence, which he strived to achieve during his career (CRM Society, 2015).

Mackintosh's works are “deceptively simple, practical structure[s], rich in organic symbolism and transitional Scots form[s]”; these characteristics came to define Glasgow Style as well (Cumming, 1992; 104). His focus was on good design, “the form and relationship between surface and decoration” (104). The design of everything, from a humble teaspoon to grand buildings were fundamental to him; this is echoed by his preference for a “total design” approach towards his commissions where he often designed the interior, exterior, and furnishings himself (CRM Society, 2015). He experimented with a variety of media and forms throughout his lifetime and produced a considerable body of graphic arts material (including highly stylized watercolors and graphic posters) in addition to his three dimensional work. In fact, in the years before his death he abandoned three dimensional work all together and spent his time painting watercolors, especially preferring floral motifs. His love and close study of nature are especially apparent in his drawings and watercolors, which greatly informed the development of the form and decoration of his three dimensional work.

Like many artists, his genius was not truly appreciated, especially by his hometown, until years after his death (Sharples, 2014). Now, however, he is the pride and joy of the Glasgow School of Art and celebrated by the citizens of Glasgow for his major contributions in defining their city's significant architectural legacy.

2. Film Scene Content

The development of each scene in the film is described below.

The Beginning

Initially, the idea of a tree scene was done to suggest the life of the piece even before the font – it came from at least one tree that lived a long life before being cut down – organic nature of piece – done to suggest how cycles of life and death are essential for the creation of art and are fundamental to life in general – also vague reference to themes that are fundamental to Christianity (in reference to the nature of the font).

With cycles of life and death in my mind, I imagined the font beginning as a pine cone, not the physical form of the font itself. Since my intent from the beginning was to tell the story of the baptismal font in chronological order, this is where the film began. I could not resist seeing if Mackintosh himself had drawn a pine cone, and sure enough, he did. He drew several features of pine trees, but I was immediately drawn to his immature pine cone with a rich, lush blueish-green color that reminded me of a peacock. And while I redrew most of the images in the film, I thought it was important to start with this original image. This image caused me to incorporate more images, including a recreation of Mackintosh's Shadow illustration, to create a progression that suggests growth and eventually leads to the physical inception of the font. The Shadow illustration, one of my favorite images that I studied, bears a loose resemblance to a tree because of its vertical form, which also shares similarities with the font's form if you look for them.

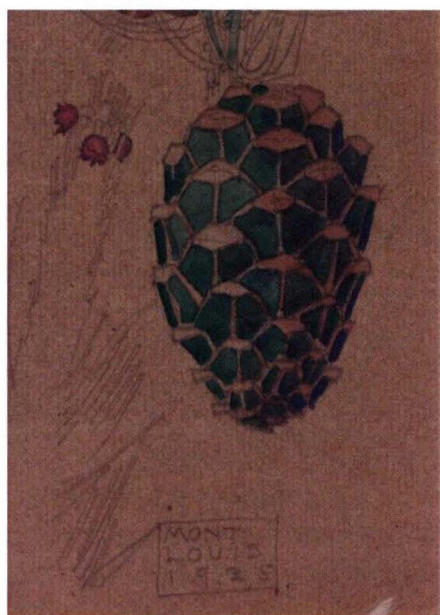


Illustration 45: Mackintosh's illustration of an immature pinecone from a larger drawing

