3-2023

Understanding Environmental Art: A Case Study of Jason deCaires Taylor's Coral Greenhouse (2019)

Laura Dean Hinson

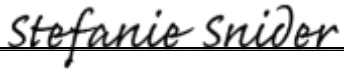
UNDERSTANDING ENVIRONMENTAL ART: A CASE STUDY OF JASON DECAIRES TAYLOR'S CORAL GREENHOUSE (2019)

by

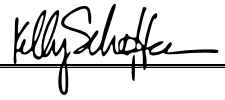
Laura Dean Hinson

Submitted in Partial Fulfillment of the Requirements
for the Degree of Master of Fine Arts in Art History and Visual Culture
at
Lindenwood University

Laura Dean Hinson  03 March 2023
Author

Stefanie Snider, PhD  03 March 2023
Committee chair

Trenton Olsen, PhD  03 March 2023
Committee member

Prof. Kelly Scheffer  03 March 2023
Committee member

UNDERSTANDING ENVIRONMENTAL ART: A CASE STUDY OF JASON DECAIRES TAYLOR'S CORAL GREENHOUSE (2019)

A Thesis Submitted to the Faculty of the Art and Design Department
in Partial Fulfillment of the Requirements for the
Degree of Master in Fine Arts
at
Lindenwood University

By

Laura Dean Hinson

Saint Charles, Missouri

March 2023

ABSTRACT

Title of Thesis: Understanding Environmental Art: A Case study of Jason deCaires Taylor's Coral Greenhouse (2019)

Laura Dean Hinson, Master of Arts, 2023

Thesis Directed by: Stefanie Snider, PhD

This thesis highlights the need for a new way to analyze environmental art. In the past, environmental artwork has been discussed in terms of the abstract concepts that drove their creation and the role they played in moving artists outside of the gallery space in the1960s and 70s. However, in recent years environmental artists are increasingly driven by themes of environmental conservation and preservation, using scientific research as the basis of their designs. Because of the shift in focus, developing a new way to discuss environmental art that takes into consideration the influence scientific research has on art production and public reception, in addition to looking at formalist aspects and historical contexts of the artwork, is more important than ever. By using Jason deCaires Taylor's exhibition *Coral Greenhouse* (2019) as a case study, this thesis aims to demonstrate the multiple ways coral conservation research altered the physical appearance of the art works as well as the critical responses from both art and scientific communities, thus proving the need for a more comprehensive way to analyze this type of environmental art in the future.

TABLE OF CONTENTS

LIST OF FIGURES

Chapter 1- Introduction

When venturing into the world of environmental art, one might expect to find photographs and videos demonstrating the effects of climate change tucked away in museums and galleries, far away from the geographical areas they depict. However, artists like Jason deCaires Taylor (b.1974) are enhancing environmental art, creating works that directly impact the environment and its issues for which they are raising awareness. Taylor specifically has produced works of underwater sculptures in multiple sites across the world that combat the effects of climate change and pollution. The first of Taylor's underwater museums was submerged in Grenada and, like the underwater exhibits that would follow, was lauded for its conservational properties. Specifically, the *Molinere Underwater Sculpture Park* (2006) (see figure 1) was placed in Grenada to help the natural reef that was left badly damaged after Hurricane Ivan in 2004. By sinking sculptures made from a unique pH neutral cement, Taylor was able to create a new structure that would allow young coral polyps a safe and stable place to grow. Furthermore, by placing his sculptures downstream from fragile natural reefs, he drew away much of the tourist activity that was hindering their recovery.[1] The popularity of the park even further contributed to the conservation of the area by playing a key role in ensuring that the government declared the reef a marine protected area, thus enabling both the natural and artificial reefs to thrive.

Since the successful installation of the *Molinere Underwater Sculpture Park* Taylor has created fifteen more major installations. Eleven of the installations are fully submerged and, like

[1] Jason deCaires Taylor, "*Molinere Underwater Sculpture Park*," Underwater Sculpture by Jason deCaires Taylor, 2019, https://www.underwatersculpture.com/projects/molinere-underwater-sculpture-park/.

Molinere Underwater Sculpture Park, work to protect and promote the conservation of the natural marine resources they neighbor.

The sculpted human forms seen across Taylor's many installations add an iconographic element to the exhibits, playing out conceptually relevant themes of environmental preservation, persuading visitors to learn more about how they can help save these natural resources. Sometimes these sculptural messages come in the form of a warning, depicting scenes that represent potential waste filled futures that will come to pass if no action is taken to counteract the effects of climate change and human pollution. Other submerged sculptures show the potential positive impacts conservational efforts can have on the environment by depicting today's youth in the process of planting coral that will populate reefs in the future. Whether the scenes are a meant to communicate a warning or hope, both messages exemplify the important connection the exists between humans and their environments.

Taylor's most recent aquatic installation, *Coral Greenhouse* (2019) (see figure 2) takes the themes of environmental conservation even further than his previous exhibits. Working with local coral restorationists to integrate their scientific research and expertise into his installation, Taylor has turned his underwater museum into a large-scale coral planting project. Unlike the photographs and videos that exist in pristine gallery environments, these underwater installations have been created with the expectation that they will undergo vast physical changes over time, becoming homes to new aquatic life in the process. As the result of extensive collaborations between the artist, marine biologists, and oceanographers, the ever-evolving sculptures of *Coral Greenhouse* perfectly exemplify the type of environmental art that is currently challenging conventional historical analysis in both science and art.

Much like the relationship between humans and the environment, art and science have always had a symbiotic relationship, especially where environmental biology is concerned; as illustration has acted as one of the primary modes of visual data communication among scientists since the 1500s.[2] Furthermore, as scientific studies progress and artistic processes advance, this connection has continued to impact both fields, especially moving into the environmental and land art movements of the 1960s and 70s. Though, despite the past and present integration of art and environmental biology, researchers still struggle to capture the whole picture where biological art is concerned, choosing to look at art and analyze it as either data points or visual media, rather than conducting a more interdisciplinary study. This type of one-sided analysis was commonly applied to both environmental and land art which, at the time, might have made sense due to the separation that still existed between select artists and the ideas of environmental conservation. Indeed, it is well documented that many land artists were more concerned with leaving the gallery space than supporting the preservation of the environment they were co-opting.[3]

However, as the fields of art and science have become more integrated in the present-day, where being considerate of the earth's ecosystem is at the forefront of public consciousness, a shared vocabulary and methodology will be crucial to underscoring the significant role the relationship between art and environmental biology plays in contemporary environmental artworks. Where previous methodologies have focused on one or the other, a new balanced

---

[2] "Natural Histories: 400 Years of Scientific Illustration from the Museum's Library," *Issues in Science and Technology* 30, no. 4 (2014): 57. http://www.jstor.org/stable/43315210.

[3] See for example, V. Ginsburgh and A.-F. Penders, "Land Artists and Art Markets," *Journal of Cultural Economics* 21, no. 3 (1997): 220, http://www.jstor.org/stable/41810636, and Robert Louis Chianese, "How Green Is Earth Art?: Spiral Jetty," *American Scientist* 101, no. 1 (2013): 20, http://www.jstor.org/stable/43707665.

interdisciplinary approach would allow art historians to capture the importance of the art as well as its scientific and historical context. By examining the interdisciplinary aspects of Taylor's *Coral Greenhouse* installation, this thesis will aim to demonstrate the multiple ways scientific research influenced the final form of the exhibit, thus proving the need for a more comprehensive approach to analyzing this type of environmental art in the future.

When attempting to understand how art and biology impact one another, many significant issues arise from a lack of proper documentation. While art inspired by environmental biology has been relatively well documented, it is not often critically analyzed for its specific scientific applications. Additionally, there are biological studies that have contributed to artistic advancements that still need to be thoroughly explored in the context of art. One of the last times artists and biologists were integrated in the eyes of society was in the 1800s, when biology was making some of its most significant advancements. However, when revisited today, much of the biologically relevant art created in the 1800s was either categorized as scientific research and, as such, left out of the annals of art history, or seen solely as art and therefore rejected by the present scientific community.[4] Similarly, in the 21st century, art created by scientists for research or informational purposes has left historians reluctant to categorize it as art, while some scientists find biologically inspired pieces too aesthetically oriented to be considered scientifically relevant.[5] Even truly collaborative works, like those created by Taylor, are either discussed by the scientific community in terms of marine research, or by art historians as a way to conceptualize climate change issues and distill them into digestible images fit for public

---

[4] James Elkins, "Art History and Images That Are Not Art." *The Art Bulletin* 77, no. 4 (1995): 557-560. https://doi.org/10.2307/3046136

[5] While there are a few instances where historians have analyzed contemporary scientific imagery in a similar manner to art, when compared to the amount of scientific research being published annually this number is negligible.

consumption. While both types of articles do in part cover portions of what Taylor's works are aiming to communicate, by neglecting to discuss the scientific research that is informing Taylor's own understanding of marine ecological decline and therefore driving his creative process, art historians are missing an opportunity to embrace the recent conservation-minded collaborations between artists and scientists. By using the work *Coral Greenhouse* as a case study this thesis aims to identify a gap in art historical methodology, specifically where environmentally conscious interdisciplinary art is concerned.

The academic discourse around art and environmental biology, primarily focused on the working relationship between the two fields, is reflective of the interdisciplinary confusion felt by the historians who find themselves analyzing scientifically driven artistic creations. The themes that scholars have gravitated toward more frequently include the different ways images are categorized between one field and the next, how early connections between the two fields informed their growth, collaborations between contemporary artists and environmental biologists, and artworks that exist within the interdisciplinary grey area between art and science. The narratives formed around these themes often vary considerably, depending on whether the author is trying to support a scientific or artistic reading of the images they are analyzing. The articles written for scientific journals often prioritize the data the images present over their aesthetic value. Art historian James Elkins provides one such example from *Image Dissection in Natural Scientific Inquiry*, where the authors discuss how an image of an autoradiograph is there to assist in DNA identification rather than be analyzed for its formalist aspects (see figure 3).[6] In contrast, art journals either proffer a formalist analysis of the artworks shown or utilize an interdisciplinary approach in order to highlight the aesthetic and cultural values scientific images

[6] Elkins, "Art History and Images That Are Not Art." 553–71.

can have without losing scientific relevancy. However, even the latter method falls short, failing to detail how scientific research can impact the creation and reception of art.

Of the themes referenced, artwork created within the interdisciplinary grey area of science and art is the most understudied, specifically where land and ecological art are concerned as art and scientific historians do not yet have a standardized way to analyze it.[7] Moreover, as contemporary environmental artists find themselves working side by side with biologists it is becoming increasingly clear that the methodologies used to discuss land and environmental art created in the 1960s and 70s will no longer suffice. This is because in the past three decades, environmental artists have pivoted away from earlier practices which often disregarded and even harmed nature, choosing now to intentionally foreground the idea of environmental conservation into the artwork being created. Furthermore, since the way these pieces were read in the past primarily depended on the field of the observer, art historians have been prone to neglecting the significant role environmental studies have played, especially since the environmental impacts of the art both positive and negative were tertiary effects. This thesis aims to prove the need for a new way of analyzing and understanding environmental interdisciplinary art that takes into consideration the influence scientific research has on art production and public reception in addition to looking at formalist aspects and historical contexts of the artwork. Specifically, by using Jason deCaires Taylor's exhibition *Coral Greenhouse* (2019) as a case study, this thesis aims to demonstrate the multiple ways coral conservation research altered the physical appearance of the art works as well as the critical responses from both art and scientific communities thus proving the need for a more comprehensive way to analyze this type of environmental art in the future.

---

[7] Elkins, "Art History and Images That Are Not Art," 553.

Chapter 2- Literature Review

The topic of analyzing interdisciplinary art is not new to art historians. In fact, for many years, art historians have found the overlaps between art and environmental biology to be rich subjects, as evidenced by the number of essays on scientific illustration and ecological art. However, while writing about scientific art is not a new phenomenon, there has never been a systematic way to approach this type of interdisciplinary art that covers both the artistic and scientific aspects. Many art historians focus on reclaiming the artistic elements of scientific images and objects rather than discussing how their scientific applications informed their visual aspects. In earlier essays that focus on biology and art, such as those by James Elkins and Maura Flannery, it is common to find references to scientists who have discounted art, choosing instead to see data.[8] Over time, interdisciplinary articles began to remedy the one sided approach, re-analyzing older works of scientific illustration and finding new information about how these images fit into the artistic narrative as well as the ways they contributed to biology (outside of the apparent role as visual tools).

However, the majority of these interdisciplinary articles focus disproportionately on scientific illustration neglecting the growing number of contemporary environmental artworks. Additionally, while art historians made an effort to mention the scientific purpose of artworks, many still failed to relay how that purpose may have had further impacted the creative process (i.e. material choices, placement, and scale). Finding a way to quantify the impact of scientific research on these environmental works is increasingly important because collaborations between scientists and artists are becoming more frequent as movements like bio-art and largescale environmental exhibitions gain momentum. With only glancing nods to the science entangled in

[8] Elkins, "Art History and Images That Are Not Art," 553; Maura C. Flannery, "Building Biology," *The American Biology Teacher* 64, no. 1 (2002): 64. https://doi.org/10.2307/4451238.

these pieces, contemporary articles written about the impact art has on biological studies are struggling to capture the total impact, specifically where ecological art is concerned, losing out on the potential to become part of a wider interdisciplinary conversation. Furthermore, while this thesis will analyze an ecologically oriented large-scale installation, it will be helpful to first begin by surveying discussions about interdisciplinary methodologies that focus their attention on scientific imagery in order to assess how various scholars have approached scientific interdisciplinary art and comprehensively assess potential shortcomings. To streamline this literature review it will be broken into three sections, focusing on literature discussing interdisciplinary methodologies, art with scientific applications, and earthworks and environmental biology. Within each section the literary works will be discussed chronologically.

Interdisciplinary Methodologies

Beginning with literature which specifically focuses on defining interdisciplinary methodologies, a prime example of an author with an innovative approach is James Elkins.[9] Beginning by asserting that "most images are not art,"[10] Elkins creates an interesting premise, aiming to both define how the history of images differs from the history of art while simultaneously underscoring how non-art images that "engage the central issues of art history… can present more complex questions of representation, convention, medium, production, interpretation, and reception than much of fine art; and… are fully expressive, and capable of as great and nuanced a range of meaning as any work of fine art."[11]

Elkins highlights the artistic tradition of referencing scientific data that stems back to the romantic era, wherein artists would exaggerate expressionistic qualities. Elkins then compares

[9] Elkins, "Art History and Images That Are Not Art," 553.
[10] Elkins, 553.
[11] Elkins, 553.

this tradition to contemporary art historians' anti-romantic practice of reconnecting the expressive romantic imagery to its scientific origin. This cycle of artists referencing scientific images is still occurring in modern art. However, in the 90s, little was written that tied artwork it back to its scientific roots. Elkins identifies the inability of art historians to successfully tether art back to science as a methodological shortcoming "since the search for scientific sources depends on specific iconographic parallels."[12] In his opinion, art history was, in 1995, ill-equipped to appropriately discuss the ever-growing connection between art and science, as no methodology would allow for focus on literal similarities. In order to better analyze interdisciplinary images moving forward, Elkins laid out three possibilities; in the first, art historians analyze scientific imagery as it relates to the creation of art, simplified; science in art. The second way to examine non-art images would be for scientific historians to borrow analysis techniques from art historians who employ a wide variety of universal artistic conventions. Lastly, however, Elkins proposes that instead of "studying the "science of art" or the "art of science," we should perhaps acknowledge that in the end, many divisions between kinds of images are untenable, and…begin writing the history of images rather than of art."[13] In other words, a truly interdisciplinary approach. This approach to analyzing images in a way that favors neither art nor science, might prove to be the most appropriate choice for historians working to analyze installations like Taylor's *Coral Greenhouse* since, the science involved is so thoroughly integrated into the exhibit that showing disciplinary favoritism might deny readers the full scope of the project.

