Confronting ecophobia: increasing ecoliteracy through art and marine science

Jacquelyn Dale (JD) Whitman

University of Iowa

Follow this and additional works at: https://ir.uiowa.edu/etd

Part of the Art Practice Commons

Copyright © 2019 Jacquelyn Dale (JD) Whitman

This thesis is available at Iowa Research Online: https://ir.uiowa.edu/etd/6881

Recommended Citation
CONFRONTING ECOPHOBIA:
INCREASING ECOLITERACY THROUGH ART AND MARINE SCIENCE

by

Jacquelyn Dale (JD) Whitman

A thesis submitted in partial fulfillment
of the requirements for the
Master of Fine Arts
degree in Art in the
Graduate College of
The University of Iowa

May 2019

Thesis Supervisors:  Associate Professor Isabel Barbuzza
                       Assistant Professor Rachel Cox
To Andy Evans for saving my face and this thesis from an exploding lithium battery.
PUBLIC ABSTRACT

All citizens should be ecoliterate; however, science can be emotionally and cognitively overwhelming when it is contextualized. When learning about large-scale environmental threats and disasters, people can experience ecophobia – a negative response, a paralyzing fear, or desensitization to the looming environmental issues. These responses are accompanied by an additional feeling that there is nothing to be done to achieve resolution, which makes environmental education counterproductive. Now more than ever, ecoliteracy is vital to saving our planet. Humanity’s impact on the Earth has ushered in a new geological epoch – the Anthropocene – defined by climate change, environmental degradation, loss of biodiversity, and pollution. The inauguration of the Anthropocene declares that the impact of human activity is global and irreversible – it is a call for change. This call cannot be answered unless all citizens become ecoliterate.

I propose that art can be used to successfully deflect ecophobia in environmental education; that a specific union of art and marine science can generate responsible citizens who consider themselves stewards of the environment; and that these two factors can aid in the creation of the global environmental intelligence needed to enact change. This is a chronological record of my intent to prove these claims by outlining my research, developing artistic practice, and specific projects and their outcomes over a four-year period. My overall goals are to evaluate how to combine art and marine science to avoid ecophobia and positively educate viewers on anthropogenic threats afflicting the oceans.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIST OF FIGURES</td>
<td>v</td>
</tr>
<tr>
<td>INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>CONCERNING ECOPHOBIA</td>
<td>3</td>
</tr>
<tr>
<td>SCULPTURE MFA: PROJECTS 1-6</td>
<td>6</td>
</tr>
<tr>
<td>PHOTOGRAPHY MFA: PROJECT 7</td>
<td>34</td>
</tr>
<tr>
<td>CONTEXTUALIZATION AND THE FUTURE</td>
<td>53</td>
</tr>
<tr>
<td>FIGURES</td>
<td>63</td>
</tr>
<tr>
<td>REFERENCES</td>
<td>101</td>
</tr>
</tbody>
</table>
LIST OF FIGURES

Figure 1: Exponential Growth. [Installation View] .......................................................... 63
Figure 2: Exponential Growth. [Detail] ............................................................................. 64
Figure 3: Exponential Growth. [Detail] ............................................................................. 65
Figure 4: Cavern Dive. [Installation View] ................................................................. 66
Figure 5: Cavern Dive. [Detail] ..................................................................................... 67
Figure 6: Cavern Dive. [Detail] ..................................................................................... 68
Figure 7: Cavern Dive. [Detail] ..................................................................................... 69
Figure 8: Plastic Purge Scraps ....................................................................................... 70
Figure 9: Biomes. [Installation View] ................................................................. 71
Figure 10: Biomes. [Detail] ......................................................................................... 72
Figure 11: Biomes. [Detail] ......................................................................................... 73
Figure 12: Bacterium Luminarium. [Installation View] .............................................. 74
Figure 13: Bacterium Luminarium. [Detail] ................................................................. 75
Figure 14: The PGC Project. [Installation Interior] ..................................................... 76
Figure 15: The PGC Project. [Installation Exterior] ................................................... 77
Figure 16: The PGC Project. [Installation Interior] ..................................................... 78
Figure 17: The PGC Project. [Installation Interior] ..................................................... 79
Figure 18: The PGC Project. [Installation Interior] ..................................................... 80
Figure 19: The PGC Project. [Installation Interior] ..................................................... 81
Figure 20: PLASTICITY: Our Changing Oceans. [Installation Interior] .................. 82
Figure 21: PLASTICITY: Our Changing Oceans. [Installation Interior] .................. 83
Figure 22: PLASTICITY: Our Changing Oceans. [Installation Interior] .................. 84
Figure 23: PLASTICITY: Our Changing Oceans. [Installation Interior] .................. 85
Figure 24: PLASTICITY: Our Changing Oceans. [Installation Interior] .................. 86
Figure 25: PLASTICITY: Our Changing Oceans. [Installation Exterior] ........................................... 87
Figure 26: PLASTICITY: Our Changing Oceans. [Installation Interior] ........................................... 88
Figure 27: PLASTICITY: Our Changing Oceans. [Installation Interior] ........................................... 89
Figure 28: PLASTICITY: Our Changing Oceans. [Installation Interior] ........................................... 90
Figure 29: PLASTICITY: Our Changing Oceans. [Installation Interior] ........................................... 91
Figure 30: PLASTICITY: Our Changing Oceans. [Installation Interior] ........................................... 92
Figure 31: PLASTICITY: Our Changing Oceans. [Installation Interior] ........................................... 93
Figure 32: Blaschka Invertebrate Models. National Museum of Ireland – Natural History ........... 94
Figure 33: PLASTICITY: Microplastics & Mutations. [Installation View] ........................................... 95
Figure 34: PLASTICITY: Microplastics & Mutations. [Detail] .............................................................. 96
Figure 35: PLASTICITY: Microplastics & Mutations. [Installation View] ........................................... 97
Figure 36: Artificial Reef. Jason deCaires Taylor. ................................................................................. 98
Figure 37: Washed Ashore: Art to Save the Sea. Angela Haseltine Pozzi ........................................... 99
Figure 38: Midway: Message from a Gyre. Chris Jordan ................................................................. 100
INTRODUCTION

All citizens should be ecoliterate; however, science can be emotionally and cognitively overwhelming when it is contextualized (Bloom). When learning about large-scale environmental threats and disasters, people can experience ecophobia – a negative response, a paralyzing fear, or desensitization to the looming environmental issues (Sobel). These responses are accompanied by an additional feeling that there is nothing to be done to achieve resolution, which makes environmental education counterproductive. Marine Conservationist Charles Saylan believes that environmental education has failed because it is not keeping pace with environmental degradation and human impacts on the environment, and has simultaneously failed to provoke action (Nijhuis). Ecophobia is directly responsible for the delay in the transference of current environmental information and the subsequent inaction. Educators have made various attempts to suppress and circumvent ecophobia: Sobel proposed that ecophilia – supporting children’s biological tendency to bond with the natural world – should be emphasized and used to replace ecophobia in environmental education (Sobel); McKnight deduced that the development of environmental empathy and ecoliteracy can be achieved through the use of narrative (McKnight); and Rigolon suggested that ecoliteracy should be developed in children through the processes of empathy development and knowledge-building (Rigolon). Yet, even with these attempts, environmental education and the rate of ecoliteracy amongst citizens are still considered to be inadequate.

Now more than ever, ecoliteracy is vital to saving our planet. Humanity’s impact on the Earth has ushered in a new geological epoch – the Anthropocene – defined by climate change, environmental degradation, loss of biodiversity, and pollution. The inauguration of the Anthropocene declares that the impact of human activity is global and irreversible – it is a call
for change. This call cannot be answered unless all citizens become ecoliterate and ecophobia controlled. Art and art processes have not been adequately tested in the fight against ecophobia. The process of creating, viewing, and interpreting art promotes cognitive and intellectual development, and the combination of the visual with the tangible intensifies that development (Young). I propose that art can be used to successfully deflect ecophobia in environmental education; that a specific union of art and marine science can generate responsible citizens who consider themselves stewards of the environment; and that these two factors can aid in the creation of the global environmental intelligence needed to enact change. This is a chronological record of my intent to prove these claims by outlining my research, developing artistic practice, and specific projects and their outcomes over a four-year period. My goals are to evaluate how to combine art and marine science to avoid ecophobia and positively educate viewers on anthropogenic threats afflicting the oceans.
CONCERNING ECOPHOBIA

As an artist, scuba diver, and marine conservation advocate, my passions drive me to produce art that effectively educates people on anthropogenic threats afflicting our oceans and global marine ecosystems. When I started scuba diving at the age of twelve, the ocean seemed healthy and it seemed indestructible. Each time I returned to the sea over the years, I noticed a gradual – but definite – degradation in marine life. To my untrained eye, I saw populations decreasing, vibrancy and colors fading, and pollution increasing. More unsettling, I felt a certain imposed violence and a reactionary helplessness that plagued the water’s inhabitants. Witnessing these negative changes but not knowing their causes, was terrifying to me. Through volunteer and research work within ocean conservation and dive communities, I learned that these changes were caused directly by human activities: anthropogenic threats.

The only reason I know and understand this fact was because I am fortunate enough to be a scuba diver and to have had hands-on, marine-specific environmental education. What about people with no ties to ocean life: non-divers; or in more extreme cases: people who have never seen an ocean? How do these people understand that their actions adversely affect the oceans without seeing it? More importantly, why should they care?

When I began my art education, I thought I could share my experiences as a diver and bring the ocean to viewers through underwater photography. I showed images of what anthropogenic threats were doing to marine species, hoping viewers would be able to 1) experience the ocean; 2) understand the threats and that they were human in origin; 3) feel empathy towards the threatened marine species; and 4) feel an impulse to do something about these threats. However, viewers had extreme negative responses. They were so upset with what they saw that they completely closed off to receiving any educational information. This was my
first encounter with ecophobia. I struggled with understanding how to show viewers documented evidence of a terrible truth in a way that triggered a positive response and cognitive processing. At this point, I began to investigate ecophobia in an effort to understand, question, and attempt to avoid it.

A common action to avoid ecophobia has been to completely eliminate the use of documentary photography and video in the distribution of information to the general public. Because of an image’s ability to quickly and powerfully impact our visual perception and understanding, eliminating the image is a logical, tangential endeavor. In these cases, visual documentation of what occurs in the oceans and to marine species has been censored or replaced with images that exclusively glorify the beauty and potential of the oceans. While I am not completely opposed to this effort, I do not believe it is enough to fully educate the general public on the health of the oceans. People still need – and deserve to see – the truth. They need to experience what is actually happening in order to process the information and develop a sense of environmental empathy, and be inspired to act.

A possible reason viewers are negatively affected by documentative imagery is due to its nature as a two-dimensional object. More often than not, a two-dimensional object is ingested quickly by a viewer in a flat, inactive space. The thousands of images we see every day on social media, television, and in public-space advertising are meant to be consumed as quickly as possible; this is to ensure the viewer only perceives the immediate, surface information. A viewer’s cognitive processing is clipped by this pacing, which limits the amount of digested information to our instantaneous - and often biased – reactionary acuities. A viewer’s processing is also restricted by the special barrier that exists between themselves and the space – both physical and conceptual – in which the visual information exists. When looking at unsettling
images in this system, documentary images of adverse environmental threats are going to be received negatively. From a detached secondary viewpoint, they are shockingly upsetting at first glance.

In an attempt to avoid immediate negative responses, and at the same time educate the viewer, I have 1) slowed down the process of viewing and perceiving; and 2) brought the visual information and the viewer into the same dimensional space. During my MFA in sculpture, I explored these thoughts through a series of sculptural installation projects.
In the sculptural installation projects, *Exponential Growth* and *Cavern Dive*, I wanted to 1) use my original, documentation of ocean threats; 2) simplify the scientific information I shared; 3) control the speed of viewing; and 4) eliminate the special divide between the viewer and visual information. The projects, *Exponential Growth* and *Cavern Dive*, were my first attempts at this method of presenting information.