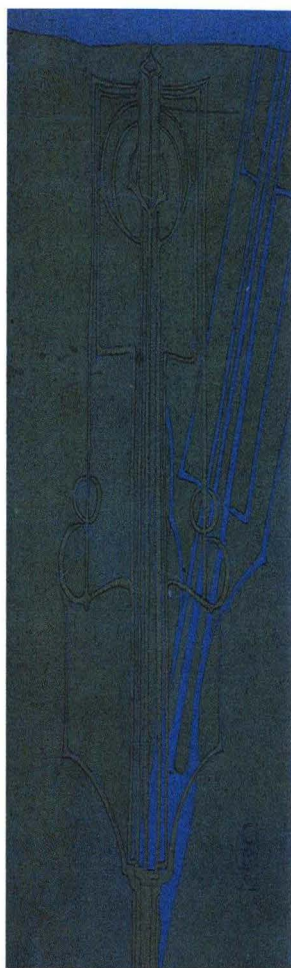


Illustration 44: The Shadow, Mackintosh

Assembly Scene

This scene acts as a transitional scene that moves the film from flat, drawn space into three dimensional space. I felt there should be another scene before moving into the church setting, and I wanted to acknowledge the physical construction of the piece –how its form is actually made up of numerous smaller pieces that were carefully crafted and fitted together. This scene was fun to make and a little playful—it shows some of the advantages of working within a digital medium including self-assembling, floating, spinning objects and impossible views that could never be seen in real life. The juxtaposition of stark, simple and elegant black forms surrounded by blank white space also creates an appealing interplay between positive and negative space, a dominant Mackintosh aesthetic.

Church Scene

The church scene was the single most difficult scene to produce, not only because there are no visual records to work from, but because I struggled with how to represent important concept such as baptism, performance, the eventual removal of the font from the church, the destruction of the bowl which in turn robbed the font of its intended purpose and potential value. I am least satisfied with this scene.

I considered issues such as how this object played an incredibly important social and religious role in this church community in Paisley for over 60 years, but I never thought of a good way to visually represent this. I eventually let these ideas go to due time constraints as well as the fear of overloading the film with too much information rather than focusing on a few key themes.

Instead I decided to keep the scene simple and focus on the basics: the font, the bowl, and the architectural setting, and a few water elements to emphasize its purpose as a ritual object. One of my most clever ideas in this project was to use the base of the font, and greatly increase its scale and turn it into an architectural setting. It worked perfectly for this scene. The base becomes a stage to display the font, and the arches act as a door and decorative backdrop. They also subtly symbolize the Holy Trinity.

Fade to Black

At the end of the church scene the camera pans out as the scene fades to black. Two doors come from the sides and then shut center screen. This is meant to symbolize the end this significant chapter in this life. The doors are loose recreations of the front door of the Mackintosh building, which is where the font was stored long term and was damaged in the fire. The doors are intended to link this scene and the following fire scene together. The scene ends with an extra long pause to denote the passing of time as well as give the next fateful fire scene a touch of suspense.

The Fire

This scene was one of the most problematic to create, both from an artistic and technical point of view. Creating it was the turning point in the project that caused me to re-imagine the project and decide to use more illustrations to tell the story since that was what seemed most natural to me. I kept the basic idea of the scene consistent through the development process but eventually changed the medium from 3D CGI in 3DS Max to illustration-based 2D animation that was created with a combination of Adobe Illustrator and After Effects. The concept was to have the fire slowly fade into the scene and grow while also having the viewer's point of view travel through space, eventually travel into the grid, and then conclude the scene by fading to white, partially to set up the next scene which is bathed in stark white.

I used the pierced square grid for several reasons, but largely because it an important detail of the font as well as one of Mackintosh's most favored motifs. I used it as a simple way to create 3D architectural space because of its resemblance to a window. I like the relationship between larger architectural forms and smaller details that can be found in Mackintosh's furnishings and also wanted to play with positive and negative space. This pattern is especially significant because of how clearly its form is reflected in the windows at the top of the Mackintosh building, which struck me after seeing this photograph of them as they are engulfed in flames. It is certainly one of the most striking images of the fire and succinctly encapsulates its devastating power.



Striking a balance between acknowledging the fire, especially since it was the catalyst that transformed the font into what is today and lead to this entire project, without overdoing it. I also did not want to make it the focal point of the film. Nor did I want to make it hokey or overly dramatic. Furthermore, simply representing fire from an aesthetic point of view is difficult. At first I experimented a lot by playing with the fire settings in 3DS Max in a scene I set up. While I got a few interesting still images from my efforts, overall the animations were not pleasing. Firstly, I did not think the fire aesthetics in 3DS Max were visually appropriate for the film. While my own inexperience with atmospherics in 3DS likely contributed to this issue, ultimately I decided I needed to go in a completely different direction to properly represent the fire, especially *this* fire, which has so much meaning and strong emotion attached to it.