Roughly twenty years after Elkins examined the potential ways historians could approach the intersection between art and science, Catherine Allamel-Raffin conducted a similar

[12] Elkins, "Art History and Images That Are Not Art," 556.
[13] Elkins, "Art History and Images That Are Not Art," 571

investigation on the ways images are used in art and biology respectively.[14] Aiming to understand what separates the two image types at a functional level, she provides critical commentary on how imagery is analyzed in art versus science by questioning whether the initial purpose of an image prevents it from taking on a different meaning when subjected to a formalist analysis. Allamel-Raffin begins by describing the similarities between what she calls "the art studies" and natural sciences. The similarities listed are "the initial polysemy of visual representation" and "the fixation of meaning as the result of the interpretation process."[15] Though, this is where the similarities end, as each field utilizes the imagery created to meet different ends. As explained, what separates the images used in each field is not a drastic visual difference but rather what they are aiming to interpret.[16]

Allamel-Raffin believes that art studies search for a "second order of significations,"[17] meaning there can never be one static interpretation. Conversely, scientific imagery is often created for a specific purpose and, as such, has one (often literal) meaning that is accepted by the entire scientific community. However, as Allamel-Raffin clarifies, "even if the reduction to an unambiguous meaning is possible for scientific images, this meaning is never definitely established; most precisely, the meaning is always potentially revisable."[18] Therefore, even the most straightforward scientific image or object can be subjected to the same multifaceted interpretation as art images. Allamel-Raffin, unbeknownst to herself, therefore both affirms and challenges Elkins' findings. By utilizing methodologies favored by art historians, such as iconography, Allamel-Raffin shows that scientific images can be read as art while also affirming

---

[14] Catherine Allamel-Raffin, "Interpreting Artworks, Interpreting Scientific Images," *Leonardo* 48, no. 1 (2015): 76, https://doi.org/10.1162/leon_a_00903.
[15]Allamel-Raffin, "Interpreting Artworks, Interpreting Scientific Images," 76
[16]Allamel-Raffin, "Interpreting Artworks, Interpreting Scientific Images," 76.
[17]Allamel-Raffin, 76.
[18]Allamel-Raffin, 76.

Elkins' thesis that artistic and scientific images can be studied together without a dramatic shift in methodology.

Another important study published in 2015 is "Bridging Science, Art, and the History of Visualization: A Dialogue between: Scott Curtis and Robert Lue." Unlike the previous two essays that use specified methodologies to analyze images used in art and science, Curtis and Lue instead focused their conversation on a general concern about using visual mediums in scientific endeavors. Specifically, Curtis and Lue create a dialog around the fear that visual representations could "mislead the untrained eye by giving an abstracted yet simplified understanding of the processes depicted."[19] This is a fear that is ever present when dealing with areas of science where abstract visualization is necessary.

Using a conversational approach, Curtis and Lue communicate a broad range of topics that help underscore what they find to be the role of art in science moving forward while also effectively addressing the ever-present concerns that come from mixing art and science. Guiding the conversation, Lue mentions the historical use of artistic visualizations to describe and teach biological processes, prompting Curtis to compare the present-day wariness around animation to past discussions about scientific illustration. Curtis then points out that even early scientific illustrators were careful to label their drawings as nothing more than visual representations of scientific data. Though the field, as both scholars note, has started to shift to make space for the practical applications that art can provide in biological research as well as in the classroom. This shift is echoed in the artworks currently being created as environmental conservational projects, like those by Taylor.

---

[19] Scott Curtis and Robert Lue, "Bridging Science, Art, and the History of Visualization: A Dialogue between Scott Curtis and Robert Lue," *Discourse* 37, no. 3 (2015): 193. https://doi.org/10.13110/discourse.37.3.0193.

Art with Scientific Applications

With a base level understanding of how historians have addressed interdisciplinary conversations in the past, it will now be important to survey how art and scientific historians have addressed the role of scientific research when analyzing art with scientific applications in order to identify which methodologies are effective and which ones leave informational gaps. Beginning once more with the interpretations of scientific illustrations will be beneficial since the research into this interdisciplinary niche offers a wide variety of methodological approaches not seen in literature specifically focused on ecological art. After carefully reviewing the methodologies used to discuss art with scientific applications, it will become apparent which could later be applied to analyzing ecological art works.

The practice of using scientific illustration to create a visual record of plant and animal life has continued into the present day, aiding biologists in species identification. Today, most identification guides, or dichotomous keys as they are known in the scientific community, are created using photography, which has usurped hand-drawn illustration as the primary data recording method due to its accessibility, eliciting mixed reviews from scientists and interdisciplinary artists.[20] As the practice of illustrating research results waned and less importance was placed on the ability of scientists to sketch their observations, scientists wishing to create illustrations typically employ artists to help them create the most accurate drawings.[21] Ideally, in this situation, the artist in question would have a baseline understanding of the scientific field for which they created images. In response to this growing demand for artists well-versed in science in the 1900s, there was a rise in artists seeking out multidisciplinary

[20] Some biological fields, such as ornithology, still prefer hand-drawn illustrations.
[21] Elaine R. S. Hodges, "Scientific Illustration: A Working Relationship between the Scientist and Artist," *BioScience* 39, no. 2 (1989): 104, https://doi.org/10.2307/1310910.

degrees.[22] From the 1900s onward, the majority of scientific illustrators are artists who work alongside biologists. Elaine Hodges details the obscure but essential connection between scientists and artists as it revolves around scientific illustration. One of the first issues Hodges tackles is the common assumption that modern scientists utilize photography more than hand-drawn images. The reality is that while photography is a useful tool, it is often only used for specimens that are not "broken, dirty, bloody, crushed, distorted, and/or confusing,"[23] and most specimens fit this description. Additionally, Hodges points out that cameras have many limitations and lack the illustrator's ability to interpret the objects they are given, as artists mentally reconstruct and clean the objects in their illustrations.

Having explained the benefits of a scientist having an illustrator on their team, Hodges goes on to lay out how to select an artist, organizing her article in an instructional way. Of the qualities scientists are encouraged to look for in an illustrator, the quality of the artist's portfolio is of the utmost importance since "scientific illustrations should be beautiful … the best qualify[ing] as art."[24] However, the second most important qualification of a scientific illustrator is situational awareness and accuracy because, at the end of the day, "a beautiful but inaccurate drawing is useless to science."[25] Interestingly, at the time of this writing in the late 1970s, having a background in science was not deemed necessary for scientific illustrators. In fact, the combination of an attentive artist and a lack of scientific knowledge has produced new scientific discoveries that were previously unknown because earlier drawings of the specimen were created partially based on accepted scientific knowledge. This work provides an illuminating look into

[22] Hodges, “Scientific Illustration.” 104.
[23] Hodges, “Scientific Illustration.” 104.
[24] Hodges, “Scientific Illustration.” 104.
[25] Hodges, “Scientific Illustration.” 104.

one way in which scientists and artists have been proven to work well together while maintaining scientific objectivity as the ultimate goal and as such supports the belief that collaboration between artists and biologists is still essential.[26]

It was precisely this scientific interest in objectivity that drove Anna Atkins to produce her groundbreaking book *British Algae: Cyanotype Impressions*, in which she cataloged hundreds of species of algae. In describing Atkin's text as "The First Photographically Printed and Illustrated Book," Larry Schaaf details Atkins's process. Created in 1843, Atkins' book is now accepted as not only the first scientific publication printed using a photographic technique but also "the first sustained effort to apply photography to the complex task of making exactly repeatable images for scientific study and learning."[27] Atkins herself selected the new method to capture details that were too small to accurately depict through illustration. By documenting Atkin's journey as a female scientist and a photographic printmaker, Schaaf reaffirms the critical role she played in future photographically illustrated science texts. However, while Schaaf does credit Atkins's creativity, he never directly correlates that to the artistic impact her prints may have had outside their accepted role as scientific documentation. Therefore, even though the topics discussed by Schaaf are relevant to the field, it is worth noting that if Schaaf spoke more about the artistic implications of Atkins's work her contributions.

Earthworks and Environmental Biology

Moving away from scientific illustrations, an aspect of art that has existed parallel to the field of biology is environmental art. Often drawing upon environmental issues as inspiration,

---

[26] Scientists recognize that true objectivity is impossible but hold that accurate portrayal of scientifically relevant features is the primary goal of scientific illustration.

[27] Larry Schaaf, "The First Photographically Printed and Illustrated Book," *The Papers of the Bibliographical Society of America* 73, no. 2 (1979): 210, http://www.jstor.org/stable/24302456.

Contemporary environmental art has the ability to communicate biological issues to the public in a way that is easily understood. As conservation efforts in the face of various ecological threats have advanced, environmental artists have been called to work alongside scientists either to create exhibits that deliver a message or, in more recent years, to create structures that not only function as art but help directly aid in conservation.

However, while most art and scientific historians agree that art should play an essential role in the future of biology, encouraging collaboration, not all working biologists share this view, fearing that it could "potentially [infect] scientific endeavor with the taint of popular culture."[28] This dismissive attitude is perhaps due in part to the large scale earthworks created by land artists in the 1960s and 70s which, unlike the environmental art created in recent years, was typically not directly concerned with environmental conservation or even preservation. Because of this difference of opinions, the literature centered around environmental art has been perhaps more polarizing than those focusing on the place of scientific illustration in art making it more common for the scientific context of the works to become lost in the broader discussion of environmental impact.

Many scientists debate whether environmental art is actually helping or creating a confusing narrative for the public.[29] Even articles written at the time of installation either do not mention the impacts the exhibits had on nature or classifies them as affronts to nature. To prove the need for a more comprehensive way to analyze contemporary environmental art it will be beneficial to examine the ways art historians discussed it in the 1960s and 70s before analyzing

[28]Curtis and Lue, "Bridging Science, Art, and the History of Visualization," 193.
[29] Nicolas J. Bullot, "The Functions of Environmental Art," *Leonardo* 47, no. 5 (2014): 512. http://www.jstor.org/stable/43832972.

how more contemporary scholars have approached large scale environmental art of the past and present.

In order to fully comprehend attitudes towards early earthworks it will be advantageous to begin with an article written in the 1970s that covers the emergence of environmental art as it was happening. In "The New Leap – Landscape Sculpture," written for a magazine on landscape architecture, Grady Clay begins by framing the environmental art movement as a break from the traditional gallery structure, recounting how "dirt-artists" were turning to the landscape as their medium, thus physically escaping the art gallery world. This movement of artists into nature also signified an opportunity for landscape architects and environmental designers to integrate their work into the sculptural sphere. The article was intended to help welcome land and environmental artists into the architectural landscape field. However, in 1971 many landscape architects and environmental designers were expressing frustration over the disregard artists were showing towards the environment, seeing artworks such as Michael Heizer's *Double Negative* (1969) (see figure 4) as landscape defacement.[30] As Clay summarized "They talk ecology but practice destruction…theirs is often the most superficial engagement with landscape in all its complexities."[31] This attitude is one that was echoed by many environmentalists at the time and still impacts environmental art today, as the legacy of less considerate artists is now permanently intertwined with the movement. Though, it is worth noting that even in a time where artists were seen as destructive, Clay still saw great potential in the earthworks created by artists who took the environment into consideration and produced something ecologically sustainable.

---

[30] *Double Negative* is a large trench created by removing 240,000 tons of earth from a remote plot of land in Nevada.

[31] Grady Clay, "The New Leap—Landscape Sculpture," *Landscape Architecture* 61, no. 4 (1971): 296–97, http://www.jstor.org/stable/44671207.

Concurrent to these discussions of environmental impact, art historians were beginning to dissect the concepts behind environmental artworks. Beginning around the mid-1970s, as the land art movement gained traction, art historians started to reference earthworks in literature with more frequency. By 1979 articles analyzing these works for their artistic merit had become common. A great example of an article focused on understanding the conceptualization behind an earthwork is Craig Owens's on Robert Smithson's *Spiral Jetty,* (see figure 5) the 1,500 ft. long coil situated in Utah's Great Salt Lake. Unlike Clay, Owens is entirely focused on unraveling the symbolism behind Smithson's spiral, applying postmodern theories to the artwork as he sees Smithson's desire to ground it as a response the "homelessness" of many modernist sculptures. Throughout Owens's review of *Spiral Jetty* he captures many potential meanings of the artwork, yet it only alludes to the site of Smithson's work as it applies to the time-dependent nature of the sculpture. This aspect of the article is remarkable, not because the sculpture raises many environmental concerns, but because it demonstrates perfectly just how much the concepts driving environmental art have changed over the last fifty years. Indeed, many land artists in the 1970s were focused on creating works that dealt with abstract themes and concepts such as postmodern deconstruction. As understood by Grady, *Spiral Jetty* is not only a sculpture but a text, each of the geometric shapes a signifier for the viewer to read. This type of analysis works well when applied to *Spiral Jetty*, because it recognizes the ways Smithson himself was conceiving of his work. However, if applied to a contemporary environmental installation like *Coral Greenhouse* it would have some merit but ultimately feel disjointed because many works of environmental art are no longer based in theory but rather stem from a place of concern for the environment itself.