**Project 1: Exponential Growth - December 2015**

In *Exponential Growth*, I addressed the problem of invasive species by utilizing an image I had taken of a lionfish (Figure 1).


**Scale:** Installation Space: 15’L x 15’W x 12’H. Object: 12’L x 8’W x 7’H

**Marine Research Information:** An invasive species is an organism that is not native to a specific location and has the capacity to spread to a degree that can cause damage to the environment, human economy, or human health. Lionfish are the largest invasive species in the Atlantic region and are a major threat to coral reefs and marine ecosystems. With no dietary restrictions or preferences, a single lionfish can reduce the juvenile fish population on a reef by 90% in just 5 weeks. Additionally, their reproduction rate is alarming. A female is capable of reproducing every 4 days and spawning over 2 million eggs per year.

**Objective(s):**
- Use my photograph of a lionfish in a positive format.
- Imply the problems that lionfish pose as invasive species in a positive way.
- Control the speed viewers see, comprehend, and interpret the photograph of the lionfish.
• Control the speed viewers see, comprehend, and interpret the installation space.
• Invite viewers to enter the installation space.

**Project Description:** I constructed the sculptural form from various types of handmade and recycled paper, and projected two animations on top of the form. My initial image of the lionfish was the only imagery used in both the sculpture and animations. I abstracted the image using repetition, fragmentation, and animation so that upon first glance, the viewer would only see ornate color, pattern, and movement in the sculpture (Figure 2). The projected animations furthered these affects by adding a layer of movement and light in order to activate the sculpture, the space, and the viewers within the space (Figure 3). Viewers were prompted to enter the installation space and interact with the varying layers of imagery in order to dissect the visual information. Here, the image acted as a signifier within the composition so that optic play could prolong the viewers’ recognition of the lionfish. Ultimately, viewers spent more time with the content and interacted with the installation space before recognizing the lionfish.

**Project 2: Cavern Dive - March 2016**

In *Cavern Dive*, I addressed threatened ecosystems within underwater caverns by using photographs of stalactites and a video of my brother scuba diving in a cavern (Figure 4).

**Materials:** Handmade Abaca Paper. Salt. Gel Medium. Fishing Line. 2 Standard Throw Projectors.

**Scale:** Installation Space: 15’L x 15’W x 12’H. Object: 8’L x 6’W x 11’H

**Marine Research Information:** Climate change is causing the formation of new underwater caverns and ecosystems. With rising sea levels, caves are being submerged to form new aquatic landscapes. In conjunction with acidification and rising sea temperatures, organisms are
migrating into these caverns to survive these anthropogenic threats by avoiding sunlight and adapting their colorations.

**Objective:**
- Abstract my original documentation by changing mediums; i.e. photography to sculpture, and video to stop-motion animation.
- Exhibit the anthropogenic threats afflicting marine caverns.
- Control the speed that the viewers see, comprehend, and interpret the visual imagery.
- Control the speed viewers see, comprehend, and interpret the installation space.
- Prompt viewers to enter the installation space.

**Project Description:** This project was a three-dimensional replication of my original video documentation of a marine cavern. I abstracted my initial visual documentation further than I did in *Exponential Growth* in an attempt to delay the viewers’ recognition of the main imagery and concept. I turned the images of the stalactites into sculptural forms using handmade paper, salt, and a vacuum table, and transformed the video footage into a hand drawn, stop-motion animation (Figures 5-7). For the final installation, I used the sculpted stalactites and projected the animation to recreate my initial documentation in a three-dimensional space. Viewers entered the cavern and walked amongst the stalactites next to the animated diver.

**Critique and Viewer Response (for both projects):**
- Abstracting my initial documentation undoubtedly prolonged viewers’ recognition of the subject, which delayed any negative response to the subject. The additional time spent discovering the content instigated the viewers’ curiosity, and prompted them to ask about what they were viewing. The abstraction techniques used in *Exponential Growth* were
more successful than in *Cavern Dive*. In *Cavern Dive*, the documentation was abstracted too far from its original form, steering viewer inquiries towards the techniques and materials rather than the scientific concept behind the visuals. Once viewers discovered the original image of the lionfish in *Exponential Growth*, they asked me about the animal and its importance, rather than how the installation was made.

- Abstracting my documentation within an installation space that is ornate and captivating upon first glance triggered an initial positive reaction from viewers. This positive reaction was accompanied by a need get closer to and/or step into the installation space to explore and dissect the sculptural object(s) and visual imagery within the space. This need propelled viewers to discover my intended visual imagery from an already positive, cognitive standpoint.

- An immersive installation space captivated viewer attention, triggered curiosity, and prompted engagement. There was an exponential relationship between the scale of immersive quality and these viewer responses: the more immersive an installation, the more captivated, curious, and engaged the viewer was. In both projects, viewers automatically entered the installation spaces without permission and began exploring. Instead of standing back and critiquing the installations from a plan view, they critiqued it from within the space. However, in both projects, all viewers wanted the space to be even more immersive. Viewers requested the space be made more immersive by placing the sculptural forms of the installation away from the walls. Existing farther away from the walls would allow 1) the entire gallery to be activated; 2) viewers to be able to interact more freely with the sculptural objects and activated space; and 3) viewers to become a part of the installation through their interaction with the projected animations.
Using projections was an easy and effective way to activate the installation space and everything that existed and entered into that space. Light from the projector interacted with and activated the sculptural objects, the gallery space (floor, walls, ceilings), and the viewers that entered and moved around in the space. Essentially, projections filled in stagnant spaces, changing the entire gallery space into an immersive environment through back/front-lighting, reflection, color cast, conduction, and shadow play.

Using animations enabled me to 1) use projections and the resulting benefits; 2) abstract my documentation while keeping it in its original two-dimensional form; and 3) temporally and spatially control the viewer in the installation. The projected animations were used to move a viewer through the installation space based on where and when the animation was projected. Contingent upon their length, the projected animations were also used to control how long and at what pace a viewer explored the installation space.

Abstracting my documentation and creating an immersive environment achieved my initial two goals of slowing down the viewing process and bringing the visual information and the viewer into the same dimensional space. However, this did not guarantee a transfer of information once the viewer entered the space and recognized the primary documentation. In both projects, viewers positively arrived at my documentation and then either stopped engaging with the project or asked me for more information. I had to become a part of the installation for viewers to learn about the concepts I was trying to portray. At this point in time, this was not the reaction I was trying to prompt. I wanted the art to be able to stand on its own to educate viewers, while avoiding negative responses.
By the end of my first year, I learned that my best chance for combating ecophobia though art would be to engage the viewer by creating immersive installation art using projections. If immersive quantity directly controls the amount of viewer engagement, then my future goal was to create as immersive an environment as possible. The viewer would need to be completely encapsulated within my created environment, leaving no thought or visible connection to the outside world. In essence, the gallery needed to be eliminated from my work so that the viewer could be removed from their present reality and only exist within my constructed reality. This displacement could potentially aid in the postponement of ecophobia.

During my second year, I realized a few things that completely altered and propelled my practice. First, Iowa is a landlocked state and seems as far away from an ocean as humanly possible. This meant that it was impossible for me to collect additional underwater documentation of my own while in school. If I wanted new source material, I was going to have to make it in a different way or outsource. I also learned Iowa is a national leader in plastic production, with seven factory plants surrounding Iowa City. This meant that Iowa is a leading US contributor in the marine plastic pollution epidemic. With zero ocean access, and practically unlimited access to the source material of a major anthropogenic threat, I switched my research (and resulting art) to focus solely on plastic pollution in our oceans.

Plastics - synthetic organic polymers - are lightweight, durable, and anthropogenically-influenced materials. Fragments of this plastic, which comes from items like grocery bags, drinking straws, water bottles, shampoo bottles, etc., are carried into the oceans every day. Annually, eight million metric tons of plastic ends up in the oceans, and the global plastic production rate is only increasing. By 2050, the global production market will be producing three times as much plastic as it did in 2014. If this stands true, that means by 2050, there will be more
plastic in the world’s oceans than fish (Lykketoft). Mass accumulation is a problem for the environment because of plastic’s durability - it is broken down by tidal and abrasive forces, but never fully decomposed. Our species has been producing plastic at an exponential rate since its conception in 1907 and according to the EPA, “every bit of plastic ever made still exists”. I became particularly interested in the research directed at how plastic pollution is affecting biological adaptation. Due to their physical permanence, plastics have created a new nature specific to the marine realm – a hybridization of the synthetic and the organic.

Plastiglomerates are a newly-noted kind of stone formed through the intermixing of melted plastic, beach sediment, basaltic lava fragments, and organic debris. First discovered on Hawaii’s Kamilo Beach, these new stones look like chunks of garbage. These original plastiglomerates at Kamilo Beach were proven to be anthropogenically-produced, formed when plastic litter was melted in the heat of campfires and forced to mix with sand, basaltic fragments, wood, and flotsam (Zuckerman). It is possible that these new stones could serve as markers of the point in civilization when humans started using – and discarding – plastics on a grand scale. Forming a marker horizon in the Anthropocene, these new stones are being dubbed the “fossils of the future” (Corcoran). Additionally, a new bacterium has been discovered called Ideonella sakaiensis, that is able to enzymatically degrade and assimilate Poly[ethylene terephthalate] (PET) (Yoshida). Essentially, this means that a bacteria has adapted to live off of only plastic. The bacterium’s byproduct is not yet known, nor is its adaptation rate, or how animals consuming the bacterium are affected. Concerning both research tangents, Plastiglomerates and Ideonella sakaiensis, I am interested in the point of material merger: the material point mutation. Specifically, I am focused on where natural biological energy forces the organic to adapt to, co-
mingle with, and even process the inanimate synthetic. How long before organic adaptive traits produce a living plastic?

With this in mind, I began to collect discarded plastic from the University of Iowa’s campus and the Iowa City community. In addition to collecting my own plastic products, I gathered sheet plastics from campus, painting companies, and construction sites; bottles, milk cartons, containers, and grocery bags from neighbors and community members; and plastic purge scraps from a bottle production factory – the holy grail of plastic waste. Plastic purge scraps are circular plastic blobs of polypropylene and PET. These objects are created at bottle production factories when injection machines need to be cleaned, or “purged,” before a new color (for a different product) is injected into the machine. When a machine needs to be purged of a specific color, a clear plastic is pumped through the machine to push the leftover colored plastic out. This process ends with a flow of hot plastic congealing on the bolstering concrete floor, where it cools and forms the plastic purge blob. Plastic is only reusable if it is completely composed of “pure” color. Because the clear plastic has mixed with the colored plastic, this mass of plastic is considered contaminated and is thrown away (not recycled). Eventually, these blobs make their way directly into a landfill, and eventually, the ocean. Over a four-month period, I collected over 300 plastic purge scraps from one bottle production factory outside of Iowa City. These objects range in weight from 2lbs – 45lbs each, are of varying colors that extend beyond the simple ROYGBIV, and exhibit variable textures and opacities (Figure 8).

This collected plastic took on two major roles in my art practice. First, I utilized the plastic as a physical material to create sculptural objects and installations. Second, I documented the plastic and my sculptural objects so I could project the images into installation spaces. I also animated photographs of the plastic objects so I could manipulate them to look like they were in
an underwater environment or at varying stages in their recycled life-cycles. This new way of working was a big step forward in my practice, because it allowed me to visually address ocean issues without needing access to the ocean. Before I began working with plastic scraps, I would have had to travel, scuba dive, and photograph plastic in our oceans in order to document the destruction of the oceans and implement that documentation into my artwork. With access to the refuse, I could photograph plastics in the studio, animate them, and use that footage just as successfully as real underwater documentation. All I needed to educate viewers on plastic pollution in the oceans was the source material and the ability to animate the material’s documentation into visual representations of scientific fact.