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Damaged Font Scene

This scene is intentionally simple and self-explanatory. I wanted all the attention to be on the damaged font itself, to force the viewer to closely study its transformed form, to feel its trauma while also gazing at its evolving beauty. This scene was also largely inspired by Ross Burrell's film 'A Living Beautiful Thing' that was shot in the vacant Mackintosh library post-fire. The film featured a number of long, slow forensic tracking shots of the debris left behind from the fire. They are simple yet extremely effective at provoking an emotional response because of how brutally honest they are in displaying the damage. You cannot look away. I wanted to provoke a similar response in this part of the film.

Music

From the beginning I knew audio would be a crucial part of the film that would set the overall tone and carry the action. Furthermore, I anticipated from the beginning that multiple tracks would likely have to be used because of significant plot and mood changes throughout. Audio including four song sequences and a crackling fire sound effect were sequenced into the master composition in After Effects. The dominant melody for the film is repeated at the end to create a complete loop, and tie the whole film together. Perhaps because all the music was made by the same composer it instinctively fit together without too much fuss.

I spent considerable amounts of time searching for the right music that could be legally used, testing it out, and then finally sequencing the chosen audio compositions into the visuals. Effort was also needed to sync the timing and procession of the music in relation to the tone and action of each scene as well as movement from one scene to the next.

All music is composed by Kyle MacLeod and is used under Creative Commons License 3.0. Audio files were kept in their native .MP3 formats.

Harp "duet"... where the harps never actually play together.
Impromptu

Dark, Calming, Eerie

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Evening Fall (Harp)

Genre: [Soundtrack](#) Collection: [Thoughtful](#)

Time: **2:45** unknown tempo

Instruments: Small Ensemble - Harp

[▶ Listen!](#)

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Copy and paste the following text into your video's credits:

"Evening Fall (Harp)" Kevin MacLeod (incompetech.com)

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Long broad notes with a solo oboe.

Dark, Somber, Unnerving

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Mourning Song

Genre: [Classical](#) Collection: [Gloom and Sadnes](#)

Time: **1:32** 57 BPM (Largo - Very Slow)

Instruments: Basses, Cellos, Oboe

[▶ Listen!](#)

Slow moving cluster chords. Beautiful, I say!

This piece of music is [available in an uncompressed format here](#).

Relaxed, Somber

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"Pensif" Kevin MacLeod (incompetech.com)
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Pensif

Genre: [Contemporary](#)

Time: **2:09** 52 BPM (Largo - Very Slow)

Instruments: Piano

[▶ Listen!](#)

Extraordinarily depressing piano solo. Please treat with caution... or meds. The uncompressed WAV file version of this [is available here](#) as played on 3 different pianos.

Uncompressed (wav or aif) files available

Mysterious, Somber



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"Colorless Aura" Kevin MacLeod (incompetech.com)

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Colorless Aura

Genre: [Modern](#) Collection: [Gloom and Sadness](#)

Time: **2:38** 50 BPM (Largo - Very Slow)

Instruments: Piano



3. Additional Workflows & Software

The following is follow-up of the methodology section. It describes additional technology, software

Artec Laser Scanning

One of the methods used to record the geometry and surface texture of the font was white light laser scanning, which was carried out with a hand-held Artec MHT laser scanner. Scans were taken while the font was standing on its base and taken in succession as the operator slowly moved around the font to record it from all directions. It was not apparent until the font was unwrapped in the well-lit gallery that its surface is still fairly shiny, even after the fire. Due to both the reflective sheen and the black color of the font—both qualities the Artec scanner has trouble with due to its reliance on reading reflected light (Artec source), recording was cumbersome, time consuming, and led to mixed results. Under normal conditions, the font should have been recorded in less than 20 minutes, however due to the black and specular surface it took over two hours to record. In total 54 scans were made, although many were fairly fragmented and of poor quality. This made processing the data set problematic.