One example of an article that focuses on the relationship between environmental art and the natural settings they inhabit is one by Allen Carlson.[32] For the purposes of Carlson's essay, environmental art is defined as "earthworks and earthmarks."[33] Getting their start in the mid-1960s, earthworks and earthmarks are natural installations that are intrinsically tied to the environment, depending on it for context as well as a display site. As discussed, this type art was particularly popular at the time as it allowed artists to create works on a large scale that would not contribute to the hyper-consumerism of the 1950s. In his essay, Carlson focuses on earthworks created by artists such as Robert Smithson, Michael Heizer, Dennis Oppenheim, and Christo and Jeanne-Claude. A large portion of the earthworks works created by these artists are immobile and relatively permanent, like Smithson's *Spiral Jetty.* Throughout the creation of earthworks, there has been criticism of their impact on the environment site they are coopting. Specifically, Carlson briefly mentions the 450 page environmental impact report Christo and Jeanne Claude were required to file to erect their large scale *Running Fence* (1976) (see figure 6) and the concerned response environmental activists had to the work.[34]

However, ecological critiques are not the primary focus of this writing, Carlson instead focusing his efforts on assessing if environmental artwork is specifically an aesthetic affront to nature. In the context of this essay, an aesthetic affront is one that "is generated by the aesthetic qualities of an object, rather than by, for example, its social, moral, ecological, or other such qualities."[35] This conversation around environmental art differs greatly from those in taking place in the 1970s which were much more focused on the role earthworks played in defying the

---

[32] Allen Carlson, "Is Environmental Art an Aesthetic Affront to Nature?" *Canadian Journal of Philosophy* 16, no. 4 (1986): 635–50. http://www.jstor.org/stable/40231495
[33] Carlson, 635-50.
[34] Carlson, 636.
[35] Carlson, 637.

tradition of sculpture in the gallery space. After thoroughly reviewing several environmental art pieces, Carlson concludes that if an artist does not defile the environment's natural form too much, it is not an aesthetic affront to nature. Conversely, if an artist feels the need to alter the untouched state of nature or mar it in any way, which they often do, the piece becomes an aesthetic affront. In closing, though, the question is asked as to whether environmental art can be considered art at all. Carlson finds substantial evidence to support his conclusion that if nature has not been altered "enough," the delicate relationship between art and the environment needed to consider an earthwork art no longer exists, and therefore neither does the art.[36] This means that if an artist does not alter nature enough it cannot be considered art at all. Carlson's approach to the early earthworks is intriguing, because while he does echo the ecological concerns of environmental architects he also makes it very clear that that is not his interest and that it was not the artists primary concern either.

Redirecting the focus of contemporary conversations about environmental art to capture the various ways a societal increase in environmental consciousness has changed the way current art historians view early environmental art; Doug Blandy, Kristin Congdon, and Don Krug examine how art and art education have impacted ecological restoration in "Art, Ecological Restoration, and Art Education." By first investigating how early western colonization has led to a widespread environmental decline, the authors set the stage to discuss the subsequent re-examination and adoption of Native American ideologies by contemporary environmentalists who wish to undo the ecological damage of their colonial ancestors. They write, "These ecological restorationists advocate living in harmony with nature, discovering nature's

[36] Carlson, "Is Environmental Art an Aesthetic Affront to Nature?" 637.

connections, and then using these relationships to change and restore the natural world."[37] In addition to ecological restorationists,[38] artists are integral to efforts to rehabilitate the ecosystem, making it a multidisciplinary effort.

When ecological art gained traction in the late 1960s, it was partially due to artists attempting to create art that would not feed consumer culture; large-scale earthworks were unable to be bought and sold in the way more typical artworks have been. However, after Joseph Beuys began to use ecological art to make a political statement, his ideas of how "art and life were interconnected as are culture, nature, and ecological systems"[39] began to take hold. Blandy, Congdon, and Krug delve deeper into the interconnection between ecological restoration and art by outlining collaborations between artists and scientists. The first of these collaborations mentioned was a Robert Rauschenberg installation entitled *Mud Muse* (1968–71) (see figure 7) which was created with the help of the aeronautics company Teledyne. *Mud Muse*, a clear tank filled with 1,000 pounds of mud over a large speaker, recreates, in a clinical gallery space, the messy illusion of unedited nature. As the mud bubbles and hisses, the gallery goers can see and appreciate the messy, unbridled power of nature. Rauschenberg envisioned *Mud Muse* to be interactive, to draw people in with its humorous bodily sounds and earthy smells and to remind them of the unkempt features of the natural world.

Other ways artists have incorporated ecological ideas into their artwork include using plant life in their artwork to communicate to an audience the different roles nature can play in

---

[37] Doug Blandy, Kristin G. Congdon, and Don H. Krug, "Art, Ecological Restoration, and Art Education," *Studies in Art Education* 39, no. 3 (1998): 230–43. https://doi.org/10.2307/1320366.
[38] Scientists who have studied ecological sciences and aim to restore damaged ecosystems using proven scientific methods to include: re-planting trees in forests, finding natural means of pest control, growing a wider variety of crops in an area to promote greater soil health.
[39] Carlson, "Is Environmental Art an Aesthetic Affront to Nature?" 650.

people's day-to-day lives. “For example, Mel Chin's *Revival Field* (1990-present) (see figure 8) demonstrates a safe and natural means to clean up toxic waste from the soil of the Pig's Eye landfill in St. Paul, Minnesota.”[40] He accomplished this by planting six different types of hyperacculmulater plants in an area where old batteries had left traces of cadmium and zinc in the soil. The plants naturally absorbed the harmful chemicals and were then dried and disposed of in a controlled manner. Additionally, many multimedia and sculpture artists, such as Mandy Barker, John Dahlsen, and Alejandro Durán use recycled or discarded materials to simultaneously create art while highlighting the impact waste has on the ocean. The remainder of this article is spent discussing how art education has been used as a vehicle to formally teach ecology to collegiate art students and communicate the importance of environmental awareness to the public through the use of gallery spaces. However, the authors of this article do little to delve into the science behind these pieces or the individual impacts these they had on the environment.

Some environmental artists choose to build structures based on naturally occurring biological forms rather than create new structures in nature. Maura Flannery’s “Building Biology” focuses on the similarities between the natural building strategies of animals and how humans, in recent years, have integrated these techniques into their structures. The most famous examples of this type of biologically inspired architecture are the buildings designed by Antonio Gaudí based on everything from the structure of shells to the skeletal structure of a snake. Flannery begins by explaining that contrary to their animal counterparts, human architects are not driven biologically to build specific structures but are instead influenced by the ecosystems in which they live. Additionally, it is known that, often, humans create new environments that

[40] Blandy, Congdon, and Krug, “Art, Ecological Restoration, and Art Education,” 238.

will provide a sense of comfort in adverse ecosystems. Humans also create artificial environments such as laboratories and museums to "investigate and examine nature."[41] It is in these exploratory structures where Flannery sees nature and architecture meld together, stating that "the issues of animal architecture are most likely to be studied where the architecture of the building can influence the kind of work that is done there."[42]

An article that takes a closer look at the relationship between environmental art and biology is “The Functions of Environmental Art.” In this work, Nicolas J. Bullot explores how the function of environmental art differs from that of "scientific inquiry into natural phenomena and environments."[43] Bullot accomplishes this by applying Reber's psycho-historical theory of art appreciation[44] to the impacts of art inspired by natural phenomena. Using three modes (basic exposure, design stance, and artistic understanding) to analyze the practical functions of environmental art, Bullot showcases artists' ability to elicit an emotional response from their viewers by inspiring them to develop a design stance, or an attitude of inquiry, prompting them to seek artistic understanding. Once viewers begin to search out more information, they might also find themselves learning and reflecting on the current state of the environment. Bullot’s methodology thoroughly addresses the functions and impacts of environmental art. However, as in previous the literature about environmental art, his method does little to communicate the scientific relevance these works may have outside of raising environmental awareness.

---

[41] Flannery, “Building Biology,” 64.
[42] Flannery. “Building Biology,” 65.
[43] Bullot, “The Functions of Environmental Art,” 511–12.
[44] Bullot writes, “The psycho-historical theory combines this historical account of art functions with a psychological model that distinguishes three modes of artistic appreciation.” The modes are: basic exposure, design stance, and artistic understanding. “The Functions of Environmental Art,” 511.

J. Malcolm Shick describes the ways in which incorporating marine art and early marine illustrations into a marine biology class would provide college students an easy entry point into the field. One of the many marine artworks referenced is a large-scale collaborative crochet exhibition by Christine and Margaret Wertheim called *Hyperbolic Crochet Coral Reef Project* (2007) (see figure 9) in which "experimental mathematics of non-Euclidean geometry"[45] is combined with crocheting to create "complex models of corals, sea anemones, and other organisms."[46] The materials used in this coral project were explicitly chosen to call to mind the trash currently polluting the oceans, carrying on the eco-conscious message of previous environmental art pieces. In the present day, marine environmental art is moving even further into this sphere of field biology, with a push to incorporate aesthetic marine biology in the classroom and within underwater conservation projects. An excellent example of this type of artistic conservation is seen in the works of Jason DeCaires Taylor.

Taylor's artwork demonstrates what thorough integration of science and art could look in the form of sculptural installations. Created from pH-neutral cement mixture and placed on previously desolate areas of the ocean floor in multiple locations around the world, Taylor's sculptures act as a substrate for coral growth and create new habitats for sea creatures. More importantly, these underwater sculpture installations draw visual and physical attention away from struggling reefs, allowing them to heal while tourists dive and snorkel elsewhere – drawn to Taylor's "underwater exhibitions." Since Taylor is a Contemporary artist, working since the mid-1990s, there are relatively few scholarly articles written about him thus far. The scholarly articles and book chapters that do cover his work as a sculptor are very similar to the essays referenced

---

[45] J. Malcolm Shick, "Toward an Aesthetic Marine Biology," *Art Journal* 67, no. 4 (2008): 83, http://www.jstor.org/stable/40598927.

[46] Shick,"Toward an Aesthetic Marine Biology," 83.

above, focusing on the visual concept behind his sunken installations, with the science behind the coral restoration mentioned as a tertiary factor. In contrast, some articles are written for scientific journals and focus on the coral transplant acceptance rate of the sculptural surfaces, only mentioning the sculptures as art forms created by Taylor in reference to their functional purpose as substrate.[47] Taylor is a perfect example of an artist whose work would benefit from a truly interdisciplinary analytical approach. From reading both kinds of sources, it is obvious that the subject matter he has chosen to base his work around is tied to past underwater sculptural projects created by artists such as Betty Beaumont, who, similar to Taylor, relied heavily on biologists, chemists, oceanographers, and engineers when completing her *Ocean Landmark* Project (1980), which notably helped "counter the damaging effects of overfishing and the use of coastal waterways as waste disposal ground."[48] Like Beaumont, it is apparent that Taylor's work with marine biologists and environmental scientists heavily influenced the materials he chose and the locations of his installations. However, as it currently stands, to get an accurate picture of his work's impacts artistically and scientifically, readers are left to search out articles from two different disciplines.

There is an exhaustive body of resources and perspectives to consider when researching connections between art and biology, and the works examined here are only a small sample. Despite the limited range of articles reviewed, it is still apparent that contemporary historians support the reintegration of art and science, specifically where education and research are concerned. Additionally, while some field biologists are still keen to distance themselves from

---

[47] Adam Smith, Al Jayson Songcuan, Nathan Cook, Rachelle Brown, Kailash Cook, Reuben Richardson, "Engineering, Ecological and Social Monitoring of the Largest Underwater Sculpture in the World at John Brewer Reef, Australia," *Journal of Marine Science and Engineering* no. 10 (2022): 1, https://doi.org/10.3390/jmse10111617.

[48] Blandy, Congdon, and Krug, "Art, Ecological Restoration, and Art Education," 238.

the arts and present only textual data in their reports, many scientific researchers have acknowledged the advantages of utilizing visual aids and art in their research studies and findings. This integration is more important than ever, historical scholars seeing the separation of biology and art as detrimental to future biological studies, as it hints at a disconnect between the objects being studied and the resultant data. However, art historians are struggling to capture the role collaboration between artists and scientists plays in the interdisciplinary creative process, failing to quantify the impact further scientific investigation into environmental art can play in the overall reception of a piece. In the past, art historians have often detailed the creative processes of artists, to include any preparations they would make. In an age where scientific research has become part of the prepatory work for Contemporary artists, art historians are now faced with the task of including this new facet of the creative process in their analyses.

This thesis aims to prove the necessity of a new methodology that will help historians analyze interdisciplinary, environmentally influenced works of art by combining historical, ecocritical, formalist, and scientific methodologies. To demonstrate the necessity of a new methodology, a thorough analysis of the *Coral Greenhouse* (2019) installation by Jason deCaires Taylor will be completed. This demonstration will highlight the advantages of exploring the multiple ways coral conservation research altered the physical appearance of the artworks as well as the critical responses from both art and scientific communities, by extension showing future historians how they can connect the scientific research involved in interdisciplinary art to the final products.

Based on the various approaches used in the literature addressing scientific interdisciplinary art, it is apparent that both qualitative and quantitative methodologies will be critical moving forward; therefore, a mixed-method approach will be employed. However, unlike

previously conducted mixed methodological studies that separate the qualitative and quantitative methods, this thesis will integrate scientific analyses of Taylor's *Coral Greenhouse* with historical, formalist, methodological approaches. This interdisciplinary analysis of Taylor's installation will begin by situating Taylor within the broader historical context of the earthworks and Land Art movements of the 1960s and 1970s. Highlighting the long tradition of ecological art that Taylor is part of early on will add much-needed context for readers before delving into the ways he is revitalizing and improving upon the earlier movements.

Additionally, by pairing the relevant scientific information with aspects of formal analysis, the impacts scientific research has had on Taylor's forms will be more apparent. The formalist approach will also be vital for capturing the changing artistic qualities of the underwater sculptures that comprise the *Coral Greenhouse* exhibit while simultaneously documenting the aesthetic importance of the materials chosen. Furthermore, examining the contextual elements of Taylor's work will give a broader insight into the intended meaning of his creations, including how conservational information has played a role in the messages he chose to communicate with his audience. Finally, applying elements of the less traditional ecocritical approach will allow Taylor's installation to act as a vehicle to discuss and investigate the global ecological crisis while factoring in how his work impacts current and future conservation plans. Most crucially, examining the scientific research that went into planning the sculptures and researching the after-effects will allow for a complete understanding of these works' impact on the environment.

Chapter 4 – Research

Land Art Movement

In the mid-1960s through the early 1980s, the Land Art Movement gained popularity among artists who were tired of the consumerist nature of the art market and sought to create installations that would conceptually challenge the public without falling victim to the buy and sell mentality they felt had permeated the art world in the previous decades. Additionally, the physical nature of the Land Art Movement offered artists a way to not only comment on ecological issues, but also work to create change through their artistic practices. Based on this premise, artists involved in this movement, such as Robert Smithson, Agnes Denes, and James Turell, left their studios to create "site specific work" in areas untouched by art. However, it is important to note that while land artists certainly used the works they created to question the practices of the art market, many of them were commissioned by museums and represented by art dealers and therefore integrated into the art market.[49] It is highly probable that the choice by land artists to engage with the very system they were commenting on was because it was only by people within this system that their often highly conceptual works could be fully understood and therefore venerated as art.