When I started making installations my second year, my goals included: 1) utilizing my new research on plastic pollution; 2) working with my newly discovered primary source material/documentation retrieval process; 3) using projections; and 4) creating immersive installations that activated and augmented viewer engagement. In Installations and Interactive Performance, a class taught by Dan Fine, I was able to test all of these goals. I worked on a series of collaborative, experimental projects that implemented projection mapping through Isadora. I wanted to eliminate the gallery space to maximize viewer immersion, and thus, engagement. To do this, my team and I projection mapped onto plastic inflatable structures that I built for viewers to enter.

**Project 3: Biomes – March 2017**

In the project, *Biomes*, my team and I projection mapped found video documentation of five major biomes onto a multi-chambered plastic inflatable that viewers entered (Figure 9).

**Materials:** Clear Recycled Sheet Plastic. 2 Carpet Fans. 3 Short Throw Projectors. 2 Audio Speakers. Isadora.
Scale: Installation Space: 30’L x 25’W x 18’H. Inflatable Object: 18’L x 8’W x 8’H

Marine Research Information: A biome is a large region of the planet that has a specific climate and houses specific types of biological species. The plants and animals of each biome have traits to help them survive in their particular biome. Each biome has many co-dependent ecosystems that are dependent on balance. This balance has been thrown off by anthropogenic activity in the tundra, forest, grassland, ocean, and desert biomes.

Objective:
- Create an immersive installation by projection mapping onto an inflatable structure that viewers enter.
- Use Isadora to control a time-based viewing experience through projection mapping.
- Utilize a performer to make the installation interactive, engage with viewers, and transfer information.
- Positively transfer information and educate viewers on Biome research.

Project Description: Viewers experienced the installation from inside the inflatable, one chamber at a time, by following a series of visual and audio cues (Figure 10). Viewers were prompted into the inflatable and through each chamber by one of my collaborators performing as an “environmental tour guide.” The tour guide stopped in each chamber to tell viewers about a specific biome, its importance, and a specific human threat affecting it. He then asked the viewers questions. While the tour guide engaged with the viewers on a specific biome, the rest of the collaborative team actively projection mapped video footage pertaining to that biome onto the occupied chamber. When the viewers moved to the next chamber, we switched our map
location to that chamber and the projected video content to the next biome (Figure 11). The entire viewing experience of traversing through five biomes lasted for 7-10 minutes.

Critique and Viewer Response:

- Having viewers experience the installation from inside a plastic inflatable worked to maximize the immersive quality of the experience by directing their attention and minimizing the surrounding gallery space in view. About 50% of each chamber was covered in high definition video imagery that immediately grabbed viewer gaze. The other half of each chamber was activated by secondary light and shadow, but because the plastic structure of the inflatable was clear, viewers could still see outside the structure to the surrounding gallery. This posed as a distraction from the imagery and information being delivered. Two major critiques arose from utilizing the plastic inflatable. First, the structural integrity of the inflatable (and thus installation space) was entirely dependent on a constant presence of a certain amount of air and air pressure. When viewers entered into, breathed inside of, and exited from the inflatable, the consistency of the air/air pressure fluctuated and threatened the stability of the structure. The air/air pressure could be made consistent by building a compression chamber at the entrance/exit of the inflatable. Additionally, the projections were mapped to the inflatable at its fullest and most consistent stance, so when the air pressure changed, the mapping was thrown off. Second, the actual composition of the inflatable structure needed to pertain to the concept of the installation or be hidden from view. Besides serving as visual and spatial dividers, the three chambers in this installation had no conceptual meaning and detracted from the viewing of the piece.
• The clear, recycled sheet plastic was an excellent material for projection mapping because 1) when backlit, it held an incredibly clear image on the front surface; 2) it acted as a conductor and moved non-specific light through any connected plastic to activate the entire inflatable structure. This was true even if the projected light was localized to one point; and 3) it acted as a reflector and refractor, activating the viewers and the surrounding space with shadows and distorted projector light. Noting that last point, I should carefully utilize dark or non-transparent sheet plastic in some places of any future structures; in addition to the clear plastic, this would help direct viewer attention and eliminate any recognition of the surrounding gallery space.

• Having a performer was extremely beneficial because it helped to 1) transfer specifically-scripted information in a fun and immediately accessible manner; 2) activate viewer participation by giving viewers the opportunity to ask questions and receive responses; and 3) move viewers through the installation at a specific pace. It is extremely important to note that the performer needed to be thoroughly versed in the drafted script and the knowledge being discussed to avoid giving false information and/or altering the installation’s pacing.

• Isadora was the ideal program for 1) projection mapping several video and audio sources onto multiple cylindrical, transparent, and fluctuating objects; and 2) actively reacting and creating visual and audio cues that corresponded to the pacing of a performer (who in turn was reacting to the audience). While giving the viewers an opportunity to ask questions about the information was a great way to encourage viewer participation and knowledge transfer, it 1) was dependent on having a team of people working Isadora in real time to control the pacing and synching of the supporting projected material with the
viewers; and 2) eliminated the possibility to firmly control how long the installation experience lasted. If I were to operate this installation myself, while on a specific time restriction, I would need to set up a time-constrained loop of the projected imagery that only required pressing start to run.

**Project 4: Bacterium Luminarium - April 2017**

In the project, *Bacterium Luminarium*, viewers explore a plastic world being consumed by the newly mutated bacterium, *ideonella sakaiensis* (Figure 12).

**Materials:** Clear & Black Recycled Sheet Plastic. Recycled PET Plastic. 2 Short Throw Projectors. Isadora.

**Scale:** Installation Space: 15’L x 15’W x 12’H. Inflatable Object: 13’L x 8’W x 8’H

**Marine Research Information:** *Ideonella sakaiensis* is a recently discovered species of bacterium that is able to enzymatically degrade and assimilate Poly[ethylene terephthalate] (PET) (Yoshida). PET, the chemical abbreviation for polyester, is a clear, strong, and lightweight plastic that is used globally for packaging foods and beverages. It is most commonly used to produce the bottles that contain soft drinks, juices, and water; virtually all water bottles are made from PET. Out of the 50 billion bottles of water being purchased annually, 80% end up littered in our environment and eventually make their way to our oceans. This mass disposal of PET into the marine environment has spurred the adaptation of microbes and has become a staple food source for these microbial communities. Screening and monitoring the biodegradation within *ideonella sakaiensis* shows that this microbe is the first bacterium able to use PET as its major energy and carbon source (Yoshida). To the naked eye, this adaptation seems to be a blessing for our species and environment, because it is the first documented instance of plastic being broken down and eliminated. However, there is currently no proof that this is actually a positive
occurrence. The theoretical biological implications of this discovery are unlimited since the bacterium’s byproduct, adaption rate, or effect on animals that consume it are entirely unknown.

**Objective:**
- Create an immersive installation by projection mapping onto an inflatable structure that viewers can enter or experience externally.
- Eliminate the gallery space to maximize the installation’s immersive quality and study the results.
- Create two separate viewing spaces within one installation space.
- Create animations of plastic-eating bacteria from photographs of plastic sculptures and project them into the plastic installation space to emphasize an abundance of plastic.
- Positively transfer information and educate viewers on ideonella sakaiensis.

**Project Description:** *Bacterium Luminarium* differed from *Biomes* in two major ways: 1) the entire gallery space was hidden from the viewer; and 2) the viewer could engage with the installation from both inside the inflatable and outside the inflatable, while still being immersed within a single, all-encompassing installation space (Figure 13). To build this installation space, I completely covered the gallery walls, ceiling, and floor with black, recycled trash bags so that no gallery surface was visible. In the middle of the space, I inflated a two-chambered, clear plastic inflatable structure with a tunnel that led to the exterior of the gallery space. Two projectors were used to projection map onto the inflatable structure and onto the constructed, black plastic covered surfaces. The animations projected were created to appear like active bacteria under a microscope. To experience this installation, viewers could enter into the gallery space and choose to explore the installation from inside or outside the inflatable.
Critique and Viewer Response:

Based on viewer response, this project was successful in creating a completely immersive environment that sparked engagement. This was due to the gallery treatment and the use of two viewing spaces.

- Because viewers were completely surrounded by a dark space constructed from black, reflective plastic, they could not be distracted by the gallery space or thoughts of a reality outside of the installation space. Viewers said being in the dark space gave the impression that the installation existed inside a sensory deprivation tank and made them forget about the outside world. This reality displacement freed viewers to let their minds wander undistracted and look at the projected animations activating the space. Disguising the gallery space also removed the need for the inflatable to have a specific shape that related conceptually. People weren’t distracted by the shape or searching its meaning, because they couldn’t see the shape. With no white walls to emphasize the inflatable’s structural outline, viewers could only distinguish the projected light interacting with the surfaces of the inflatable and bouncing through the space.

- Giving the viewers the option to travel between two different spaces within the same installation augmented interaction and engagement. This was further enhanced by constructing the inflatable out of clear plastic. The transparency allowed viewers inside the inflatable to watch viewers outside the inflatable and vice versa. In essence, viewers became a part of the piece, and interacted more with it as they interacted with each other.

- The biggest critique of this project was that viewers wanted sound. They said that the movement of the animations and the interaction of the projector light within space was
active in a way that emphasized a lack of sound. The focus drawn to this lack of sound made viewers want sound.

**Project 5: The PGC Project – May 2017**

*The PGC Project (Plastic Gyre Clean-Up Project)* was an interactive installation and immersive experience that educated viewers on gyre systems, the Great Pacific Garbage Patch, plastic pollution, and recycling (Figure 14).

**Materials:** Clear Recycled Sheet Plastic. 3 Carpet Fans. 4 Short Throw Projectors. 4 Audio Speakers. Isadora.

**Scale:** Installation Space: 30’L x 25’W x 18’H. Inflatable Object: 24’L x 20’W x 12’H.

**Marine Research Information:** An ocean gyre is a system of circular ocean currents formed by the earth’s wind patterns and the forces created by the rotation of the earth. The circular motion of a gyre draws debris into its center. Once debris enters the gyre, it is trapped and accumulates exponentially, because most of it is not biodegradable. For example, marine plastics do not fully break down; instead they break into smaller and smaller pieces called microplastics. As more and more plastics are discarded into the environment, plastic pollution concentration will continue to increase in gyres. The Great Pacific Garbage Patch, formulated by the North Pacific Subtropical Gyre, is the largest accumulation of ocean plastic in the world and is located between Hawaii and California. It is estimated that it has a surface area of 1.6 million square kilometers, an area twice the size of Texas. This amassment of plastic pollution poses a severe risk for the safety and health of marine animals, with unavoidable health and economic implications for humans as well.
Objective:
- Create an immersive installation by projection mapping onto an inflatable structure that viewers enter.
- Utilize a pre-recorded audio narrative and performer to make the installation interactive, activate viewer engagement, and transfer information.
- Apply the what was learned from Biomes and Bacterium Luminarium to make the experience as interactive and immersive as possible.
- Positively transfer information and educate viewers on gyre systems, the Great Pacific Garbage Patch, plastic pollution, and recycling research.
- Develop an Instagram account to instigate viewer engagement through a social media platform.