Scans were recorded and processed in Artec's proprietary file format and processed using Artec Studio 10 Professional (released 29 April 2015). Although the software has an automatic alignment function, it could not successfully align the scans due to the size and complexity of the data set. The scans had to be manually aligned, a time consuming process. Ultimately, due to technical issues (the software crashed during every attempt to export/save the model in a non-proprietary format), exasperated by limited access to the necessary software, the data set was not saved in a

format that could be used in the subsequent stages of the project. However, preliminary results suggest the model is ultimately quite successful, although texture information has not been analyzed yet. Due to the promise of the data set, processing should be completed in the future.

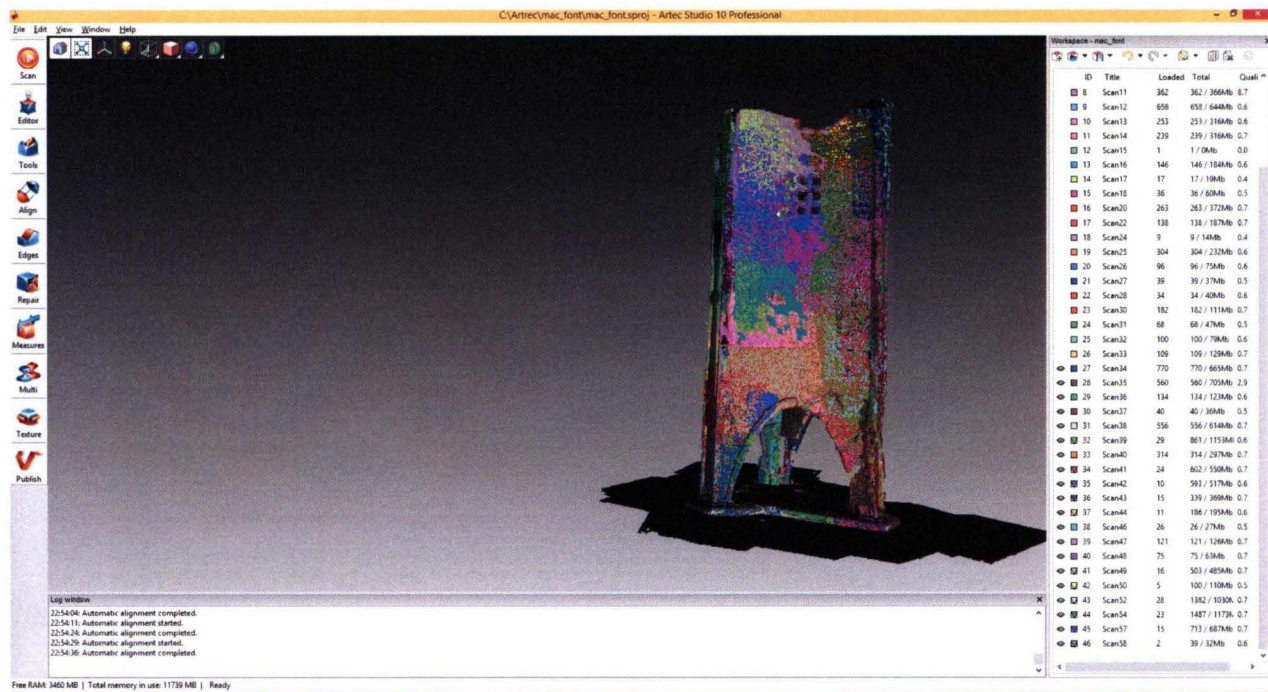


Illustration 46: Model of combined Artec scans after manual alignment completed – each color represents a separate scan; scans are listed on the right