One of the more confounding and compelling aspects of land art is the relationship between site and installation as the concepts behind these pieces are often inextricably tied to one another. For example, when looking at a work like James Turell's *Roden Crater* (see figure 10) (1979-present), a three-mile-wide volcanic crater in Flagstaff, Arizona, it is clear that without the volcanic vent the site is comprised in and sculpted out of, there would be no installation. Simply

[49] V. Ginsburgh and A.-F. Penders, "Land Artists and Art Markets," *Journal of Cultural Economics* 21, no. 3 (1997): 220, http://www.jstor.org/stable/41810636.

put, the site is integral to the art. In the case of Turell's crater, he has worked for years carving tunnels and various open-air observation points so that when it opens in 2024, viewers will be able to experience celestial events as framed by the deliberate portals offered by *Roden Crater.* Similarly, works such as Agnes Denes' *Wheatfield* (1982) (see figure 11)*,* a 300 ft. by 325 ft. field of wheat planted on a landfill, are also tied to their sites. While not as physically inseparable from its site as Turell's work within *Roden Crater, Wheatfield*, planted on the Battery Park landfill in Manhattan, would not resonate with viewers as much if planted on a farm. As with other land art installations, *Wheatfield* is as much a conceptual piece as a physical site. In this instance, by planting and successfully harvesting wheat in a place delegated to the disposal of human waste, Denes creates a paradox that highlights "mismanagement, waste, world hunger and ecological concerns. It called attention to our misplaced priorities."[50]

While *Wheatfield* was not a permanent installation, the wheat produced would go on to be shown in galleries, further spreading Denes' message about priorities regarding world hunger. From this gallery show, titled "The International Art Show for the End of World Hunger," wheat seeds were taken and planted all over the globe.[51] This means that at this moment, there may still be wheat growing that traces back to Denes' field, her installation continuing to impact the ecosystem forty years later.

Many land art installations are found to be similarly open ended, the forms originally created changing as time goes on in ways that are not always planned. Perhaps the most famous instance of a work of land art changing in an unexpected way is Robert Smithson's *Spiral Jetty.* (1970), a 1,500 ft. long coil constructed from mud, salt crystals, and rock. *Spiral Jetty* branches

[50] Agnes Denes, "Wheatfield - A Confrontation: Battery Park Landfill, Downtown Manhattan," September 11, 2001, http://www.agnesdenesstudio.com/works7.html.
[51] Denes, "Wheatfield - A Confrontation: Battery Park Landfill, Downtown Manhattan."

off from the northeastern shore of the Great Salt Lake in Utah. It is well documented that Smithson himself wanted the spiral to disappear naturally, thus presenting viewers with the process of nature reclaiming what humans built.[52] In this way, Smithson had counted on time and nature to finish the narrative he began when he created the spiral. However, to this day the spiral is still visible in low tide in Utah's Great Salt Lake, exemplifying just how unpredictable nature really can be.

Looking at artists like those mentioned above brings into focus the extent to which their conceptual ideas about working with nature and time rather than fighting against it would inspire a new generation of artists. More specifically, Jason deCaires Taylor, who was not only aware of these works, but was also inspired by them and in many ways has continued the land art tradition of tying together conceptual art, nature, location, and time. However, while all of these installations were physically isolated and hard to reach, or, in the case of *Roden Carter,* are still not open to the public, Taylor sought to create artwork that was interactive for people as well as the nature in which it is immersed.

Jason deCaires Taylor

From a young age, Jason deCaires Taylor was drawn to the sea, viewing it as a place to explore and escape. As he began his studies at Camberwell College of Arts in the early 90s, Taylor became fascinated by the earthworks and Land Art movements of the 1960s and 70s, such as those undertaken by fellow underwater sculptor Betty Beaumont, and saw the ocean as a potential site for a new type of ecological installation.[53] Beaumont's work would have been

---

[52] Robert Louis Chianese, "How Green Is Earth Art?: Spiral Jetty," *American Scientist* 101, no. 1 (2013): 20, http://www.jstor.org/stable/43707665.
[53] Robert Preece, "Submerged: A Conversation with Jason DeCaires Taylor," *Sculpture Magazine* 35, no. 9 (November 2016): 18.

particularly pertinent to a young Taylor as she specifically worked in the 1970s through early 80s creating and subsequently sinking cube sculptures made from coal fly-ash in order to provide local reefs new substrate. However, while in London, Taylor's studies were primarily focused on creating large scale surface landscape installations, the urban setting forcing him to set aside his nautical exhibition ideas. The costs and volume of materials required to create art installations on the scale he imagined also proved to be further roadblocks for Taylor. It was not until he discovered the commercial and conservational properties his installations could provide to marine environments that he saw a financially and ecologically sustainable way to create large scale works in the underwater space. Tapping into the aquatic tourism industry, Taylor realized that his sculptures would draw divers and snorkelers away from the natural reefs that were suffering from excessive activity while simultaneously pulling in much needed monetary resources for the reefs. Furthermore, by building his constructions out of substrate appropriate for coral propagation, he developed a new hybrid that exists in the categorical space between artificial reefs and art installations. These underwater museums not only provide new aquatic living spaces where previously there were none, but also help promote the importance of environmental conservation through the subject matter and treatment of the artworks.

Indeed, Taylor has openly confirmed that spreading awareness for ecological issues is the primary driving inspiration behind his installations.[54] He, like many historians, has noted a separation between humans and nature in recent years, even where ecological studies are concerned. In order to help remedy this disconnect, Taylor chooses to work with human forms in the hopes of reminding viewers that humans are intrinsically tied to the world around them and are constantly changing with and impacted by the environment they live in. Additionally, by

[54] Preece, "Submerged," 19.

utilizing an unconventional business model that combines the value these sites provide the tourism industry and the ecological advantage they supply to reef conservation organizations, Taylor ensures that the pre-existing tourist industry supplies a steady flow of revenue. These returns not only fund the creation of his underwater installations and subsequent tour operators but also "helps to finance a system of marine patrols for coastal waters."[55] Funding these marine patrols is increasingly important since in many locations, the laws in place to protect the ocean are not enforced. When considering where to place his sites, finding areas that may require more financial and ecological help plays an important role in Taylor's decision-making process, which he has mentioned often requires as much if not more preparation than the creation of the sculptures themselves.[56]

The decision making process Taylor employs to select a location for an installation involves many variables that he and his team must take into account, including "visibility, reef biomass, depth, access, storm exposure, anchoring substrate, substrate level, art aesthetics, logistics accessibility and community engagement."[57] Taking these environmental elements into consideration is paramount because, unlike above ground installations where most viewers can easily access them in a museum type setting, away from the elements, placing the exhibit underwater creates a unique set of restrictions for visitors. In Taylor's most recent installation, *Coral Greenhouse*, as with other installations he has completed, he worked with a team of marine biologists, coral experts, and engineers to complete one site assessment necessary to receive a Marine Parks Permit in order to build in the Great Barrier Reef. One of the first

---

[55] Preece, "Submerged," 19.
[56] Preece, "Submerged," 17.
[57] Adam Smith, Paul Marshall, and Nathan Cook, "Site Assessment of John Brewer Reef for a proposed Museum of Underwater Art (MoUA), Townsville," ResearchGate, May 2018, 2, 10.13140/RG.2.2.33861.19681.

limitations Taylor and his team investigated at the potential site to ensure an inclusive aquatic museum experience was accessibility of the site to boats and SCUBA and free divers. Of these hurdles, producing boats' access plans are the more straight forward since, when planning for divers, the primary considerations are depth and site visibility, both of which can prove to be fickle.

The depth of a dive site heavily impacts which divers will be able to venture down to the sculptures. Based on the Professional Association of Diving Instructors (PADI) certifications levels, Open Water Certified Divers (the entry level certification) can only venture to depths of up to 18 meters.[58] A SCUBA diver himself, Taylor is aware of these restrictions and has worked very hard to ensure that his installations are available to even the newest of divers, confirming that all of the sites considered were at depths of less than 18 meters. This consideration for novice divers is evidenced by the site surveys conducted in preparation of building Taylor's installations.[59] By taking the dive community into consideration, the Taylor and his team have made sure that divers with Open Water Certifications have the ability to dive his "underwater museums" without paying hundreds of dollars to acquire an additional level of certification. SCUBA divers are not the only thing informing depth though, as proposed locations are also required to meet safety depth requirements to ensure the sculptures are deep enough to allow the passage of marine vessels overhead.

As mentioned, it is precisely Taylor's consideration for accessibility and visibility that separates him from his land art predecessors. For instance, while artists like Beaumont also cared greatly about reef conservation and worked to produce artworks that could double as substrate,

---

[58] "Professional Association of Diving Instructors," PADI, Accessed January 28, 2023, https://www.padi.com/.
[59] Smith, Marshall, and Cook, "Site Assessment of John Brewer Reef for a proposed Museum of Underwater Art (MoUA), Townsville," 2.

her most famous sculpture *Ocean Landmark* (1970), while listed as a "fish haven by Natural Geographic," is so deep that it is not accessible or even visible to anyone.[60] As such, *Ocean Landmark* exists primarily in a conceptual artistic space, relying on people's ability to visualize what it could have looked like when initially submerged. Only in recent years has the technology existed that allows for imaging of the work in its current life sustaining phase. When creating his installations, Taylor works to ensure that they are accessible for artistic and scientific observation and interaction immediately upon submersion.[61]

Coral Greenhouse (Inspiration and Planning)

Taylor began the planning for *Coral Greenhouse* in 2016, a full three years before the installation would be opened to the public, after being commissioned by the non-profit organization Museum of Underwater Art – Townsville Great Barrier Reef (MoUA).[62] When considering artists, the MoUA chose Taylor because of his unique background with underwater sculpture exhibits and his personal commitment to global conservation efforts. In between the commission and the first site proposal, many dives were made to assess various locations and materials were tested for consideration. By the time the first site proposal was written in 2018, Taylor had already seen the successful completion of projects in the Caribbean, Mexico, Spain, London, Bali and other areas. As a location, Townsville presented Taylor with multiple infrastructural advantages that fell in line with his pre-existing business model, providing the artist support from "world-leading coral reef experts (Reef Ecologic, James Cook University,

---

[60] Martin Kemp, "Betty Beaumont's Ocean Landmark is in Deep Water," *Nature* 431, 1039 (2004). https://doi.org/10.1038/4311039a

[61] It is worth noting that currently, divers wishing to dive the off-shore sites like *Coral Greenhouse,* which is 45 miles away by boat, only pay the boat fee, the cost of the dive master, and dive gear rental keeping prices between 100 to 200 dollars. To further lower prices, divers with their own gear receive a 25% discount, making the dive as affordable for one requiring a two hour boat ride. "Product Page," Museum of Underwater Art, 2023, https://www.moua.com.au/book-now.

[62] The Coronavirus Disease further exacerbated the delays in 2020.

Australian Institute of Marine Science), tourism and transport companies (Sealink Travel Group, The Ville), industry (Port of Townsville, Pacific Marine Group), Aboriginal and Torres Strait Islander community (Palm Island) and Townsville City Council," leading to a mutually beneficial partnership.[63] Additionally, the John Brewer Reef which is only 43 miles offshore provided Taylor's installation natural shelter from potential storms, and rough currents.

After Taylor accepted the commission, work began on the installation design.[64] Since this work was conceptualized with a scientific research project in mind annotating the preparation and installation process will help to further clarify just how essential research was in the design processes, even in the early stages. In order to understand how the sculpting process intertwined with the site selection information was primarily sourced from site assessments, which were never published in a public format, and an interview Taylor gave to Robert Preece. The interview with Preece is particularly insightful as it is one of the few official interviews Taylor has given on his processes.

As with all of his underwater exhibits, Taylor looks at the multiple sculptures that comprise it as smaller elements of a larger whole; this is similar to the way a natural reef is viewed, where each organism is a small part of a harmonious ecosystem. Therefore, while it is possible to analyze and appreciate these sculptures as individual creations, it would be more beneficial to treat the 47 sculptures that make up *Coral Greenhouse* and the Underwater Museum of Art as details of a larger narrative. In this case, the message Taylor is aiming to communicate through his installation is that by shifting perspectives and providing a new entry point into

---

[63] Smith, Marshall, and Cook, "Site Assessment of John Brewer Reef," 4.

[64] Taylor's *Coral Greenhouse* installation is also referred to as the Underwater Museum of Artas such the sculptures in this "museum" make up one exhibit. Therefore throughout this analysis the terms installation, museum, and exhibit will be used interchangeably due to the unique nature of *Coral Greenhouse.*

marine conservation, anyone can gain a deeper appreciation for the Great Barrier Reef and its important ecological role. Taylor accomplishes this using his underwater museum to "bring into focus diverse fields of study including marine science, coral gardening, underwater and environmental art and architecture."[65] It is because of his focus on education that Taylor chooses to refer to his installations as museums, seeing museums as institutions associated with learning. Together these contributors have created an ever-changing exhibit that not only fascinates viewers but is actively changing the landscape of the GBR and promoting new coral growth.

Due to the ever-changing nature of this exhibit, each diver, even those who visit more than once, will never truly see the same exhibit twice. This biological evolution of the sculptures often amazes even Taylor who, inspired by the natural changes he observed in his previous installations, has come to see the biological additions to his underwater creations as collaborative effort between himself and the ocean, allowing and even planning out his structures in a way that encourages aquatic organisms to grow in and around them. This is especially true of *Coral Greenhouse*, where additional holes were added to the installation in the sculpting phase that would later allow volunteers to plant new coral on the figures. There is a time-based aspect to watching the corals and algae spread across the sculptural surface, altering them until all of the minute sculpted details are replaced by "intricate patination of coralline algae, white tubular worms, pink sponges and coral membranes that have pores like human skin."[66] The colors and textures left behind by the organisms tell a story of growth and cohabitation, with each other and humans, playing perfectly into the narrative of ecological symbiosis Taylor is aiming to impart

[65] Jason deCaires Taylor, "The Coral Greenhouse," Underwater Sculpture by Jason deCaires Taylor, 2019, https://www.underwatersculpture.com/projects/the-coral-greenhouse/.
[66] Preece, "Submerged," 19.

upon viewers. The biological additions visually communicate to viewers that when humans work with nature and provide it a safe space to grow, beautiful things can happen.

It is precisely his consideration for the ever-changing organic components of his work that further influenced Taylor to choose human forms as his primary subject matter since human figures, even when obscured, are more visually recognizable than abstract figures. Furthermore, by using human figures, Taylor feels that he is encouraging those who view his work to relate to the figures and thus recognize that they too are inseparable from the nature that surrounds them and, like these submerged sculptures, they too can have a positive impact on their environments.[67] Of the 47 forms that comprise *Coral Greenhouse,* 17 of them are human and, more importantly, these individuals, or "reef guardians," as Taylor refers to them, are portraits of local residents.[68]

As part of his artistic process, Taylor recruits' residents who live in the area where he will install his exhibit to be models; upon arriving at his studio, a full-body plaster is created. Details are then added to the life-cast plasters and a mold is created that will then be filled with a pH neutral cement that is both safe to use in marine environments and also still allows Taylor to accurately capture the fine details of the locals.[69] The specific cement mixture used was tested to ensure that it would retain its structural integrity through various environmental conditions and could, with proper anchoring, survive oceanic forces matching those of a category four tropical cyclone.[70] Furthermore, the cement mixture used resembles oceanic rock that is naturally found in the Great Barrier Reef area, a feature that is both aesthetically and functionally appropriate.