Project Description: Prompted by audio and visual cues, viewers were led in a circular motion through a gyre-shaped, plastic inflatable that was created entirely from recycled sheet plastics (Figure 15). Underwater documentation of marine life and plastic pollution was projection mapped onto the exterior of the inflatable, illuminating the installation space and activating the immersive experience. Unlike in previous projects, the team used a prerecorded audio narrative, in addition to a tour guide, to direct viewers through a segmented, viewing experience. The viewers experienced the information in this order: 1) an introduction to our oceans; 2) an emphasis on the beauty, power, and intrigue of our oceans; 3) why our oceans are important; 4) an introduction to plastic pollution; 5) what plastic pollution is doing to our oceans; and 6) what viewers can do to help stop plastic pollution (Figures 16-18). For each of these six information sections, viewers were led to another part of the gyre inflatable, where a new segment of underwater video documentation pertaining to that specific information was projected. Sections
1-5 lead the viewers though the tunnels of the gyre, and Section 6 existed in the very center of the gyre. This center was a large domed shape viewing space that had six separate projection maps covering all surfaces of the inflatable – completely immersing viewers in underwater imagery pertaining to plastic pollution. Additionally, the floor of this space was covered in recycled plastic products that were piled about shin high (Figure 19). During this segment, the audio narrative and the performing tour guide instructed viewers on what they could do to help stop plastic pollution. At the end of this narrative, viewers were instructed to take a piece of plastic from the center of the gyre, exit the installation, and recycle it in the recycling bins that were strategically placed at the gallery exit. The entire viewing experience took 9 minutes, and 10-12 people were allowed into the installation space each viewing. For this project, we tried to spark viewer engagement through a social media platform by creating an Instagram page: @thepgcproject. Viewers were invited to take and share images of their experience in our installation and use the hashtag #reversethegyre to prompt awareness.

**Critique and Viewer Response:**

- From the interior, the shape of the inflatable was very conceptually successful. As a gyre form, viewers were lead in a spiraling manner while they learned about the spiraling gyre currents. Viewers were trapped in the center of the gyre shaped inflatable with piles of plastic as they learned about how plastic gets trapped in the center of gyre currents. Viewers were completely surrounded by plastic when they learned about the outrageous amount of plastic that is inundating our oceans. Essentially, the shape of the inflatable helped to compound and repeat the information being delivered through multiple physical senses. Additionally, the shape of the inflatable - being cylindrical - helped maximize surface coverage for projection mapping, which aided in the creation of a completely
immersive environment. The inflatable was not as successful from the exterior. The inflatable was set up in the center of the gallery space and viewers had to be lead through this space to enter into the inflatable. The exterior did nothing to aid the concept of the installation. The gallery space should have been treated like the gallery space in *Bacterium Luminarium*.

- If this project were to be exhibited in a public gallery, it would need to adhere to ADA Fire Code standards. For ADA standards, every entry point and tunnel path within the inflatable must be at least 32”- 48” in width. For Fire Code standards, the inflatable must have two exit points. The gyre inflatable did not follow either of these standards because the beginning tunnel path was built for viewers to crawl through, and the entrance and exit were the same point. Building a structure to these standards would provide a better viewing experience for a wider audience, augmenting information accessibility.

- The air pressure of the inflatable fluctuated as people interacted with it because the entrance was built without an airlock section. As discovered in *Biomes*, maintaining a consistent air pressure in the inflatable is dire to the safety of viewers and the projection maps. In future inflatables, an airlock must be created at all entrances that 1) does not detract from the conceptual composition of the structure; and 2) can be easily used by viewers.

- Having the audio narrative, in addition to the performing tour guide, was a successful duo because 1) they both prompted viewers through the installation in the necessary time limit; 2) they initiated viewer engagement; and 3) they aided in information transfer. Having surround audio sound also helped to make the space feel more immersive.
• Air was pumped into the inflatable by three carpet fans, which were attached to plastic tubes adhered to the inflatable at three separate airduct locations. The locations where the air passed through these tubes and entered into the inflatable became an area of interest to viewers because sound and movement was produced. The tubes snapped back and forth, and loose plastic rattled on the airducts due to flaws in the structural engineering of the inflatable. The pumping air was forced to interact with the plastic in a conflicting and constrained manner. This was a happy accident that breathed life into the material and created a new option for producing sound and repeating concept. In the future, the tubes and airducts could be designed to experiment with and emphasize that sound. In addition to being visually surrounded by it, being able to hear the plastic could help viewers understand the overwhelming quantity of plastic waste in our oceans.

• Needing to manually change the mapped projections in synch with the prerecorded audio script left room for error. The wrong video was sometimes projected or it was projected too late. This could be avoided by synching the audio and visuals within the same program, and programing all information to run on a narrative loop.

• Having a specific, time-restrictive viewing experience was both good and bad. It was successful because the strict narrative and time limitations allowed for a very precise information transfer during the experience. However, it limited the amount of people that could experience the installation. Having the narrative on an ongoing loop could allow more people to enter into and exit the installation at their own speed, but this could also dilute information transfer.

• Having a tactile experience within the installation that directly related to the concept was successful because it created a hands-on learning experience for viewers. When viewers
were asked to recycled a piece of plastic from the center of the gyre, the learning style switched from passive to active. For children participants, this active viewing and learning aids in cognitive processing and understanding. In one of the viewer groups, a toddler picked up a Tide detergent container bigger than herself. As she dragged it out of the inflatable and to the recycling bin with her father, she said, “We’re going to save the fishes!”.

This was proof of tangibility aiding in information transfer.

- The composition of the narrative script, in conjunction with the accompanying visual images, was crucial in educating viewers on the problem of plastic pollution without inducing ecophobia. Section 1 introduced the ocean to viewers through beautiful underwater seascapes. This positively enchants viewers and captures their attention. Section 2 emphasised the beauty, power, and intrigue of our oceans by displaying large sea creatures and ship wrecks. This maintained the initial enchantment and instigates curiosity. Section 3 discussed why our oceans are important by showing closeups of colorful coral reefs and the vibrant, smaller animals that live there like. This maintained attention, curiosity, and instigated admiration and empathy towards the beautiful and intriguing marine species. Section 4 was an introduction to the problem of plastic pollution, paired with visuals of solely plastic floating in the deep sea – void of any animals or seascapes. This sudden change from vibrant texturized seascapes and animals to disgusting inanimate objects floating in dark water made viewers 1) pay attention to the plastic objects; and 2) long for the return of the previous imagery. Section 5 discussed what plastic pollution is doing to the oceans and was paired with images of the same seascapes and animals from sections 1-3. The difference in this section was that those seascapes and animals were covered, entangled or harmed by plastic. Merging the
positive imagery with the new negative imagery activated the viewers’ earlier-created empathy for sea life and instilled a new-found dislike of plastic. Viewers saw the species and seascapes, remembered what they looked like initially, comprehended what they look like covered in plastic, and had a general response to long for the initial state where plastic did not exist. Section 6 discussed what the viewers can do to help fight plastic pollution, while showing further footage of plastic inundating our oceans and its species. Giving the viewer these tools immediately following their newly-formed longing for the original, healthy ocean and species, allowed viewers the opportunity to act in a positive way. In short, manipulating the viewer through very specific information and accompanying visuals, allowed me to control the negative responses of the viewers to a degree that avoided ecophobia, but still transferred negative information.

- Our attempt to include social media as another form of engagement was just that: an attempt. It existed, but didn’t really have a negative or positive response for the installation experience. We had a hard time getting people to interact with our page, even though we gave them many prompts and opportunities before, during, and after the installation. A few things that could have helped include: 1) making the page more active for a longer period of time before the exhibition began; 2) making the page more active during the exhibition; 3) including more posts that involved information transfer and viewer interaction (ex. trivia, puzzles, etc); 4) building specific segments into the installation narrative where viewers were prompted to photograph themselves and what they were experiencing in the space; and 5) having an external, wall assemblage/installation outside the gallery in the waiting area specifically built for viewers to get their pictures taken in front of.
Each project produced in Interactive Installations and Performance influenced my thesis research and I considered *The PGC Project* to be the pilot study for my MFA thesis show: *PLASTICITY: Our Changing Oceans.*

**Project 6: PLASTICITY: Our Changing Oceans – March 2018**

The project, *Plasticity: Our Changing Oceans*, was a large-scale, interactive installation that engaged and educated viewers on the threat of plastic pollution in our oceans. This installation specifically focused on how plastic is affecting marine invertebrate species and emphasized the contribution a singular community can have towards the global problem (Figure 20).

**Materials:** Clear & Black Recycled Sheet Plastic. 4 carpet fans. 5 short throw projectors. Isadora.

**Scale:** Installation Space: 46’L x 25’W 18’H. Inflatable Object: 182’L x 14’W x 12’H.

**Marine Research Information:** Human beings across the globe produce 300 million metric tons of plastic annually, and 12.7 million metric tons of that plastic finds its way into our oceans each year – an amount that is expected to triple by 2025. The plastic pollution epidemic is one of the most prominent and immediate human threats to our oceans because plastic is indestructible. It can be broken down into microscopic pieces - called microplastics - but it will never fully deteriorate. Our oceans are filling up with plastic trash that chokes marine life and devastates vital ecosystems. It is causing the rapid global decline of marine biodiversity. Evaluating the effect of plastic on marine invertebrates - animals that lack a backbone, such as crabs or giant squid – is critical to understanding marine biodiversity’s decline. Marine invertebrates make up 97% of all species on the planet and sustain both marine and terrestrial ecosystems. They are now endangered because they involuntarily ingest microplastics. Our oceans are changing
because our plastic pollution is threatening the existence of marine invertebrates. Without these species, it is doubtful that we as a species can survive.

**Objective:**

- Create an immersive installation by projection mapping onto an inflatable structure that viewers enter and/or view externally.
- Build the inflatable to augment and work with the projection mapping by using clear plastic where mapping would occur, and black plastic where it wouldn’t.
- Apply the what was learned from *The PGC Project* to make the experience as interactive and immersive as possible.
- Positively transfer information and educate viewers on how plastic pollution is afflicting marine invertebrates and causing the decline in marine biodiversity.
- Create two separate viewing experiences: one that is deliberately meant to be viewed as art and one that is meant to be viewed as a scientific and educational tool.
- Make viewers understand 1) the overwhelming amount of plastic that is polluting our oceans; and 2) the amount of plastic that Iowa City contributes to that pollution by building the entire installation from plastic recycled from Iowa City.
- Build the installation to ADA and Fire Code standards.

**Project Description:** The installation and its inflatable structure were constructed entirely from recycled plastics that I collected from the University of Iowa’s campus and the surrounding Iowa City community for two years. The inflatable had four separate chambers that spanned between 7-14 feet high by 8-12 feet wide, and were connected by 182 feet of winding tunnels (Figure 21). The walls of the inflatable were illuminated with projections of coral reefs, deep-sea life, floating
marine plastics, and marine invertebrate animations in a narrative fashion (Figure 22). The marine invertebrates displayed were animated photographs of the Blaschka Invertebrate Models from the National Museum Ireland Natural History in Dublin, Ireland [discussed in detail in Section 3 (Figure 23). The visual narrative loosely introduced viewers to marine invertebrates and then to plastic pollution. Section 1 introduced viewers to individual marine invertebrate species; Section 2 exhibited groups of invertebrate species interacting with larger ecosystems; Section 3 showed videos of plastic pollution afflicting marine species; Section 4 showed documentation of solely plastic in the ocean. The projected imagery ran on a continual loop with no prerecorded audio narrative so that viewers could experience the installation at their own pace. Found audio recordings of scuba divers breathing through regulators underwater were played in surround sound and could be heard from all locations in the inflatable. The actual inflatable structure was manipulated so the air interacted with the plastic, tubes, and air ducts to create further sound. The installation could be experienced from inside the inflatable, or from outside the inflatable. Walking through the inflatable felt like being in a tunnel aquarium, where one could witness the vibrant, undulating marine world and its inhabitants (Figure 24). From the exterior, the inflatable acted as a living, breathing specimen spawned from wasteful habits; it became an artifact of the local community’s consumption of plastic products (Figure 25). From either location, viewers could see other viewers walking in the opposing space and watch their figures interact with the projected imagery.