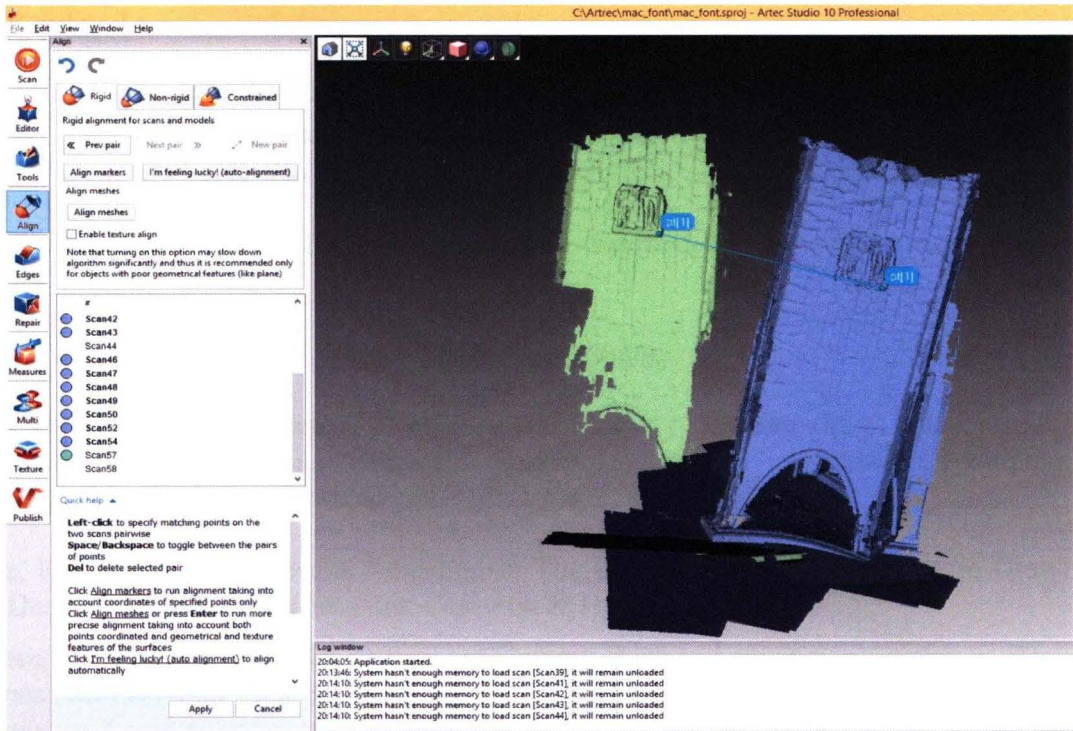


Illustration 47: Example of manual alignment in Artec Studio 10

Animation and Rendering in Adobe After Effects

Adobe After Effects was used for several aspects of film production, including development of the final master film composition. The final composition was rendered in an H64 format with a size of --- at full quality, not suitable for web-streaming but suitable for archiving and to share. Scenes that were rendered as TIFF Image Sequences in 3DS Max were imported as blocks of animated footage in After Effects for easier handling. Some animations were produced in After Effects including the fire scene and the final flower blossoming scene. The Illustrations were produced in Adobe Illustrator, imported as layers and then compiled and manipulated to produce animated effects. In some cases such as the scene it was easier to animate sequences backwards and then reverse the footage in After Effects.

Additional Illustrations Produced in Adobe Illustrator

A number of illustrations were also created in Adobe Illustrator as film content. Most of them were digital reconstructions of Mackintosh's own drawings and watercolors. Beyond an artistic process, they were recreated as vector files to maintain consistent high quality for any use in the project; the original raster images of Mackintosh's work, especially of smaller details, were far too low quality for the film.

Photo Editing in Photoshop

Photoshop was used to edit (mostly exposure levels and clone stamp imperfections) the textures for the 3D models, and batch process photos from Nikon's native RAW format (.NEF) to TIFFs. It was also used to recreate an image of the flower motif on the font as it would have originally looked, since the only known pre-fire photo is blurry and unsuitable for high definition use as well as create a bump map of the same image to add more texture. However, the detail is small, so it is not apparent in most of the film.

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