---

[67] Preece, "Submerged," 19.
[68] Preece, "Submerged," (2016): 18.
[69]Smith, et al, "Engineering, Ecological and Social Monitoring of the Largest Underwater Sculpture in the World at John Brewer Reef, Australia," 3.
[70] Smith, et al, "Engineering, Ecological and Social Monitoring of the Largest Underwater Sculpture in the World at John Brewer Reef, Australia," 3.

The resulting sculpture texture allows Taylor's forms to blend believably into the surrounding environment, while simultaneously doubling as ideal substrate for organisms to populate.[71] After the sculptures are removed from their molds, Taylor then carves out any finishing details that may have been lost in the casting process, even though as Taylor has mentioned, these final touches "will be lost to the sea within days."[72] Considering the detail and care with which Taylor photographs his installed works, it is clear why he spends so much time on physical aspects like wrinkles, fine eyebrows and strands of hair that will quickly be obscured by algae, hard and soft corals, as these bare versions of the sculptures will live on in his photographs and serve to document the full extent of the installation's environmental integration.

Coral Greenhouse Sculptures (2018)

As stated, *Coral Greenhouse* is comprised of forty-seven sculptures; seventeen are people, fourteen are plants, eight are sculpted benches, and one is a greenhouse structure; various smaller sculptures such as planters and walkways inside and outside of the greenhouse comprise the rest. Because the conservational properties of Taylor's *Greenhouse* played such an integral role in the conception and resulting form, analyzing how these sculptures have changed in the time since their initial submersion seems to be the most appropriate way to proceed. In order to truly capture the differences, the sculptures will be analyzed twice, once at the time of installation and again based on the most recent photographs.

This review of the *Coral Greenhouse* installation will begin with the greenhouse structure itself, which was the first underwater architectural endeavor Taylor undertook. In initial designs, the greenhouse was visually similar to those found above ground, creating a kind of skeletal architectural structure where the primary difference was a lack of glass to allow for water flow

[71] Preece, "Submerged," 19.
[72] Preece, "Submerged," 19.

and ease of access for fish and divers.[73] However, as planning continued, the curved walls were found to be less structurally sound, resulting in a shift in appearance. Made out of a "corrosion resistant 316 Stainless steel," rectangular structural tubing the greenhouse as it appears now is visually reminiscent of the roofs of gothic cathedrals (see figure 12). Comprised of triangular rafters with rounded collar ties placed just below the ridge beam, the whole structure is given a soaring appearance while maintaining a low center of gravity that will further ensure structural stability. Contrasting with the heavy base and extending the line of the greenhouse structure ever upwards are the floating geometric spires that rotate with the currents. Echoing the rectangular aspect of the structural tubing, the spires are also rectangular in build, with four solid sides that become increasingly perforated with octagonal cutouts towards the top of the structures before giving way to a delicate geometric lattice.

The greenhouse entryway further recalls gothic architecture, as the heavy metal beams of the archways curve gracefully into a point. However, the entryway itself is perfunctory since the structure is open and can be entered through the gaps between the triangular support structures or the wider openings at either end of the greenhouse. Therefore, the primary function of the entryway is its role as a framing devices for the sculptural scenes occurring within the greenhouse. When planning a work of this magnitude in a weightless setting, the layout is one of the more important elements; in this case, it was important to Taylor that every potential viewing angle was deliberately thought out, since unlike a canvas hanging on a wall in a museum, the sculptures here can be viewed from every potential angle including those above them.[74] This

[73] Smith, Marshall, and Cook, "Site Assessment of John Brewer Reef," 6.
[74] Smith, et al, "Engineering, Ecological and Social Monitoring of the Largest Underwater Sculpture in the World at John Brewer Reef, Australia," 3.

makes the anchoring points the only obscured elements of the exhibit, further separating it from previous aquatic sculptures.

Inside and outside of the greenhouse structure, Taylor has placed human figures, all of whom are engaged in various scenes of gardening. Upon entering the greenhouse through the front archway, a young girl in overalls and goulashes greets the divers. In her hands, she clutches an empty flower pot. The girl, like all of the figures in the installation, is a made of grey cement, the surface of which shows the rough texture of the material used in addition to the finer sculptural details. On the greenhouse's seven work benches, more empty flower pots can be seen covering their surfaces while figures either hold or watch over them. Two of these figures holding pots are sitting on the workbenches themselves looking down into the pots, their shoulders hunched. One figure in the structure that differs from the other gardeners is a young researcher who, placed in front of a microscope, can be seen with her arms clutched respectfully behind her back while she observes the slide before her. (see figure 13) Unlike the other pots and various details, the microscope is not made of concrete but metal. Initially, when viewing the figures as a group, it is clear that they are a diverse cast of characters, each of them possessing their own unique features and attitudes. However, upon closer inspection, it becomes clear that all of the figures have in one attribute in common, more specifically, all of these figures are children and adolescents.

Outside of the greenhouse structure, similar scenes of gardening can be seen. In one location, a boy is hoisting a shovel over a flower bed while two other gardeners can be seen holding trays. Furthermore, outside of the structure, Taylor has created various types of tree sculptures, which practically speaking are prefect gathering spaces for small fish, and visually speaking add more context to the "outdoor" gardening scenes he is working to create. For

example, a young woman with a watering can be seen standing under the shade of one of these trees, which helps to ground the figure in a scene. With the tree she is carrying out the action of watering a tree; without the tree, there is only a disjointed figure with a watering can surrounded by sand. The message the latter would send viewers is very different from the feelings the sculptures evoke in their current iteration, which are overwhelmingly those of hope. While all of the pots are empty, their existence signifies potential for new life, the young gardeners leaving viewers with the impression that there are people caring for and watching over these seeds of life. As in his previous exhibits, Taylor used local models to create his casts for his sculptures; however, for the *Coral Greenhouse* project; it was important to Taylor that the models were school age children from local and international schools.[75] In the broader context of the gardening and research scenes, the age of the children helps to convey a visual narrative that "the children are tending to their future and building a different relationship with the marine world by recognizing that it as precious, fragile, and in need of protection."[76]

Post-Submersion Studies and Coral Introduction

The first divers to explore the underwater world of the *Coral Greenhouse* would have been greeted by the sculptures as described above, young hopeful children with empty pots full of potential. What they would have missed was the biological growth that would soon occur in that very spot. From its inception, *Coral Greenhouse* was set to be the site of an exciting coral propagation and transplantation experiment, hopefully growing into its name as time went on. As in all scientific experiments, establishing a baseline was important for the research team working alongside Taylor. Diving down in early 2018, a team of marine biologists from Reef Ecologic

[75] Jason deCaires Taylor, "The Coral Greenhouse," Underwater Sculpture by Jason deCaires Taylor, 2019, https://www.underwatersculpture.com/projects/the-coral-greenhouse/.
[76] Jason deCaires Taylor, "The Coral Greenhouse," Underwater Sculpture by Jason deCaires Taylor, 2019, https://www.underwatersculpture.com/projects/the-coral-greenhouse/.

established three 50 meter transects, along which the exhibit would eventually be installed. Following these transects, they "recorded species and abundance of individuals…following the long-term monitoring program (LTMP) procedures from the Australian Institute of Marine Science (AIMS)."[77] Once the exhibit was installed, the team returned to the site in February 2020 to record any changes to the exhibit and the ecosystem in which it resides. Since many of the design elements incorporated into the greenhouse, such as the open lattice doors on the work benches, were geared towards producing environments that could provide smaller fish and other marine organisms shelter from larger predators and encourage congregation, it is promising to see post-installation studies showing an increase in fish species from twelve to forty-six.[78]

In 2021, *Coral Greenhouse* saw even more positive change as the vision of a functioning greenhouse would begin to be realized. Much like land artworks of the 1970s and 80s, such as Agnes Denes' *Wheatfield* (1982), where growing plants was integral to the success of the work, realizing the vision for *Coral Greenhouse* would involve successfully planting 131 corals throughout the installation. However, rather than plant corals throughout the entire installation, a decision was made to divide the exhibit along one of the pre-determined transects, leaving one half as a control group for both scientific and later aesthetic surveys. The scientific surveys would allow researchers to accurately assess the scope of the biological changes, and aesthetic surveys would make it possible for Taylor and MoUA to determine if divers would find the biological additions to the exhibit to be visually pleasing. In March 2021, a large group of scientists, students, and volunteers[79] began planting corals collected from local reefs of a similar

[77] Blandy, Congdon, and Krug, "Art, Ecological Restoration, and Art Education," 238.
[78] Smith, et al, "Engineering, Ecological and Social Monitoring of the Largest Underwater Sculpture in the World at John Brewer Reef, Australia," 9.
[79] The individuals involved in the mass coral planting event were a part of the following organizations: Reef Ecologic and MOUA were joined by scientists, volunteers, and partners from James Cook University, CSIRO, C2O Consulting, Grumpy Turtle Creative and Pacific Marine

depth, or broken pieces of live coral, on seventeen locations throughout the "treatment" half of the installation. The volunteers then spent time filling the pre-made holes in the porous cement planters with hopeful coral propagations.

Over the next year, researchers would continue to monitor these coral recruits, returning to the reef one, six, and twelve months after transplantation. After twelve months, survivorship of the corals was 91.6% and of the "remaining propagated corals, 93% were in good health and 7% were partially dead."[80] In fact, at the time of writing this thesis, the coral transplantation conducted at *Coral Greenhouse* is thought to be "the deepest successful transplantation experiment in Australia."[81] Additionally, the planted corals were not the only ones taking root. On the control side of the exhibit, there was markedly more soft coral recruitment than on the treatment side, averaging 4.97 soft coral recruits per m^2, and while hard coral recruitment was not as high, there was still a recorded average of 1.8 corals per m^2.[82] Based on the high survival rate of coral recruits, as a studied transplantation experiment, *Coral Greenhouse* is currently a successful example of how artificial reefs can provide vulnerable reef ecosystems a critical boost in substrate availability.

Coral Greenhouse Sculptures (2022)

One year after the successful transplantation of the coral recruits in 2021, researchers and recreational divers who visited the site were greeted by a very different version of *Coral Greenhouse.* Where before empty pots and flower beds covered much of the various surfaces in

---

Group. This is documented in - Smith, et al, "Engineering, Ecological and Social Monitoring of the Largest Underwater Sculpture in the World at John Brewer Reef, Australia," 5.

[80] Smith, et al, "Engineering, Ecological and Social Monitoring of the Largest Underwater Sculpture in the World at John Brewer Reef, Australia," 18.

[81] Smith, et al, "Engineering, Ecological and Social Monitoring of the Largest Underwater Sculpture in the World at John Brewer Reef, Australia," 18.

[82] Smith, et al, "Engineering, Ecological and Social Monitoring of the Largest Underwater Sculpture in the World at John Brewer Reef, Australia," 15.

the exhibit site, in 2022 promising healthy coral recruits filled the pots while rows of coral had taken up residence in the coral guardian's trays and flower beds. In the space of a year, the once hopeful yet barren exhibit had flourished after the mass planting, resulting in a structure that is now a proper greenhouse in function as well as name. Beginning as before with the greenhouse structure itself, there is a marked increase in soft corals growing on the triangular support beams transforming the metal from hard and reflective to a softer almost velvet-like texture. Furthermore, the new biological additions have created more than just a textural change, leaving splashes of colors in their wake. Reds, pinks, and vibrant and light greens are taking over the once monotone surface of the gothic structure (see figure 14). These colors are especially eye catching when a flashlight is used to explore the site. Since red tones do not register well at depths past 3m due to the fact that red light wavelengths are absorbed first, by bringing a light source down to the sculptures, a visitor can better experience the vibrant colors the corals have to offer.

Interestingly, the amount of corals growing on the greenhouse beams show no marked difference from the control side to the treatment side. However, there is a pronounced difference between the treatment and control side when looking at the planted corals. Moving through the entryway, the young girl with goulashes is still there to welcome divers, though now almost all of her facial features are entirely obscured by a thick layer of coral. She also has hard coral growing off of her left shirt sleeve, and in her hands where previously there was only and empty pot, now there is a young coral growing. Similar changes can be seen in the other sculptures inside of the greenhouse, their features now obscured behind a mask of new life, while corals fill the pots around them (on the treatment side). Of the corals planted inside of the greenhouse, one of the largest can be seen in a flowerpot held by a small girl sitting cross-legged on one of the

work benches. The type of coral planted here is Acropora spp. also known aptly as "staghorn coral," as various branches shoot off of the main stalk in a way that mimics the antlers found on a deer.[83] The other colonial coral that has really established its home in the greenhouse can be found in a hanging basket near one of the workbenches. The basket is made up of a series of connected triangles with a circular disk placed in the center for the purpose of holding the organism that now grows inside of it. The coral in the basket is known as Seriatopora or "bird's nest coral" and, while visually similar to the branching form of staghorn coral, is made up of smaller branching segments that appear to be tangled together much like a briar patch or, as the name implies, a bird's nest. Both of these organic additions, as well as the smaller ones that fill the remainder of the treated plots, are visually stunning, their delicate interwoven forms contrasting with the detail-less forms which now hold and watch over them.

Outside of the greenhouse, similar growth can be seen in the planters just outside of the structure. However, the external structures in many ways are more visually intriguing than their "indoor" counterparts. Take for example the plant boxes which lay empty in the first analysis -- now, rows of thriving Acropora can be seen taking over every inch of space, thickening as they grow upwards and outwards (see figure 15). Similar growth can be seen in the plant box covered with a metal frame, along with the growth of unplanted corals which have spawned in the months between the initial planting. In front of these boxes, a young boy now encrusted in layers of corals holds a plant box now overflowing with coral, while another young man holds a shovel carrying a coral over the box nearest him, in the action of planting the maturing coral.

[83] Acropora spp. makes up 90% of the 131 planted corals. Smith, et al, "Engineering, Ecological and Social Monitoring of the Largest Underwater Sculpture in the World at John Brewer Reef, Australia," 14.