This project was present in two separate viewing styles. First, it was presented exactly as stated above. Viewers walked through that installation at their own pace and experienced the loose visual narrative. The second viewing style was set up as a school tour. I collaborated with Twain Elementary School and Williamsburg Extended Learning Program to take groups of 4-6th
graders through my installation space. Here, I performed as a tour guide and presented
information about what was being viewed in each section. After the tour, students were allowed
to go back into the installation space on their own with coloring supplies and were asked to draw
the invertebrates in the scenes that they saw projected (Figure 26-31).

Critique and Viewer Response:

- The door to the inflatable was a challenge. I tried to make an airlock entrance and exit to
  allow people to enter and exit the space on their own without deflating the entire
  installation. However, my signage prompts instructing how to enter and exit the inflatable
  were not able to ensure that the airlock doors were utilized properly. I ended up using
  volunteers to stand at the entrance and exit to operate the airlocks for viewers.

- Making the installation to ADA and Fire Code standards provided a better viewing
  experience for a wider audience, augmenting information accessibility and interactivity.

- The inflatable structure was successful in working with the projection mapping.
  However, the clear plastic that was situated and mapped as major viewing screens were
  only partially successful. These areas allowed a clear image to be viewed in an
  intentional location; however, they were too transparent and also allowed viewers to see
  the gallery space and equipment outside the inflatable structure. Two things could be
done to help this: 1) the clear surface could be built with more blemishes and layers so
that the projected image is broken up into a more three-dimensional space. This would
make the surface area more interesting and also hide the external gallery through light
and image distortion; and 2) The exterior gallery (walls, ceiling, and floor) could be
  treated in the same manner as Bacterium Luminarium. The external gallery and
equipment was extremely distracting and either needed to be eliminated or made a part of the installation.

- Creating an interior and exterior viewing experience within the same installation space forced viewers to actively engage with the space in an explorative way. This also allowed viewers to become a part of the installation, watch other viewers become a part of the installation, and interact with other viewers from both spaces.

- Creating two separate viewing experiences was an interesting experiment. When I performed as a tour guide, viewers were less interested in the projected visuals and more interested in the facts I was presenting them with. The installation became a backdrop for the information. Because of this, the installation was unsuccessful as a work of art and more successful as an educational tool. When I allowed viewers to explore the installation without any scientific information, they were not able to fully understand what they were seeing. Here, the installation was a successful work of art but it did not transfer all the information I wanted viewers to walk away with. Does artistic value matter if my goal is to positively transfer, negative scientific information?

- I overheard a woman say to her husband, “Wow, can you believe all this plastic came from here? There’s just so much it is overwhelming!” If I wanted to prompt any reaction to this project, that was it. I wanted viewers to recognize the material as recycled plastic, understand that it was locally sourced, and be overwhelmed by the amount. If viewers could understand that - and at least one of them did - then they would be one step closer to understanding the severity of the plastic pollution epidemic in our oceans.
Exponential Growth, Cavern Dive, Biomes, Bacterium Luminarium, The PGC Project, and PLASTICITY: Our Changing Oceans served as vital studies in my quest to understand how art and marine ecology can be combined to circumvent ecophobia in environmental education. Moving forward, I need to apply these findings to my art in order to positively transfer any negative information concerning anthropogenic threats to our oceans.
In the summer of 2016, I took my inquiries on ecophobia to Western Ireland. While there, I discovered the Blaschka Invertebrate Models - glass replicas of marine invertebrate species - housed at the National Museum Ireland - Natural History (Figure 32). These models were the physical embodiment of my desire to combine art and marine science for the purpose of education. I was immediately enthralled with their existence as historical scientific tools and masterful works of art.

In the 19th century, Natural History Museums sought to glorify God’s creations by displaying as many different species as possible. However, the collection and exhibition of invertebrate marine species challenged this goal due to the effects of necessary liquid preservation techniques. The fluid chemicals used for storing invertebrate marine species diluted their color and slowly disintegrated their tissues and form. The work of Leopold Blaschka and his son, Rudolph, offered a new and improved technology for displaying marine specimens. As glass craftsmen, the Blaschkas developed an experimental, artistic approach to model construction that continually evolved throughout their lives. Utilizing glass, their models accurately captured every minute detail and each fleck of color a species had to offer, while also demonstrating enlarged versions of specie’s natural size. In addition to their anatomical and visual exactness, the glass models were fashioned in a suspended state of movement, implying the illusion of life. The Blaschkas also formed a number of dissection models where species were cut open to reveal their internal anatomy. All models became an invaluable educational resource for young biologists and zoologists.

Due to their meticulous detail, artistic mastery, and value as scientific tools; museums, institutions, and universities worldwide commissioned models by the late 1880s. In time, with
the commencement of ocean life surveys, underwater photography, and other advancements in technology, these models became outdated, were placed in storage, and most collections were forgotten. Presently, these Blaschka models have established a renewed value and are seen collectively as a relic of marine biodiversity - spurring the exhumation and preservation of collections worldwide. In fact, re-galvanizing these collections is now a matter of both preservation and conservation. The immaculate accuracy of the models establishes them as a precise marker of a decline in marine biodiversity since the 19th century, and as such, makes them a viable tool for educating the public on natural and anthropogenic threats affecting our oceans.

Ireland has the largest collection of models in the world. A total of 952 models exist in six separate collections across the country. The Natural History Museum in Dublin houses the largest collection of Blaschka Invertebrate Models in Ireland, and one of the largest collections globally. In the summer of 2016 when I first encountered this collection, I discovered that the majority of it was not properly documented, catalogued, or open to the public. As I researched further, I discovered this to be true of most Blaschka collections worldwide. I could not understand why these objects were not being celebrated. I full heartedly believed that they deserved to be preserved and shared with the public because they are:

1) Artifacts of museum display techniques, scientific tools, and glass-craftsmanship methods from the Victorian era;

2) A physical record of education systems utilized in both the academic and general public spheres of the Victorian era;

3) Masterpieces of Art created through techniques that still baffle experts in the field of glass;
4) Still considered to be excellent tools for research students studying the anatomy and behavior of marine invertebrate species due to their truthfulness as replications;

5) A physical, visual archive of marine biodiversity in the 19th century; and

6) Potential tools for educating the public on a decline in marine biodiversity due to natural and anthropogenic threats.

The models stand today as stunning documents of marine biodiversity, and as such, remain a wholly underappreciated tool for educating the public on natural and human threats to biodiversity in our oceans. In some cases, specific models are the only accurate replicas of now extinct marine invertebrate species. Understanding marine invertebrates is critical to understanding and acknowledging a decline in marine biodiversity. Marine invertebrates make up 97% of all living species in the world, sustain both marine and terrestrial ecosystems, and are endangered due to human threats such as pollution, overfishing, climate change, ocean acidification, habitat degradation, and invasive species. Propagating this knowledge is both timely and necessary because without significant change, according to UNESCO, more than half of the world’s marine species will stand on the brink of extinction by 2100. Furthermore, it is doubtful that we as a species can survive without marine invertebrates because they are the foundation for essential food chains and ecosystems. The models offer a unique opportunity to communicate this crucial, timely message. As masterful works of art, they instill a sense of wonder in viewers. As science artifacts, they prove a decline in marine biodiversity. I believed that this duality could be used to positively and creatively educate the public on threats to our oceans.

Before I left Ireland in the summer of 2016, I met with the Keeper of the National Museum of Ireland – Natural History, Nigel Monaghan, told him my beliefs, and asked him to
allow me to help document and preserve his collection. I volunteered to properly photograph the models and organize all historical documents and ledgers so that a digital archive and catalogue could be produced. In exchange, Mr. Monaghan gave me permission to legally use and or publish all images that I produced as long as I gave the museum credit. Since this exchange, I have been working with the museum to photograph, catalogue, and research their collection in an effort to standardize the digital preservation of Blaschka models worldwide.

In both 2017 and 2018, I moved to Ireland from May to August and worked at the National Museum of Ireland-Natural History and University College Dublin. At the museum, I worked under Nigel Monaghan, Keeper of the Natural History division; and Paolo Viscardi, Curator of Zoology and assistant Keeper of the Natural History division. At University College Dublin, I worked under Dr. Emmanuel Reynaud, a biomolecular scientist, Blaschka specialist, and founder of the Blaschka Dublin Project. Collaboratively, we developed a standardized method for photographing and documenting all models, and published our research. The purpose of this photographic standardization was to accurately represent each model through a series of standardized image formats that A) utilize color profiles for accuracy; B) provide taxonomical reference; and C) highlight physical damage to each model. Eight standardized image formats allowed us to 1) capture each model in its entirety for taxonomical reference; and 2) document the current physical state of each model for conservation and research purposes.

As historical artifacts, the Blaschka models exist in varying physical states of material stability. These states can be classified by the type and number of cracks visually present on the glass surface and throughout the form of each model. Knowing the level of material stability and the amount of damage present in a model can help curators and conservators to store and display that model without compromising its longevity. While the models are damaged by chance,
storage, transportation, and human impact, they are more commonly altered by their environment because of their main compositional material: glass. Glass is highly susceptible to deterioration over time depending on the relative humidity of the surrounding environment. The sodium and potassium oxides within glass absorb moisture from the air, triggering a corrosive process that deteriorates the surface of the glass object. The rate of deterioration is directly related to the amount of atmospheric water interacting with the surface of the glass. As moisture is absorbed, the visual quality of the glass surface transforms: its transparency and opacity shift to higher percentages, droplets might form, and microcracks appear and spread. Eventually, these microcracks weaken the mechanical strength of the glass and cause the structural integrity of the object to fail. In specific relation to the glass of the Blaschka models, the level of visual surface deterioration on each model can serve as a signifier for that model’s level of material stability, or instability. Knowing the level of stability of a model based on its level of visual corrosion can help to identify what environmental conditions should be applied for the storage and/or display of that model. Specifically, this information can help curators and conservators more accurately assess the appropriate relative humidity at which to store and display a model that exhibits moderate to severe signs of instability.

Following the development of this photographic standardization, I began to document the entire Blaschka Collection at the National Museum of Ireland – Natural History. The images I produced served as ignition for extensive research into the Blaschka models. We began to write and distribute articles on specific phylums represented in the collection, how the models were made and with what materials, steps for glass conservation, and how the models differentiated between the European collections held in London, Liege, Strasbourg, Utrecht, Vienna, and Geneva. At the same time, I continued my own line of research. For each model that I
photographed, I investigated the invertebrate that it represented. I researched each invertebrate’s health status; the human threats affecting each invertebrate (specifically focusing on plastic pollution); what is being done to stop these threats; and what the general public can do to help stop these threats. In the Spring of 2018, I applied this research to the narrative of my project *PLASTICITY: Our Changing Oceans*. I animated my photographs of the Blaschka models and projected them in conjunction with underwater documentation. While this served to educate viewers on plastic pollution and its effects on marine invertebrates, displaying the Blaschka images in this way did not give the collection appropriate recognition. After this show, I decided to extend my MFA program an extra year so that I could continue my Blaschka research and determine the best way to exhibit my documentation of the collection.

Initially, I was adamantly against displaying my documentation of the Blaschka models as photographs because it has been done (and done better than I could ever do). Starting in 2013, Guido Mocifico, a photographer considered to be a contemporary master of still life, photographed a selection of Blaschka models from all European collections. Using his own unique style, he illuminated each model against a stark background to highlight its clear, colored, and painted glass. In an interview with *Aesthetica Magazine*, Guido explains,

“If you look at my photographs, I am not creating a still replica I am just reproducing the models with a light technique that is purposefully not intrusive by me. This light is not a photographic light – the viewer does not know where it comes from – but it is to appear that the light comes from the object itself. It is as if the creature has its own light coming from within itself”(13).

As the interviewer points out, the result of this lighting method makes the models, “both hypnotic and surreal, to the extent that the audience is perhaps unsure of whether they’re seeing
the real object itself, a photograph or an imagined artifact” (13). This is where I have conflict with Mocifico’s work. He is breathing life into the models, which I applaud, but it is false life. The resulting images are neither accurate representations of invertebrates, nor accurate documentation of the actual models. Light gives the illusion of life, transforming the models from scientific tools to printable works of art. Guido explains,

“I am very interested in illusion. . . we end up in an absolute illusion because I mystify the viewer and I make them believe they are looking at jellyfish, when they are actually looking at glass models. If the viewer was not told that the creatures/plants in my photographs were glass models of the real thing, they would believe them to be the creatures/plants themselves” (13).

Uncontestably, Guido’s photographs are incredible works of art. However, that is where the viewers interpretation stops. In my opinion, Guido’s application of illusionistic beautification changes a model’s appearance and limits its educational potential. In a way, this limitation is incredibly similar to the censorship that was applied - in fear of ecophobia - to the visual imagery of the oceans used in environmental education. In both cases, the produced visual imagery is a glorification of beauty that minimizes information transfer. In the end, when looking at Guido’s images, viewers are intrigued by the striking specimen and appreciate each photograph as a stunning work of art.

When I began working with the Blaschka models, I knew I wanted my documentation to honor the legacy of the collection and to function as an aid for conservation, preservation, and historical and cultural and scientific research. The photographic standardization achieved this. I also knew that I wanted to use my documentation in my art as a visual tool to educate viewers on the marine invertebrates that each model represents. I was highly unsure of how to do this
without ending up like Guido. For *PLASTICITY: Our Changing Oceans*, I learned how to animate each documented model so that they appeared to be existing in or swimming through water; and then projected those animations onto the inflatable and into the installation space. My animation capabilities were not adequate enough to transfer information to viewers – they just existed as visual imagery.

Since this attempt, I have been working on animating each documented model to move like its actual invertebrate moves in nature. I have been utilizing *WoRMS* (World Register of Marine Species) and studying underwater documentation acquired from my dive community to recreate accurate movements for each invertebrate species. My goal is to place these animations within a projected marine environment to give viewers a glimpse at an accurate marine realm.

**Project 7: PLASTICITY: Microplastics and Mutations – March 2019**

*PLASTICITY: Microplastics and Mutations*, was an immersive installation that showcased my photographs of the Blaschka models in order to address how plastic pollution negatively affects marine invertebrates and causes biological mutations (Figure 33).

**Materials:** Clear Recycled Sheet Plastic. Clear & White PET from recycled bottles. 4 Short Throw Projectors. 4 Audio Speakers. Isadora.

**Scale:** Installation Space: 21’L x 30’W x 18’H.

**Marine Research Information:** Microplastic pieces of plastic waste floating in our oceans are sticking together to form larger pieces, potentially posing a risk to animals and starving deep-sea ecosystems. Microplastics measuring 5mm or less are being fused together by exopolymers, a type of tacky biopolymer secreted by organisms such as bacteria, microorganisms, and algae. It has been found in studies that the biopolymers envelop or engulf the microplastic particles,
which causes the plastics to agglomerate into clumps called agglomerates (Summers).

Microplastics are 100-200 times smaller than the individual bacteria and are not visible to the naked eye. When they are incorporated into the agglomerates, they become large enough to be seen, meaning they are more likely to be seen as food sources to marine invertebrates. While consuming plastic is terrible from digestion standpoint, it is more worrisome from a consumption standpoint. Microplastics pull and maintain pollutants from the water into their material forms. With the formation of these larger clumps, the level of toxicity increases. It is completely unknown what a highly condensed level of toxic pollutants will do to the life cycle of the bacteria formulating the clumps, let alone the animals that will consume them. However, toxic waste causes mutations in the species that consume it, so one can assume that mutations will occur in species that consume these agglomerates.

**Objective:**
- Apply what I learned in Projects 1-6. Specifically, address the problems encountered in Project 6.
- Divide the gallery space in half by building a wall from recycled plastics.
- Eliminate the known gallery space to create a completely immersive experience by covering the entire room in recycled plastic.
- Make each surface covered in plastic resemble the geological formation of the natural and distinct reef stratification.
- Design structural units from harder recycled plastics to resemble mutating cells to support structural forms within and on the sheet plastic wall and surface structures.
- Create a structure that blocks light from the entrance and exit points.
- Build the installation to ADA and Fire Code standards.
- Back-light the main wall by utilizing Isaodora to projection map animations.
- Project animations of the Blaschka models mutating.
- Utilize a pre-recorded audio of plastic interacting with water, air, and solid objects.

**Project Description:** The installation space was constructed from recycled sheet plastic, bottles, containers, and milk cartons I collected from the University of Iowa’s campus and the surrounding Iowa City community. I did not alter the structure of the recycled sheet plastic. The bottles, containers, and milk cartons I cut into 1/8\textsuperscript{th} inch rings. I connected these rings together into flattened cell-like structures, that I shrink-wrapped using the sheet plastic. These forms became structural units that I used to give volume to the sheet plastic within the installation space. The focal point of the installation was a concave wall that measured 30 feet long by 18 feet high (Figure 34). This wall was built by layering the sheet plastic with the ring units to achieve a surface that was both translucent and structural, undulating horizontally and vertically in an organic manner. To further this visual movement, two fans were placed behind this wall so it swayed to create a changing natural environment. To contain light bleeding into the space from the gallery entrance, a structural tunnel was built to lead viewers into the space and dissipate light intensity. I constructed this tunnel by welding a metal skeletal frame that was 15 feet high, 9 feet wide, and 14 feet long, and covered it in the recycled plastics. Using two projectors, I projection mapped two video animations onto the back of the main plastic wall so it was backlit in the installation space. I used a third projector to projection map two separate animations onto the front gallery wall and the front of the tunnel structure. I used a fourth projector to projection map three separate animations onto the side of the tunnel structure, the back wall of the gallery, and onto plastic that was covering the large gallery window.
Each animation used in these projections was composed from three digital elements: 1) video recordings of melting shrink wrapped plastic; 2) photographs of the Blaschka Invertebrate Models from the National Museum Ireland Natural History in Dublin, Ireland; and 3) photographs of plastic purge scraps. Each individual video recording of the melting shrink wrapped plastic was animated and manipulated to look like mutating cellular material. Each individual photograph of a Blaschka model was animated to move like the species it represented. Each individual plastic purge scrap was individually animated to move like a microplastic floating in the ocean. The individual animations were then layered and reanimated into eight final animations that built off of one another. The first animation contained forty layers of animated objects, and the final layer contained 264 layers of animated objects. All eight layers exhibited the same content: a mutating cellular or cave-like setting that had marine invertebrates and microplastics floating through the space on a continual loop (Figure 35). Each day the exhibition was open, I projected different variations of these animations into the space so that viewers could experience the installation space multiple times and witness a sense of growth, mutation, and change. Additionally, four separate sound systems were employed at various points outside the installation space (behind the plastic). Each sound system played the same audio file at a different speed and at a different volume so that the sound never matched up and generated a sense of cavern-like space and echoed space within the installation. To create the audio file, I used contact microphones to record the sounds produced when I manipulated various types of plastic. I then edited those separate recordings together, applied a reverberation effect, and layered a second recording of a regulator being used by a scuba diver underwater. The final audio file sounded like plastic detritus being floated, drifted, and bashed around in ocean currents.
Critique and Viewer Response:
- In Project 6, the areas of plastic that were backlit with projections were only half way successful, because their transparency allowed viewers to see the gallery space and equipment on the other side of the wall structure. To fix this in Project 7, the plastic surface was built with more blemishes and layers so the projected image was broken up into a more three-dimensional space. This made the surface area more interesting and hid the external gallery space and equipment through light and image distortion. Additionally, the exterior gallery (walls, ceiling, windows, and floor) were covered in black plastic to de-intensify light reflection and further distort the external space. The black plastic was applied in shapes that mimicked the undulating shapes within the installation space to ensure it related to the composition of the installation space if it did happen to be seen. This treatment of the space was successful in hiding the exterior space. However, the black plastic that overlapped into the installation space could be pushed further. Most of the black plastic was flat against the walls, but I think these shapes should have been built up into structural forms so that they have more of an impact on the atmosphere of the space.

- I further altered the known gallery space through the construction and placement of the main plastic wall. The placement of this wall in the middle of the Drewelowe Gallery confused viewers to an extent that they forgot they were in the Drewelow Gallery. This wall was also built at angles that influenced the viewers’ read of the space – the bottom of the wall angled into the space and away from the side walls, making the space seem larger and more encompassing than it actually was.
• I tried to achieve a completely immersive space without having a completely enclosed structure (as I did in Project 6) through light play. I do not think this was successful. The amount of light passing through the main wall and bouncing off the plastic structures - while beautiful and interesting - was not enough to flatten the gallery signifiers (the lights and architectural elements). Being able to see objects that signified the space as a gallery disrupted the illusion of a completely immersive space. I could fix this by either constructing a full ceiling so that the installation space is fully enclosed, building sculptural elements around those signifiers to hide them, adding a fifth projector that covers the ceiling, or attempting to create more light bleed from the four projectors already present.

• The structural entrance of Project 6 was the most complicated and unsuccessful element of that project, because I tried to build the skeletal frame out of recycled materials. This entrance was unsafe, not easily accessible, and did not keep outside light from entering the space. For Project 7, I spent a lot of time working on a design that would correct these issues. I welded a metal skeletal frame that was safe, sturdy, easy to navigate, and did not require viewer operation. The frame was built to ADA and Fire Code standards, and was fabricated in a shape that conceptually fit with other elements of the installation’s composition. The frame was then covered in black plastic to prevent outside light from disrupting the installation space, as well as to relate it to the other black shapes that had been applied to the gallery walls. This structure was not only successful in correcting the problems from Project 6: it also introduced a new element into my work. This entrance acted as a portal between the outside world, and the immersive atmosphere I presented in the installation. Viewers transitioned from the white natural light outside the gallery
through the dark space of the tunnel, and were reintroduced to a new, artificial, and all-encompassing multi-colored light when they entered into the installation space. Walking through this structure made me feel like I was diving through a tunnel and emerging on the other side in an illuminated cavern. To viewers who did not know what to expect on the other side of the tunnel, the structure helped to reframe their interpretation of the space through reality displacement. The only thing that was not successful about this entrance was the use of black plastic on its exterior. It was the only black form in the space that had a definitive structure, and it did not reflect a clear projected image. If the other black plastic forms in the space had been structural as well, it might have worked compositionally; however, it would not have produced a successful surface for the projections. For the final presentation of this piece, I covered the entrance structure in the clear/white recycled plastic and the ring unit structures, and then re-mapped that structure with its own animation.

- When I initially set up the space, I only had three projectors. I had to add a fourth projector in order to activate all of the walls and structural elements within the space. There was still a space within the installation that was not activated by projections, but it did have light reflections and light bleed from the other projectors reacting mutedly with its surface. I tried to add mylar and LED lights in areas of this wall to maximize the light play, but it did not work. If I were to do this again, I would need to determine another arrangement for the four projectors so that all areas of the installation were activated with projections; another option would be add a fifth projector. The projection mapping worked well with the main plastic wall because it was back lit. Details in the animations projected are much clearer on the plastic when back lit. Objects made out of plastic that
were lit from the front in the space were not as successful in translating that detail to the viewers. I think this could be improved by using matte and solid white plastic instead of the translucent clear-white plastic, or by adding white paper under the clear-white plastic. The projections that were on the surface of the gallery walls themselves transmitted all details in the animations. However, these projections appeared to have a lower level of intensity (both in color and brightness) compared to the projections on the plastics. The intensity levels could be adjusted by changing the settings on the projectors or by editing the animations to counteract this issue.