In the area further away from the greenhouse, where Taylor's sculpted trees are interspersed among the sculptures, lies a beautiful example of Taylor's ability to orchestrate scenes using living organisms. Underneath the shade of a sculpted umbrella tree, the girl with the watering can, despite corals and other organisms covering her face, still retains sculpted details, such as her braided hair and detailed ears which help to further humanize her in the eyes of divers. Unlike other sculptures which were created holding flowerpots or cupping corals in their hands, the girl with the watering can is shown in the act of nourishing staghorn corals growing around her feet. Because the base these corals were planted on is made to be obscured by sand, it gives the viewer the impression that this scene could have occurred naturally. Another aspect that adds to this forested area of the installation is the way the soft corals interact with the tree sculptures, which just as with the people who were modeled off of locals, the trees Taylor sculpted are based on terrestrial trees that are native to the area.[84] The trees sculpted for this exhibit already contributed to the overall atmosphere of growth, but after the soft coral made its home on the various trees surfaces it makes the form itself feel alive. No longer is the umbrella palm simply mimicking life, it is now supporting it. Similar to the corals on the metal structure of the greenhouse, the corals growing on the arbor sculptures also contain present the viewer with vibrant pinks and reds separated only by the light yellows and greens of young hard coral recruits (see figure 16).[85]

Overall, when analyzing the structures and sculptures of the *Coral Greenhouse* installation, it is clear that the exhibit post coral planting is a more fully realized version of the

---

[84] Jason deCaires Taylor, "The Coral Greenhouse," Underwater Sculpture by Jason deCaires Taylor, 2019, https://www.underwatersculpture.com/projects/the-coral-greenhouse/.
[85] Adam Smith, Al Songcuan, Nathan Cook, Gemma Molinaro, Rachelle Brown and Matthew Wilke, "Monitoring of substrate, ecology, social, marine debris and coral (dhambi) propagation associated with underwater sculptures at John Brewer Reef, Townsville," *ResearchGate*, May 2022, 21.

greenhouse project. It was clear from the inception of this project that the conservational aspects were as important to Taylor as the artistic qualities. These environmental considerations were clear in the forms Taylor chose to create, as he worked to include details like pre-made holes for coral recruits and planters placed in locations that would be easy to monitor. It is perhaps because of all of these details that the Greenhouse presented immediately post-submersion, while beautiful in its own way, was literally incomplete as the final biological touches had yet to be added. Like a roll of film meant to be double-exposed, the first version was never meant to be the final product, and the final product will always remain a bit of mystery even to the artist behind it as it continues to grow and evolve even now.

Post-Submersion Surveys of *Coral Greenhouse*

In the current stage of the installation's existence, it has evolved into a self-sustaining reef ecosystem and done so with significantly more success than artificial reefs whose only purpose was to act as substrate. For instance, a similar coral gardening project in Belize, which also utilized a long-term monitoring program like the one employed by scientists working with Taylor, reported a mean survival rate of 89% in comparison to *Coral Greenhouse's* 91.6%. As mentioned, scientists were performing site surveys for this installation before its submersion, and have continued to monitor it well after the coral planting to gauge its success as a reef. However, the scientific surveys were not the only ones conducted, as the MoUA has also consistently surveyed visitors before and after their dives to get a sense of overall experience. These aesthetic surveys have also helped document visitor reactions to Taylor's installation.

Aesthetic Survey

The practice of surveying visitors to gauge levels of interests in museum exhibits is not unique to the Underwater Museum of Art, as many museums attempt to track visitor experience.

However, due to the unique circumstances, specifically the fact that all visitors must take a boat ride to reach the sites, Taylor's exhibit presents a rare opportunity to ensure almost 100% survey participation. The questionnaire guests receive consists of multiple sections pertaining to various aspects of the *Coral Greenhouse* experience including: information about visitor's dive history, prior knowledge of coral reefs, overall satisfaction, perception of natural coral reefs, and perception and opinions on the inclusion of the *Coral Greenhouse* installation in the Great Barrier Reef.[86] As it is written, this survey helps not only track viewer experience but also how their understanding of coral conservation and reef ecosystems has changed, if at all.

By including questions that reference personal dive experience, researchers have ensured a way to track aesthetic preferences of new versus seasoned divers, an area that is currently understudied across commercial dive sites. At this point, the findings have shown that the newer divers show more interest in artificial reefs while those with more dive advanced experience prefer natural reefs. Though, with custom artificial reefs and underwater art both being such new practices, it is worth noting that more long-term research will be necessary to see if experienced divers would find mature artificial reefs more enjoyable, since they offer the biodiversity divers come to expect from natural reefs. Similarly, the questions about prior reef knowledge have showcased *Coral Greenhouse*'s ability to raise awareness of the current threats the Great Barrier Reef is facing. Surveys from both before and after the coral planting visitors have found that visitors feel as though the Underwater Museum has highlighted the need for increased reef conservation efforts; this finding specifically correlates to Taylor's goal for the *Coral Greenhouse* in the educational sphere.

[86] Smith, et al, "Monitoring of substrate, ecology, social, marine debris and coral (dhambi) propagation associated with underwater sculptures at John Brewer Reef, Townsville," 36.

Furthermore, when comparing the 142 surveys taken before to the 94 taken after the coral planting, the after survey showed no significant difference in the "overall score based on John Brewer Reef and Coral Greenhouse aesthetic beauty and visitor experience."[87] However, when broken down, the surveys clearly shows people rated the aesthetic value of the corals and fish on the treatment side of the exhibit significantly higher than those found on the control side in addition to showing a preference for the art located on the treatment side of the installation. The corals have even been noted as "giving life to the sculptures."[88] This is likely because the abundance of corals on the treatment side attracts a wider variety of fish species in larger quantities than are commonly seen on the control side. Additionally, "visitors to the Coral Greenhouse showed more interest in seeing more underwater art in the Great Barrier Reef post-coral planting."[89] When taking these findings into consideration it becomes even more evident just how integral the inclusion of the coral research and reef conservation practices in the initial concept and execution for *Coral Greenhouse* is to the success of the completed project. For, without the inclusion of the live corals, the sculptures do not offer the organic component that visually demonstrates to visitors the importance of caring for corals and reefs in the future.

Ecological Survey/Impact

As established, many pre-installation ecological surveys were completed by the team of researchers working with Taylor in order to create a baseline off of which to base future surveys. The location selected for *Coral Greenhouse* is sheltered by the John Brewer Reef and pre-installation was just covered by sand with no significant amount of substrate. By choosing an

[87] Smith, et al, "Monitoring of Substrate, Ecology, Social, Marine Debris and Coral (Dhambi) Propagation Associated with Underwater Sculptures at John Brewer Reef, Townsville," 36.
[88] Smith, et al, "Monitoring of Substrate, Ecology, Social, Marine Debris and Coral (Dhambi) Propagation Associated with Underwater Sculptures at John Brewer Reef, Townsville," 23.
[89] Smith, et al, "Monitoring of Substrate, Ecology, Social, Marine Debris and Coral (Dhambi) Propagation Associated with Underwater Sculptures at John Brewer Reef, Townsville," 22.

area of open sea with only sand, the team maximized the *Greenhouse's* impact on its environment by increasing the amount of surfaces available for coral growth by 100%. Additionally, because of *Coral Greenhouse'*s proximity to the natural John Brewer Reef, native fish communities have been able to move easily between the two locations, the former providing the fish with further habitats.[90] The fish recorded at Taylor's installation are generally invertebrate feeders who are attracted to the ample amounts of turf algae and benthic organisms growing on the porous cement mixture and piscivorous due to the intricate hiding structures, such as the work benches and caged coral boxes, where smaller fish can usually be found. The presence of these fish, in a way, can be considered part of Taylor's grand plan for the final visual of the *Greenhouse,* as the form of elements that attract them were specifically designed with the habitat function in mind.

In addition to the increase in fish, *Coral Greenhouse* saw so much success ecologically and aesthetically with the 131 planted corals that it was recommended they continue to plant corals throughout the remainder of the exhibit. In a time when coral populations are experiencing a sharp decline due to the global stress of climate change, pollution, and overfishing, projects like Taylor's are invaluable tools in raising awareness for issues effecting the ocean while also creating positive change in various reef ecosystems around the world. The Underwater Museum of Art " and the transplantation of coral fragments onto the structures have contributed to an increase of the abundance and diversity of the marine community, have improved the aesthetics of the area with minimal impact to the environment, and have contributed to high visitor satisfaction."[91] Furthermore, while there is still more research to be done surrounding the topic

[90] Smith, et al, "Monitoring of Substrate, Ecology, Social, Marine Debris and Coral (Dhambi) Propagation Associated with Underwater Sculptures at John Brewer Reef, Townsville," 22.
[91] Smith, et al, "Engineering, Ecological and Social Monitoring of the Largest Underwater Sculpture in the World at John Brewer Reef, Australia," 19.

of artistically driven artificial reef projects, the positive outcome that resulted from the collaboration between artist and scientists thus far has proven that art can aid in scientific conservation efforts so long as potential issues are carefully studied and mitigated in the planning stages of an installation on the scale of *Coral Greenhouse.*[92] Moreover, with the critical success of the installation from both the scientific and artistic communities, it is likely that after the success of *Coral Greenhouse,* further projects will be completed which seek to merge the unique skill set of fine artists and scientific researchers in order to spread awareness of ecological issues while also directly creating positive ecological change.

[92]Smith, et al, "Engineering, Ecological and Social Monitoring of the Largest Underwater Sculpture in the World at John Brewer Reef, Australia," 19.

Chapter 5 - Analysis

As documented in the previous chapter, the submerged installation *Coral Greenhouse* is inseparable from the coral research that it facilitated, as the conservational aspect was a driving factor in the final design of the sculptures that comprise the Underwater Museum. Because of the truly interdisciplinary nature of the installation, it is clear that utilizing a methodology that would not appropriately address the coral research that was always destined to take place in the greenhouse would have left readers with a gap in their understanding of why certain aesthetic choices were made. Even the theme of the installation hinged on viewers having a base level understanding of the current struggles natural reefs are facing due to climate change.[93] The aim of this thesis is to demonstrate a new methodology that will help historians analyze environmental interdisciplinary works of art. By combining historical, ecocritical, formalist, iconographic, and scientific methodologies and applying them to *Coral Greenhouse,* it was easier to understand the concept behind the work and appreciate the physical impact it has on the ecosystem it is raising awareness for, as well as the impact the research had on the installations forms. If this type of methodological approach was applied to other artworks that are equally as driven by scientific research, it would be much easier for historians to connect the scientific research involved in interdisciplinary art to the final products and demonstrate how form can influence function.

The shortcomings of using an interdisciplinary the methodology are predominantly related to the amount explanation and sometimes simplification that the scientific research requires in order to produce an easily comprehensible text. However, it is possible to include scientific jargon in a way that is universally relatable to readers of any field. For example,

[93] Smith, Songcuan, Cook, Brown, Cook, and Richardson, "Engineering, Ecological and Social Monitoring of the Largest Underwater Sculpture in the World at John Brewer Reef, Australia*,"* 1.

whenever survey results were heavily referenced, it was only ever in plain language in common metrics in order to avoid confusion. Additionally, all scientific research was tied back to the physical aspects of the installation they influenced; this is particularly important as it further establishes the interconnected relationship of the typically separated components and viewpoints of the exhibit.

Furthermore, analyzing the figures that make up the *Coral Greenhouse* and how they are changing physically as well as the concepts that drove their designs is essential in communicating to readers the significance of certain aesthetic choices. For example, the choice to use only children in his installation in order to communicate a message that children are the hope for a better future, and the use of local people and trees to create a deeper sense of community and personal connection through his pieces were both topics that were easy to discuss using an interdisciplinary approach.[94] Taking a closer look into the visual aspects also allowed for deeper analysis of aesthetic choices made on the greenhouse prior to the coral planting, facilitating a discussion on the importance of the cement choice and the predrilled holes that resided at the base of the pots.

Many of the other articles written on *Coral Greenhouse* were singularly focused on the scientific research,[95] art and the tourism industry,[96] or the aesthetic value the project added to the

---

[94] In 2020 alone was noted that 1,000 commercial tourists and 150 recreational divers visited the site. This breakdown does not further define what percentage of tourists and recreational divers are local to the Townsville area. Smith, et al, "Site Assessment of John Brewer Reef for a proposed Museum of Underwater Art (MoUA), Townsville," (2018): 4, 10.13140/RG.2.2.33861.19681.

[95] Smith, Songcuan, Cook, Brown, Cook, and Richardson, "Engineering, Ecological and Social Monitoring of the Largest Underwater Sculpture in the World at John Brewer Reef, Australia," 1.

[96] Claudio Minca and Chin Ee Ong, "Hotel California: Biopowering Tourism, from New Economy Singapore to Post-Mao China," in *Tourism Encounters and Controversies,* 1st edition, eds. Gunnar Thór Jóhannesson, Carina Ren, and René van der Duim (London: Routledge, 2015), https://www.taylorfrancis.com/chapters/edit/10.4324/9781315550732-9/real-things-tourist-things-drawing-line-ocean-felicity-picken.

Great Barrier Reef. While articles like these have their place, by not addressing the duality of the exhibit, scholars and reporters are cutting the potential of their own articles short, especially in this instance where so much of the meaning behind the project is informed by its relationship to coral conservation. This same principle stands for articles written on other interdisciplinary art endeavors. Moving forward, if art historians employed an interdisciplinary approach similar to the one used in this thesis it would increase the inclusivity and reach of art historical analysis while also providing future researchers a source that delves into all aspects of a work's creation.

Chapter 6- Conclusion

In recent years there has been a shift in the artistic and scientific communities that has resulted in more collaboration between the two, scientists choosing to involve more artists in their research projects while artists have begun to incorporate more scientifically grounded concepts into their artworks. Furthermore, with concepts like STEAM gaining traction in the educational sphere it is likely this increase integration will continue, meaning now art historians have a pressing need for a new methodology which can appropriately encompass both aspects of the scientific interdisciplinary works. As noted. in the literature review many articles and books have broached the subject of scientific art with some authors choosing to focus on the scientific data while others ignore the data and research involved in favor of a conceptual approach. However, both of these fail to communicate to reader the impact data and research has on the art these interdisciplinary artists are creating, this is why a standardized methodological approach which truly integrates both fields will important for art historians moving forward.

Identifying a gap in the methodologies used to discuss environmental art in the past, this thesis has aimed to prove the necessity of a new interdisciplinary method which will enable historians to capture the role scientific data can play in an artist's conceptualization process. In order to accomplish this goal a more comprehensive interdisciplinary method was applied to an analysis of Jason deCaires Taylor's Underwater Museum of Art exhibit *Coral Greenhouse.* When taking into account the coral research that informed the installation it becomes increasingly clear just how much of an impact it had on Taylor's design process, influencing the shape of the greenhouse structure as well as the forms that fill and surround it. Even Taylor has made it clear that the primary objective of the *Coral Greenhouse* project was inspire others to learn more about the environmental impacts negatively impacting delicate reef ecosystems while

providing biologist a controlled environment for further coral research. Therefore, not including information on the scientific aspect of this interdisciplinary project does a disservice to the message it aims to impart on its visitors. By discussing all aspects of this work, readers will now be left with a more complete understanding of Taylor's vision for the project, while also gaining a better understanding of the meaning behind the forms and figures he chose to represent. Furthermore, with so many new interdisciplinary artists finding inspiration in scientific studies, such as bio and botanical artists, using a methodology similar to this one would enable art historians to more comprehensively capture the duality of these artworks, just as it showcased *Coral Greenhouse.* Overall, whether scientific processes are a medium for artists or an inspiration it is crucial that art historians to record the impacts of the ever-evolving field of art.