- This was the first time I attempted to make my sound work conceptually with the installation. The sound file by itself, on one speaker, did not achieve the atmospheric quality I wanted. I knew I wanted sound emanating from different locations, at varying volumes, and at altering speed frequencies so that it would surround the viewer, and alter the viewing experience, depending on body placement. I ended up using four speakers that were placed at varying distances outside of the installation space, but still within the gallery. It was completely unintentional and a happy accident that the sound echoed throughout the gallery in the way that it did. The acoustics of the Drewelowe Gallery are irregular and added an atmospheric quality to the sound. Sound waves were transmitted clearly, mutedly, and incompletely, formulating echoes and chance repetition. From inside the installation space, this aleatoric movement of sound suggested the instillation was enclosed and submerged, while also implying that there was an additional cavernous space existing beyond the installation space. In my critique with Photography Graduate Workshop, my colleagues recommended that I could further this implication of an additional space by adding moments of silence at alternating time codes on the audio file.
This change disrupted the known point of origin for each sound source, making the “other” space seem larger and atmospherically more complex than it was in reality.

- I was not happy with my animations of the Blaschka models in Project 6, because the animated digital objects did not feel like they were underwater. To make each animated object appear like it was submerged in the ocean for this project, I: 1) altered the movement of each animated object (in its entirety) through special displacement so that there was a secondary movement implying the object was stuck in the ebb and flow of an oceanic current; 2) manipulated the levels of opacity and brightness of each animated object in an unstructured, temporal manner to reference how light travels through water and reacts with surfaces in the water as it travels; 3) built an implied liquid from recordings of plastic being shrink-wrapped for these animated objects to exist and interact with. Each of these recordings were heavily edited so that only the darkest linear details were present, and then they were layered in-between the animated objects at fluctuating and low opacities; 4) fabricated environmental structures that could interact with the animated objects in an everchanging oceanic environment. I created these structural shapes by masking specific details from the shrink-wrapped video recordings, altering their opacities and coloration temporally, and layering them in between the main animated objects. I was much happier seeing these animations as videos on a monitor. They were atmospheric and layered in a way that felt three-dimensional. Every detail of every modified layer could be viewed and appreciated. When projected into the installation space, this detail was lost and the animation was flattened. While these animations were far more successful than those used in Project 6, the amount of time and
intentional detail did not carry through when projected. Because of this, the animations looked unfinished or rather, unfitting for the space. I do not know how to fix this.

- Tim Barrett critiqued, “One issue with the installation is the amorphous changing nature of the entire piece. Up until the reception opening, major changes were being made, and the piece never was presented to the committee as complete. There are some parallels between this need to experiment creatively, and how to most effectively get the viewer to sense the same urgency as the artist does. How would you address this need to constantly refine and question the decisions you are making with the installation?”

  - The changing animations in the installation were intentional. I wanted the installation to exist as a new piece each day to 1) allow viewers to experience the installation multiple times; and 2) allow the concept of growth, mutation, and change to expand beyond a single viewing of the piece. Unfortunately, because of the installation’s dependency on the projections, and the projections’ dependency on the structural components within the installation, the installation needed to be changed as I changed the animations. Besides the entrance point that had fallen apart right before my committee meeting (because of a viewer who had slammed the door and dislodged the plastic), what I presented to the committee was the finalized version of the project. I did not do a good job explaining why I was changing the animations, nor defending why I was showing those chosen animations. My inadequate explanation and defense, coupled with the fact that some committee members liked other animations they had previously seen more than what I was showing, snow-balled into a serious misunderstanding. This resulted in the committee believing that I was showing an unfinished product.
I am aware I feel the need to constantly refine and question the decisions I make within the installation, but until Tim made this comment, I did not realize how much this habit affected the conceptual nature of my art: it could either destroy or strengthen it. I’ve concluded this habit has two points of origin. First and foremost, I am a retired elite athlete. As an athlete, there is no notion of “finished” or “perfect.” Everything can always be improved upon. Every action can always be altered or changed to become an elevated variation of that action. It is a constant movement forward - fueled by inadequacies and mistakes - that results in a perpetual state of change. This way of thinking and functioning is who I am. When I look at a piece of my art, I do not see it as what it is. I see it as what it is not and what it can be. I need to figure out how to hide my art’s constantly-changing nature so that viewers perceive it as finished; or, utilize this fluctuation to strengthen my concept.

Secondly, I went to the University of Chicago for my undergraduate degree to study Near Eastern Languages and Civilizations (specifically Egyptian hieroglyphic writing systems) with the intent of going to graduate school for underwater archeology. However, my experiences as a scuba diver reshaped my focus to additionally include Mayan hieroglyphic studies. I became infatuated with the history, evolution, and survival of the Mayan hieroglyphic writing system after visiting the Maya ruins in Copán, Honduras in 2010. Maya glyphs were formulated from objects, structures, and species existing in the surrounding area at the time of their development in the 3rd century BCE. When I witnessed these glyphs carved into the temple ruins - ruins that were being reclaimed by the
same natural signifiers that constructed the compositions of the glyphs - I was enamored. Viewing 4,000-year-old carvings being reclaimed by nature’s sculptural forces almost visually identical to that which they were reclaiming changed the way I viewed everything. There was something about the transference of visual physicality and the reclamation or re-transference of that visual physicality that was like nothing I had ever seen before. At the same time, I felt like I had known it forever. I spent three years studying what I considered to be a visual phenomenon. I traveled back and forth to the ruins in Honduras to investigate the power that existed in the visual conversion of signifiers from nature, to civilization, and back to nature. More importantly, I investigated the spaces that existed in between these: the visual happenings that proved the trace energy of transference or reclamation and confirmed change, mutation, and evolution within linguistic signifiers in a hieroglyphic language system. Essentially, I was studying change as a physical energy through a linguistic and archeological lens. This infatuation and the amount of subsequent academic inquiries that followed must have influenced the development of my artistic practice, because I now see a direct visual correlation between my Project 7 and the Copán Maya ruins. I do not know the importance of this, but I do know that this further proves that I am drawn to a perpetual state of change and that I need to place more importance on that in future projects.
First and foremost, I want my work to give viewers access to the ocean. When standing in my installations, I want viewers to feel the same sense of wonder I feel when scuba diving along a coral reef. From my four years of research, the most important thing I have discovered is that if viewers do not feel the power, marvel, otherworldliness, beauty, and importance of the ocean, they will never care or understand that it is being negatively affected. This lack of applied empathy is not the viewer’s fault; rather, it is a geographical or situational constriction. Not everyone lives near an ocean and not everyone who lives near an ocean has the capability, the need, or the desire to go snorkeling or scuba diving. I want my art to give all people the opportunity to appreciate what it feels like to exist submerged in the marine realm. If my work can successfully instigate this feeling and transcend the wonders of the ocean to viewers, then I would also like to use my work to introduce viewers to anthropogenic threats. Ultimately, my goal for my work is for each project to exist as an immersive underwater experience and an educational tool that aids marine conservation efforts – specifically for people who do not have access to - or have limited access to - the ocean.

To achieve my goal and maintain relevance within my work, I need to continue to collaborate with marine scientists, the scuba diving community, and marine conservationists. Because of this, I don’t believe remaining solely in the art world will do my work or research justice. In addition to art galleries, I think the most realistic locations for my art to exist are in natural history museums, aquariums, educational forums, and institutions pushing STEAM research. From a business perspective, another logical place my art could exist would be within the construct of a non-profit organization dedicated to creating art that educates viewers and develops awareness on anthropogenic threats to our oceans. I would build this non-profit with
partners from my collaborating communities for the purpose of facilitating marine research and transferring that research to the public through art. With the correct business model, this theoretical non-profit could 1) allow me to achieve my goal; 2) open access to specific government and global grant funding networks to facilitate necessary marine research into the causality chain of anthropogenic threats to our ocean; and 3) aid in the creation of a global environmental intelligence through the merger of art and marine science on a public, marketable platform.

Jason deCaires Taylor, Angela Haseltine Pozzi, and Chris Jordan are three artists with interdisciplinary careers that I admire and strive to emulate. They have each successfully merged their artwork with marine science for the purpose of educating viewers on anthropogenic threats. While varying in their career development, each of their careers is grounded in interdisciplinary action and research. This allows them to exist and move seamlessly between multiple disciplines for maximum public exposure and specifically directed conservation outreach.

Jason deCaires Taylor installs figural sculptures in the ocean that comment on environmental and social issues. These sculptures exhibit a duality - existing both as artwork and as an artificial reef - making them an active marine conservation tool. Each submerged sculpture is created using a non-toxic, pH neutral marine grade cement that is highly durable. The surface of the cement is texturized in a manner that encourages coral larvae to attach and populate. There are also corrugated holes that provide shelter and breeding sites for juvenile fish and crustaceans. Scientifically speaking, Taylor’s sculptures become the missing substratum in the sea bed, helping reefs to naturally form. In order to maximize this auxiliary purpose and facilitate an increase in the coral larvae attachment and development rates, Taylor painstakingly plans when and where each sculpture can be installed. Installation needs to occur in relation to when coral
spawning occurs. Each sculpture has to be placed downstream before spawning commences, though not too early so that other species populate the structures before the coral can take hold. Additionally, each sculpture is installed in a deserted section of sea bed, away from natural healthy reef systems. This placement pulls scuba divers away from naturally occurring coral reefs, giving the reefs time and space to recover. Collectively, Taylor’s sculptures present divers with compositions that comment on environmental issues, help new population growth in barren areas, and influence the directionality of ecotourism to help the recovery of older, damaged coral reefs.

For me, the most intriguing aspect of Taylor’s work is that each sculptural installation also exists as a scientific tool for research and data collection. Taylor’s artificial reefs are specific sites for researchers investigating marine biodiversity and fluctuating biomasses. These sites offer marine biologists a relatively controlled and highly-specific area to monitor reef development from inception. Taylor is unbelievably inspiring to me because he utilizes art as a marine conservation method. His work is art that also actively mediates, stabilizes, investigates, and educates on collapsing marine ecosystems, global warming, ocean acidification, overfishing, pollution, and tourism impact. To me, it is a completely successful amalgamation of art and marine science – each sculpture develops awareness of a threat, while concurrently working to fix that threat.

My work so far has only been developed to function as a tool for generating awareness. I think it exists as art and educational tool, but it is not yet an active scientific tool that supports ocean health or research on a biological level. Also, my intended audience includes viewers who do not have access to the ocean, while scuba divers are Taylor’s main audience. Succinctly put, Taylor shows ocean tourists marine science in action, whereas I take that recorded action and
translate it through my art for land dwellers. Because sculpture is pivotal in both our works, I think the main variable that causes this distinction is our choice of sculptural material. Taylor uses a material that is specifically formulated to scientifically counter an anthropogenic problem. The materials I use are the cause and/or detritus of an anthropogenic problem. In some cases, I feel like my material choice is a step behind Taylor’s, but it also might just be tangential. In any case, sculpture is incredibly important to both of our practices, because it allows us to use materials that are contextually linked and significant to marine research. In both instances, emphasizing materiality and providing viewers with a conceptually-linked physical substance aids in their cognitive processing and information transfer. I plan to work towards achieving what Taylor has accomplished. I would love one day to collaborate with a marine scientist in order to sculpt with a material that could, on a biological level, actively help the ocean recover.