Figure 1, Jason deCaires Taylor, *Molinere Underwater Sculpture Park*, pH neutral cement, 2006, (Molinere Beauséjour Marine Protected Area, Grenada), https://suzannelovellinc.com/blog/molinere-bay-underwater-sculpture-park/

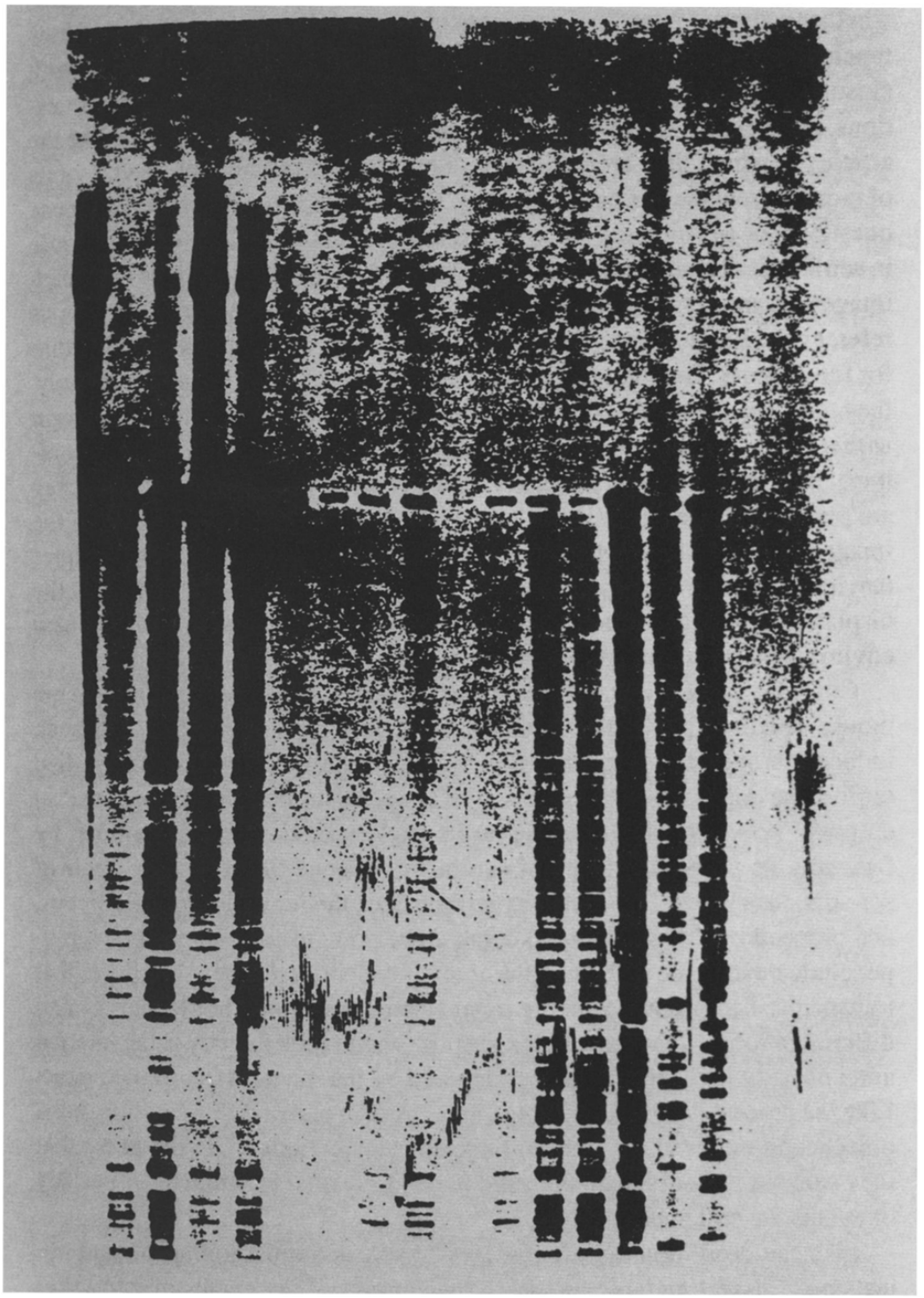


Figure 2, “Autoradiograph” 1990, *Art History and Images That Are Not Art*, by James Elkin, 562, New York City, NY: College Art Association, 1995.

Figure 3, Jason deCaires Taylor, *Coral Greenhouse*, pH neutral cement, stainless steel, 2020, (Underwater Museum of Art, Great Barrier Reef),https://www.dezeen.com/2020/06/09/museum-for-underwater-art-coral-greenhouse-jason-decaires-taylor-australia/

Figure 4, Michael Heizer, *Double Negative 240,000 Tons Displaced*, Earth, 1969, (Virgin River Mesa, Nevada), https://jstor.org/stable/community.13575143

Figure 5, Robert Smithson, *Spiral Jetty*, Mud, rock, and salt crystals, 1970, (Great Salt Lake, Utah), https://www.jstor.org/stable/community.13578926

Figure 6, Christo and Jeanne-Claude, *Running Fence*, Nylon fabric, steel poles and cables, 1976, (Sonoma County, California), https://www.jstor.org/stable/community.14728987

Figure 7, Robert Rauschenberg, *Mud Muse*, Bentonite mixed with water in aluminum-and-glass vat, with sound-activated compressed-air system and control console,1968-1971, (Moderna Museet, Stockholm), https://www.rauschenbergfoundation.org/art/artwork/mud-muse

Figure 8, Mel Chin, *Revival Field*, Landscape, 1990- present, (Pig's Eye Landfill, Minnesota) https://www.jstor.org/stable/community.14726677

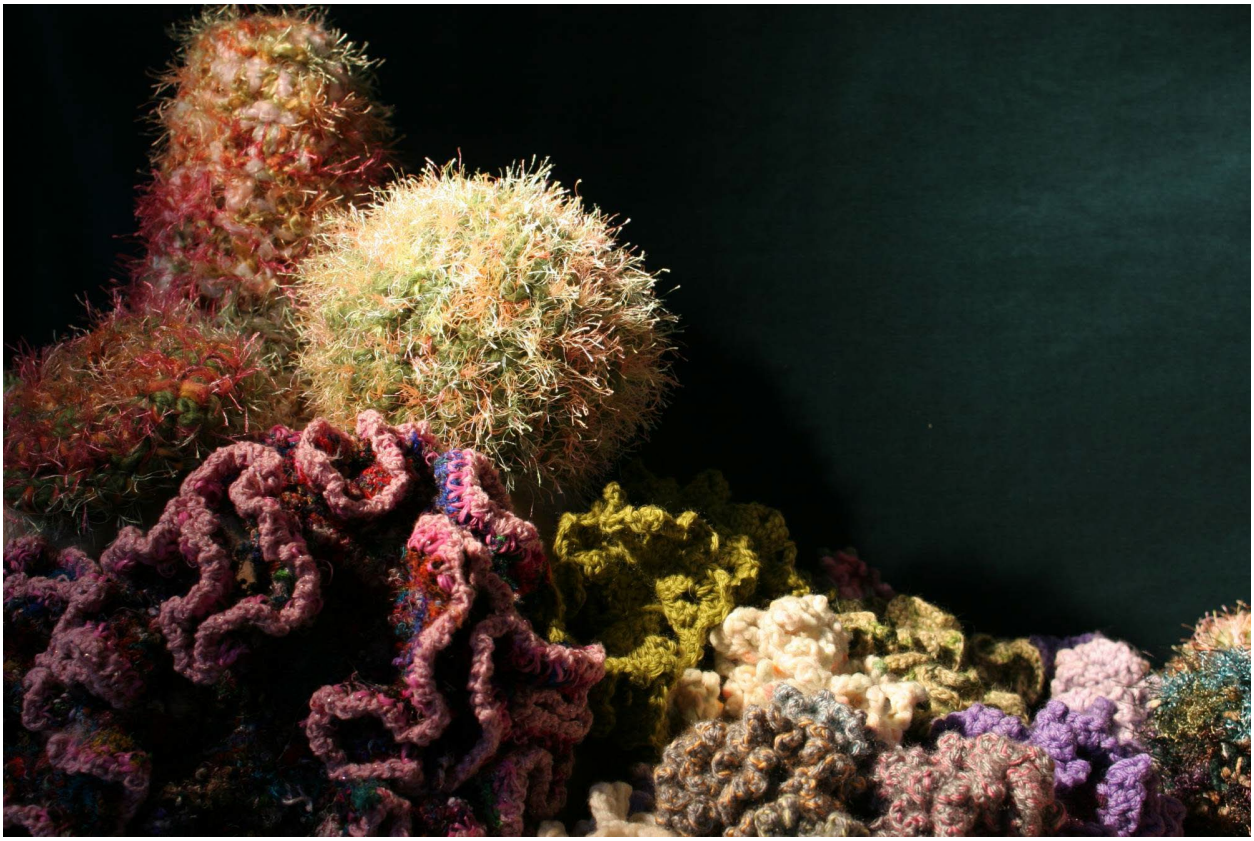


Figure 9, Institute for Figuring, *Hyperbolic Crochet Coral Reef Project*, Yarn, fibre, 2007-present, https://crochetcoralreef.org/exhibitions/andy-warhol-museum/

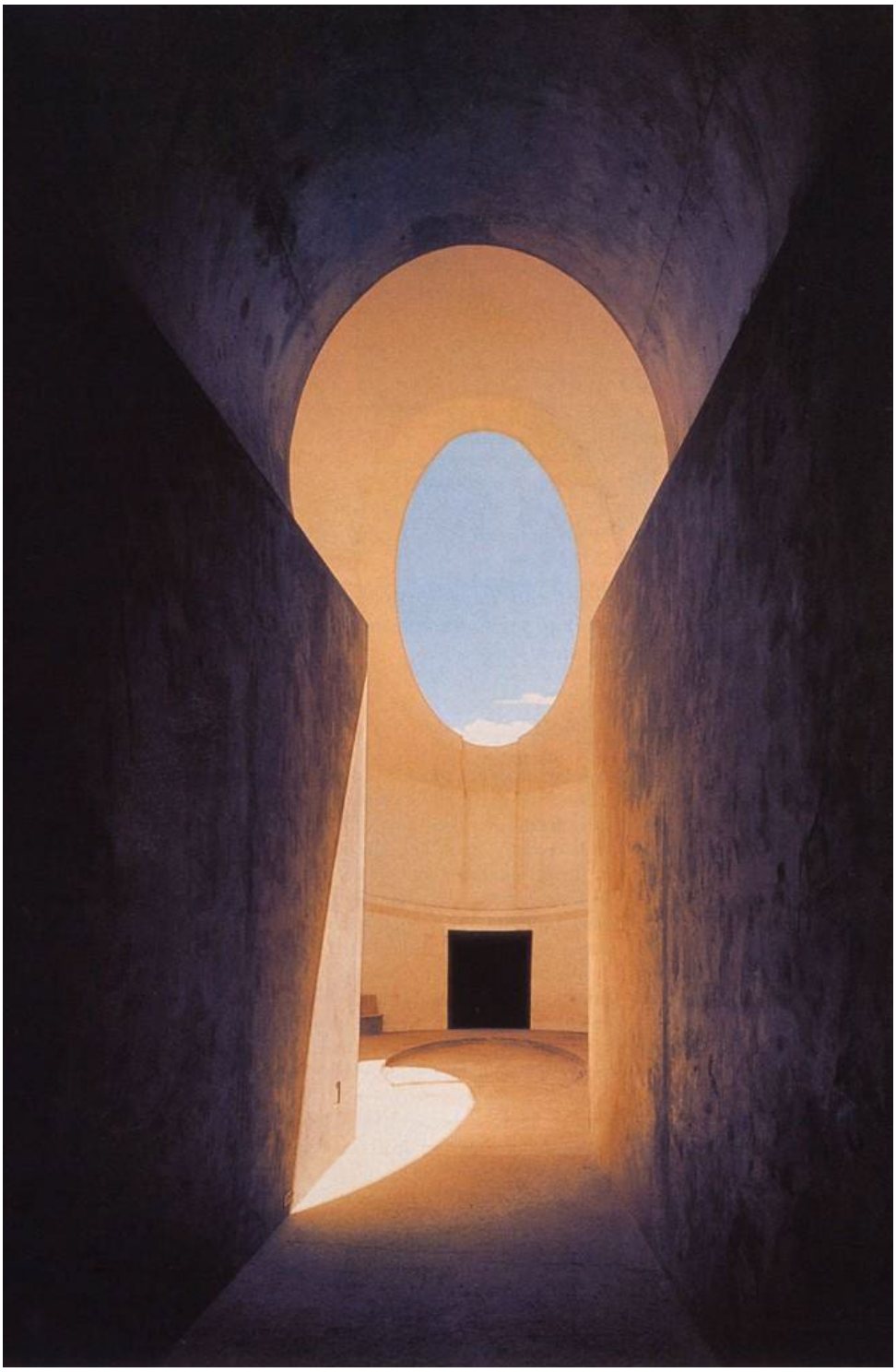


Figure 10, James Turrell, *Roden Crater Project*, Earth, 1979-present, (Flagstaff, Arizona) https://www.jstor.org/stable/community.14706466.

Figure 11, Agnes Denes, *Wheatfield - A Confrontation: Battery Park Landfill,* Wheat, 1982, (Battery Park Landfill, New York) https://www.jstor.org/stable/community.15693982

Figure 12, Jason deCaires Taylor, *Coral Greenhouse*, pH neutral cement, stainless steel, 2019, (Underwater Museum of Art, Great Barrier Reef), https://www.underwatersculpture.com/projects/the-coral-greenhouse/

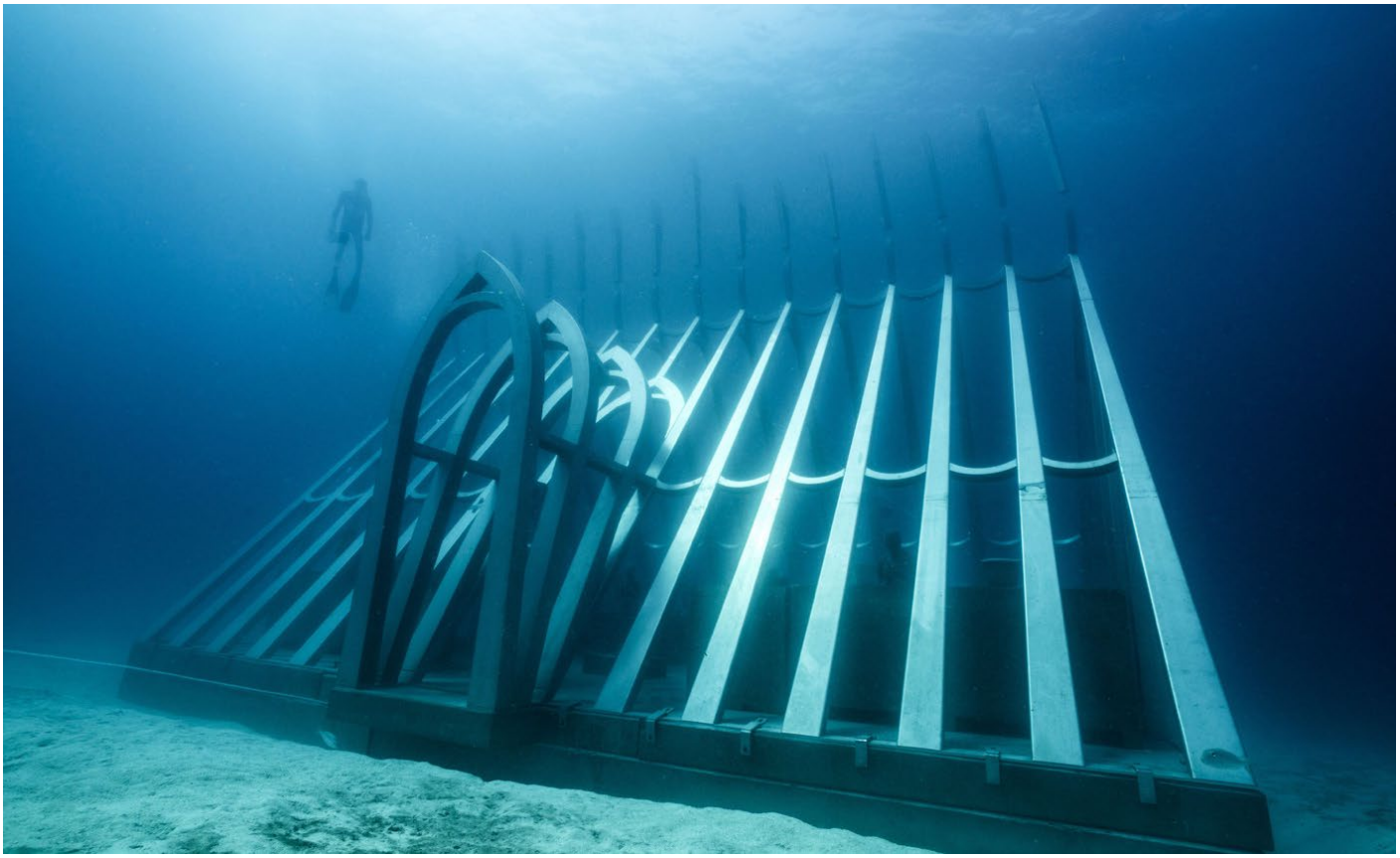


Figure 13, Jason deCaires Taylor, “Coral Greenhouse,” Stainless steel, Underwater Museum of Art, Great Barrier Reef, In Engineering, Ecological and Social Monitoring of the Largest Underwater Sculpture in the World at John Brewer Reef, Australia, 2019

Figure 14, Jason deCaires Taylor, “Coral Greenhouse,” Stainless steel, pH neutral cement, Underwater Museum of Art, Great Barrier Reef, In Monitoring of substrate, ecology, social, marine debris and coral (dhambi) propagation associated with underwater sculptures at John Brewer Reef, Townsville, 2019

Figure 15, Jason deCaires Taylor, “Coral Greenhouse,” Stainless steel, pH neutral cement, Underwater Museum of Art, Great Barrier Reef, In *Monitoring of substrate, ecology, social, marine debris and coral (dhambi) propagation associated with underwater sculptures at John Brewer Reef, Townsville*, 2019

Figure 16, Jason deCaires Taylor, “Coral Greenhouse,” Stainless steel, pH neutral cement, Underwater Museum of Art, Great Barrier Reef, In Monitoring of substrate, ecology, social, marine debris and coral (dhambi) propagation associated with underwater sculptures at John Brewer Reef, Townsville, 2019

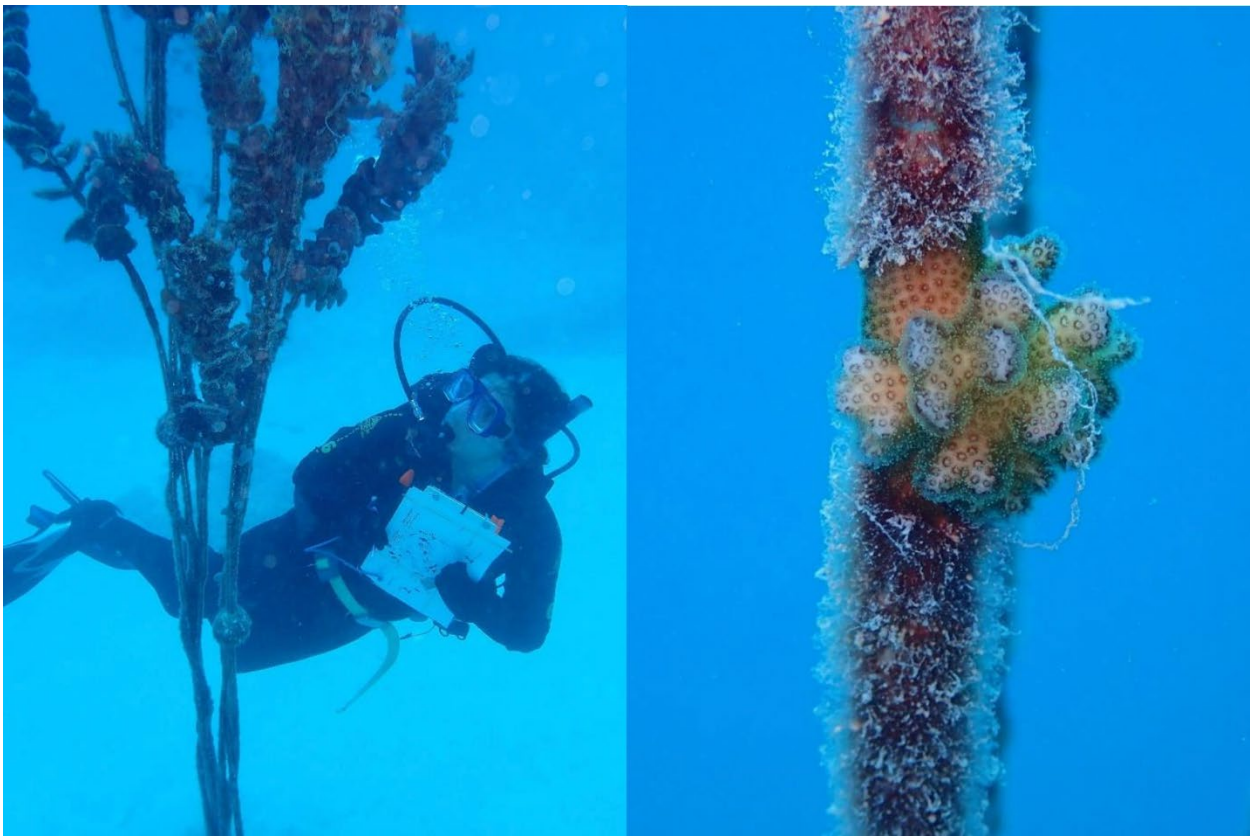


Figure 17, Jason deCaires Taylor, “Coral Greenhouse,” Stainless steel, pH neutral cement, Underwater Museum of Art, Great Barrier Reef, In *Monitoring of substrate, ecology, social, marine debris and coral (dhambi) propagation associated with underwater sculptures at John Brewer Reef, Townsville*, 2019

Bibliography

Allamel-Raffin, Catherine. "Interpreting Artworks, Interpreting Scientific Images." *Leonardo* 48, no. 1 (2015): 76–77. https://doi.org/10.1162/leon_a_00903.

Bagdassarian, Carey K. "Naturalists, Artists, and Language." *Conservation Biology* 23, no. 6 (2009): 1639–40. https://www.jstor.org/stable/40419205.

Blandy, Doug, Kristin G. Congdon, and Don H. Krug. "Art, Ecological Restoration, and Art Education." *Studies in Art Education* 39, no. 3 (1998): 230–43. https://doi.org/10.2307/1320366.

Bullot, Nicolas J. "The Functions of Environmental Art." *Leonardo* 47, no. 5 (2014): 511–12. http://www.jstor.org/stable/43832972.

Cambrosio, Alberto, Daniel Jacobi, and Peter Keating. "Ehrlich's 'Beautiful Pictures' and the Controversial Beginnings of Immunological Imagery." *Isis* 84, no. 4 (1993): 662–99. http://www.jstor.org/stable/235104.

Carlson, Allen. "Is Environmental Art an Aesthetic Affront to Nature?" *Canadian Journal of Philosophy* 16, no. 4 (1986): 635–50. http://www.jstor.org/stable/40231495.

Chianese, Robert Louis. "How Green Is Earth Art?: Spiral Jetty." *American Scientist* 101, no. 1 (2013): 20–21. http://www.jstor.org/stable/43707665.

Clay, Grady. "The New Leap—Landscape Sculpture." *Landscape Architecture* 61, no. 4 (1971): 296–97. http://www.jstor.org/stable/44671207.

Curtis, Scott, and Robert Lue. "Bridging Science, Art, and the History of Visualization: A Dialogue between Scott Curtis and Robert Lue." *Discourse* 37, no. 3 (2015): 193–206. https://doi.org/10.13110/discourse.37.3.0193.

Denes, Agnes. "Wheatfield - A Confrontation: Battery Park Landfill, Downtown Manhattan." Agnes Denes, September 11, 2001. http://www.agnesdenesstudio.com/works7.html.

Elkins, James. "Art History and Images That Are Not Art." *The Art Bulletin* 77, no. 4 (1995): 553–71. https://doi.org/10.2307/3046136.

Flannery, Maura C. "Biology & Art: An Intricate Relationship." *The American Biology Teacher* 74, no. 3 (2012): 194–97. https://doi.org/10.1525/abt.2012.74.3.13.

Flannery, Maura C. "Building Biology." *The American Biology Teacher* 64, no. 1 (2002): 64–69. https://doi.org/10.2307/4451238.

Ginsburgh, V., and A.-F. Penders. "Land Artists and Art Markets." *Journal of Cultural Economics* 21, no. 3 (1997): 219–28. http://www.jstor.org/stable/41810636.

Halpern, Megan K., and Hannah Star Rogers. "Inseparable Impulses: The Science and Aesthetics of Ernst Haeckel and Charley Harper." *Leonardo* 46, no. 5 (2013): 465–70. http://www.jstor.org/stable/43834078.

Hartle, Stephanie, Darcy White, and Karen Stock. "Jason DeCaires Taylor's Submerged Sculptures and the Iconography of Slow Violence." In *Visual Activism in the 21st Century: Art, Protest and Resistance in an Uncertain World*, 200–210. London: Bloomsbury Visual Arts, 2022.

Hodges, Elaine R. S. "Scientific Illustration: A Working Relationship between the Scientist and Artist." *BioScience* 39, no. 2 (1989): 104–11. https://doi.org/10.2307/1310910.

"Jason DeCaires Taylor." *Issues in Science and Technology* 29, no. 3 (2013): 6–21. http://www.jstor.org/stable/43315729.

Kemp, Martin. "Betty Beaumont's Ocean Landmark Is In Deep Water." *Nature* 431, 1039 (2004). https://doi.org/10.1038/4311039a

McCormack, Alan J. and Thomas Smucker. "Biology and Art: Interdisciplinary Challenges." *The American Biology Teacher* 44, no. 2 (1982): 112–15. https://doi.org/10.2307/4447420.

McCormick, Carlo, Helen Scales, and Jason deCaires Taylor. *The Underwater Museum: The Submerged Sculptures of Jason DeCaires Taylor*. San Francisco: Chronicle Books, 2014.

McLaughlin, Peter. "Naming Biology." *Journal of the History of Biology* 35, no. 1 (2002): 1–4. http://www.jstor.org/stable/4331705.

Minca, Claudio and Chin Ee Ong. "Hotel California: Biopowering Tourism, from New Economy Singapore to Post-Mao China." in *Tourism Encounters and Controversies,* 1st edition, eds. Gunnar Thór Jóhannesson, Carina Ren, and René van der Duim (London: Routledge, 2015), https://www.taylorfrancis.com/chapters/edit/10.4324/9781315550732-9/real-things-tourist-things-drawing-line-ocean-felicity-picken.

Moser, Stephanie. "Making Expert Knowledge through the Image: Connections between Antiquarian and Early Modern Scientific Illustration." *Isis* 105, no. 1 (2014): 58–99. https://doi.org/10.1086/675551.

"Natural Histories: 400 Years of Scientific Illustration from the Museum's Library." *Issues in Science and Technology* 30, no. 4 (2014): 56–63. http://www.jstor.org/stable/43315210.

Palmquist, Peter E. "Pioneer Women Photographers in Nineteenth-Century California." *California History* 71, no. 1 (1992): 110–27. https://doi.org/10.2307/25158613.

Pevsner, Jonathan. "Leonardo Da Vinci, Neuroscientist." *Scientific American Mind* 16, no. 1 (2005): 84–91. http://www.jstor.org/stable/24997605.

Potts, George D. "Ernst Haeckel: A Biographical Sketch." *The American Biology Teacher* 38, no. 9 (1976): 544–56. https://doi.org/10.2307/4445740.

Preece, Robert. "Submerged: A Conversation with Jason DeCaires Taylor." *Sculpture Magazine* 35, no. 9 (November 2016): 18–23.

Sandback, Amy Baker. "Endeavor of Like Spirits: Anna Atkins & Judy Pfaff." *On Paper* 1, no. 5 (1997): 28–29. http://www.jstor.org/stable/24554639.

Saska, Hope. "Anna Atkins: Photographs of British Algae." *Bulletin of the Detroit Institute of Arts* 84, no. 1/4 (2010): 8–15. http://www.jstor.org/stable/23183243.

Schaaf, Larry. "The First Photographically Printed and Illustrated Book." *The Papers of the Bibliographical Society of America* 73, no. 2 (1979): 209–24. http://www.jstor.org/stable/24302456.

Shick, J. Malcolm. "Toward an Aesthetic Marine Biology." *Art Journal* 67, no. 4 (2008): 62–86. http://www.jstor.org/stable/40598927.

Sinclair, Charles. "A Biology Course for Art Majors: Developing an Eye for Science." *Journal of College Science Teaching* 33, no. 2 (2003): 22–26. http://www.jstor.org/stable/45046878.

Smith, Adam, Al Jayson Songcuan, Nathan Cook, Rachelle Brown, Kailash Cook, and Reuben Richardson. "Engineering, Ecological and Social Monitoring of the Largest Underwater Sculpture in the World at John Brewer Reef, Australia*." Journal of Marine Science and Engineering* no. 10 (2022): 1-22 https://doi.org/10.3390/jmse10111617

Smith, Adam, Paul Marshall, and Nathan Cook. "Site Assessment of John Brewer Reef for a proposed Museum of Underwater Art (MoUA), Townsville." *ResearchGate*, May 2018. 10.13140/RG.2.2.33861.19681.

Taylor, Jason deCaires. "The Coral Greenhouse." Underwater Sculpture by Jason deCaires Taylor, 2019. https://www.underwatersculpture.com/projects/the-coral-greenhouse/ .

Tucker, Jennifer. "The Historian, the Picture, and the Archive." *Isis* 97, no. 1 (2006): 111–20. https://doi.org/10.1086/501104.

Ulbricht, J. “Changing Concepts of Environmental Art Education: Toward a Broader Definition.” *Art Education* 51, no. 6 (1998): 22–34. https://doi.org/10.2307/3193748.