In an article in the magazine *Sculpture*, Taylor states, “although I studied sculpture for my degree, I still view myself as an outsider artist, someone who has not necessarily passed through the traditional gallery system. . . focus[ing] more of my energy on the actual site-specific installations and pay[ing] less attention to the art market and exhibitions” (Preece). As the article goes on to explain, his identification as an “outsider artist” is grounded in his decision to construct a business model analogous with tourism development rather than gallery sales. I am highly interested in this fact because it confirms that 1) his artwork is eco-driven and exists for marine conservation and environmental education; and 2) his model successfully allows his artwork to live and thrive outside of the art market. Taylor explains the benefits of his approach by saying:

“I feel that tethering the works to a business model makes them far more sustainable in the long run. Local authorities now charge a small entrance fee for the
large-scale installations. This helps provide revenue for staff and tour operators, but more importantly it helps to finance a system of marine patrols for coastal waters. Many of the issues facing our oceans stem from the fact that the laws protecting them are not enforced, and being able to provide funds for protected marine areas and park wardens is a huge advantage” (Preece).

Taylor’s specific business model gives his eco-driven artwork 1) longevity; 2) a strong foot hold in the location where his work can make the most impact (outside of the art world); and 3) a new function as a monetary backer for conservation. Utilizing Taylor’s business model as a standard and bench-marker for developing my own could help me to achieve the internal structuring of my previously proposed non-profit organization.

Washed Ashore is a specific example of a successful non-profit organization that merges art with marine science for the purpose of marine conservation and environmental education. Founded by the artist Angela Haseltine Pozzi in 2010, Washed Ashore creates public sculptures from plastic marine debris to educate a global audience on plastic pollution in our oceans and enact positive change in consumer habits. I began following this organization initially because of the sculptures Pozzi created. Each sculpture is a larger than life replication of a marine species that is constructed entirely from plastic collected from beaches on the West Coast. When I made the choice to use discarded plastic as my main sculptural material in order to talk about plastic pollution, Pozzi was an example of a sculptor who was already doing this successfully. I admired how she repurposed the collected plastic debris, because she made sure each piece retained its original identity. The only alterations made to each piece of plastic was to clean them as they were collected. I also admired the scale of her work. The larger than life size of each sculpture augmented each species’ impact on the viewer. While the sculptures do not create a completely
immersive experience for the viewer, they are large enough to overpower the viewer, displace their reality, and influence their attention.

The material and scale utilized in her sculptures gave me confidence to construct my inflatable projects. However, where Pozzi brought marine species to viewers on land, I wanted to bring viewers to marine species in the ocean. I wanted to take the effects of her larger than life scale method a step further and create artwork that was completely immersive – thus began my work with projection mapping. I aesthetically branched off from Pozzi, but I continued to follow her work as it claimed global success within the non-profit Washed Ashore. Here, Pozzi’s artwork evolved and acquired a new set of functions as an educational tool, marketable product, and sigil for change. As Washed Ashore’s cornerstone, Pozzi’s art has created change, bolstering the company’s slogan, “Art to Save the Sea”. Today, over 10,000 volunteers have worked with Washed Ashore to help clean beaches and have processed over twenty tons of debris into over seventy sculptures of species affected by plastic pollution. These sculptures now tour worldwide as the “Washed Ashore Project” traveling exhibitions. The purpose of each exhibition is to educate and inspire all people to act in their own lives and prevent contributing to the global problem of plastic pollution.

Washed Ashore is an incredible non-profit model to follow if I want use my art to educate on a global scale. I am specifically interested in the organization’s utilization of media and online presence to further their education goals. Washedashore.org is simply impressive. The website has an extended online educational resource for each artwork, which is something I have tried and failed to develop in multiple projects. This resource extends the life of each art object beyond itself and closes the gap between the information the artwork is trying to convey and the viewer. In essence, the artwork is a catalyst for information, and the information can be eternally
accessed by viewers on washedashore.org. To explain further, each sculpture is a replication of a specific marine species. On the website, there is a photograph of the sculpture, along with photographs of the actual species, facts about the actual species, and links to organizations to learn more and to help the species. Washedashore.org is a launching pad to transfer information and get viewers to locations where they can actively get involved and facilitate change.

This is exactly what I want to do for my Blaschka project. I want to use my photographs of the Blaschka models in my art to captivate viewers and lead them to an online platform. I want this online platform to contain images of the Blaschka models, images and information of the species the Blaschka represents, and then links them to relating organizations that viewers can contact to get involved or support conservation efforts. Washed Ashore is so successful at what it does because it treats artwork as a marketing tool and participation in marine conservation as its product. In essence, the organization has a marketing strategy that enables it to move its viewers (consumers) from Point A (being introduced to a marine threat through captivating art) to Point B (learning about the marine threat which develops empathy and awareness) to Point C (participating in marine conservation efforts that thwart the threat). Based off of Washed Ashore and Jason deCaires Taylor, if I want to effectively educate and provoke change on a global scale using my art, I need to 1) develop a business model and marketing strategy for visual information transference; and 2) collaborate with like-minded people both in and outside of the art world.

In this age of technological advancement, digital media is critical to reaching consumers and successfully pushing a product. The art world, however, can be very conservative about popularizing work via widespread coverage on multiple media outlets. If the purpose of my artwork is to provoke a global change, these methods need to be employed, whether the art world
approves of it or not. The documentation of my work and the distribution of that documentation through digital media is vital to reaching a global audience to effectively use my art as a tool and influence their actions. Thus, photography is equally as, if not more important than sculpture in my practice. Chris Jordan is an artist whose photographic work has successfully remained in the art world while also utilizing digital media for mass distribution to instigate environmental change.

As a photographer, Jordan’s work shows viewers the result of mass consumption. He uses photography and digital media to present viewers with forms of American consumerism and information on excessive consumption to show how consumerism is destroying our planet. Similar to my animation work, Jordan takes photographs of objects that are products of consumerism, and then digitally collages those photographs into a singular image. This singular image is his final artwork that points out how excessive consumerism endangers our environment and every living species inhabiting it. I first became aware of Jordan’s work when I was volunteering with the foundation Sea Save in 2010. At that time, his photographic series, *Midway: Message from the Gyre*, was a shockingly powerful documentation of our negative effects on the albatross species. Each photograph captures a singular baby albatross that has died from plastic consumption. To emphasize - or rather expose this cause of death - Jordan composed the albatross of each image by dissecting and opening its stomach to reveal its contents: mass amounts of plastic detritus. His photographs became a series of macabre still life’s that villainize humanity’s mass consumption. In this project’s artist statement, Jordan states,

“For me, kneeling over their carcasses is like looking into a macabre mirror. These birds reflect back an appallingly emblematic result of the collective trance of our consumerism
and runaway industrial growth. Like the albatross, we first-world humans find ourselves lacking the ability to discern anymore what is nourishing from what is toxic to our lives and our spirits. Choked to death on our waste, the mythical albatross calls upon us to recognize that our greatest challenge lies not out there, but in here” (Cunsolo).

In 2010, I had not yet decided on pursuing art and thus experienced and was affected by Jordan’s artwork as an ocean advocate and scuba diver. The fact that I was first exposed to his work and experienced it from outside the art world is proof that Jordan’s work transcended the art world and reached a larger global audience. Additionally, this was the first time a work of art successfully highlighted to a wider audience what we in the marine conservation fields had been fighting to share for years.

*Midway: Message from the Gyre,* made a deep impact on my career path because it proved to me that art could be utilized as a tool to transfer information, generate awareness, and aid marine conservation. The semester after I was introduced to Jordan’s photographs, I switched my undergraduate major at the University of Chicago to Visual Arts. When I began investigating ecophobia and tried to use my underwater documentation in my artwork, I looked to Jordan as a mentor and studied his digital collage techniques in his series *Running the Numbers,* and *Running the Numbers II.* I also looked at how he displayed his albatross series and distributed it through digital media platforms. The albatross photographic series, as well as the later produced documentary, were examples of jarring photographic documentation that successfully exhibited negative imagery, transferred information, and evoked positive responses - all without inducing ecophobia. The difference between Jordan’s work and my own is that he developed his work for people who are already aware of the problems he is depicting. I know this approach worked, as I was a person already aware of the problem who was positively affected by his work and thrilled
that someone was finally and successfully giving it attention. Jordan’s work was an excellent roadmap to develop my artwork to a point where it could successfully reach viewers who are already eco-driven and ecoliterate. However, as I have stated in this paper, I want to reach the population that is not ecoliterate, as well as people who do not have access to the ocean and or have no knowledge of the atrocities afflicting it. This is why my art fluctuated from photography, to sculpture, to mixed media, and ultimately ended as a conglomeration of all three.

During my thesis defense, my loyalty to the art world and my desire to be an artist and exhibit in galleries was questioned. My response to that is that I am a perpetual interdisciplinary student who thrives in the in between through active research and collaboration. I do not despise the art world and the gallery as an institution as was suggested. On the contrary, the art world and the gallery are integral to achieving my goals. The global and powerful conservation movement produced by the millions of people reached by Taylor, Pozzi, and Jordan would not exist without their initial artwork, the art world, and the gallery. I simply, and full-heartedly believe that the confinement and conformity of artists, artwork, and conceptual ideas within the solidarity of the art world as an institution is not conducive for my career goals. To achieve what I want to achieve on a global scale, I need to exist spherically: in all spaces, institutions, academic fields, and social forums. I need to remain a fluid interdisciplinarian who utilizes art as a tool and catalyst for change.
Figure 1: Exponential Growth. [Installation View].
Figure 2: Exponential Growth. [Detail].
Figure 3: Exponential Growth. [Detail].
Figure 4: Cavern Dive. [Installation View].
Figure 5: Cavern Dive. [Detail].
Figure 6: Cavern Dive. [Detail].
Figure 7: Cavern Dive. [Detail].
Figure 8: Plastic Purge Scraps.
Figure 9: Biomes. [Installation View].
Figure 10: Biomes. [Detail].
Figure 11: Biomes. [Detail].
Figure 12: Bacterium Luminarium. [Installation View].
Figure 13: Bacterium Luminarium. [Detail].
Figure 14: The PGC Project. [Installation Interior].
Figure 15: The PGC Project. [Installation Exterior].
Figure 16: The PGC Project. [Installation Interior].
Figure 17: The PGC Project. [Installation Interior].
Figure 18: The PGC Project. [Installation Interior].
Figure 19: The PGC Project. [Installation Interior].
Figure 20: PLASTICITY: Our Changing Oceans. [Installation Interior].
Figure 21: PLASTICITY: Our Changing Oceans. [Installation Interior].
Figure 22: PLASTICITY: Our Changing Oceans. [Installation Interior].
Figure 23: PLASTICITY: Our Changing Oceans. [Installation Interior].
Figure 24: PLASTICITY: Our Changing Oceans. [Installation Interior].
Figure 25: PLASTICITY: Our Changing Oceans. [Installation Exterior].
Figure 26: PLASTICITY: Our Changing Oceans. [Installation Interior].
Figure 27: PLASTICITY: Our Changing Oceans. [Installation Interior].
Figure 28: PLASTICITY: Our Changing Oceans. [Installation Interior].
Figure 29: PLASTICITY: Our Changing Oceans. [Installation Interior].
Figure 30: PLASTICITY: Our Changing Oceans. [Installation Interior].
Figure 31: PLASTICITY: Our Changing Oceans. [Installation Interior].
Figure 32: Blaschka Invertebrate Models. National Museum of Ireland – Natural History.
Figure 33: PLASTICITY: Microplastics & Mutations. [Installation View].
Figure 34: PLASTICITY: Microplastics & Mutations. [Detail].
Figure 35: PLASTICITY: Microplastics & Mutations. [Installation View].
Figure 36: Artificial Reef. Jason deCaires Taylor.
Figure 37: Washed Ashore: Art to Save the Sea. Angela Haseltine Pozzi.
Figure 38: Midway: Message from a Gyre. Chris Jordan.
REFERENCES


