2017

An Examination and Condition Assessment of Robert Winthrop Chanler's Pool Grotto Ceiling Mural at Vizcaya, Miami

Lucy Midelfort
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Abstract
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Keywords
documentation, conservation, bas relief, tropical, distemper

Disciplines
Historic Preservation and Conservation

Comments
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AN EXAMINATION AND CONDITION ASSESSMENT OF ROBERT WINTHROP CHANLER’S POOL GROTTO CEILING MURAL AT VIZCAYA, MIAMI

Lucy Winona Lily Midelfort

A THESIS

in

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MASTER OF SCIENCE IN HISTORIC PRESERVATION

2017

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Table of Contents

1.0 ABSTRACT ..................................................................................................................1

2.0 INTRODUCTION ........................................................................................................2

3.0 HISTORY ......................................................................................................................4
  3.1 Robert Chanler: The Artist .........................................................................................4
  3.2 Chanler’s Working Techniques ..................................................................................7
  3.3 Vizcaya and James Deering: The Patron .................................................................11
  3.4 The Ceiling Mural ....................................................................................................15

4.0 METHODOLOGY .........................................................................................................21
  4.1 Phase 1: Summary of Findings of Prior Investigations ..............................................24
  4.2 Phase 2: Hand Recording of Conditions ..................................................................24
  4.3 Phase 3: Digitization ................................................................................................27
  4.4 Phase 4: Salts Testing ................................................................................................27
  4.5 Phase 5: Summary and Characterization of Conditions ...........................................28

5.0 SUMMARY OF FINDINGS OF PREVIOUS INVESTIGATIONS ............................29

6.0 SUMMARY OF CONDITIONS ....................................................................................36
  6.1 General .....................................................................................................................36
  6.2 Losses ......................................................................................................................38
  6.3 Loose or Detached Plaster .......................................................................................39
  6.4 Surface Deterioration ..............................................................................................41
  6.5 Biological Activity ....................................................................................................42
  6.6 Repairs and Restorations .........................................................................................42
  6.7 Evidence of Original Craftsmanship ................................................................ ......46

7.0 ANALYSIS & CONCLUSIONS ..................................................................................49
  7.1 Overall Conditions & Greatest Threats .....................................................................56
  7.2 Wall Paintings in Marine Environments ....................................................................60
  7.3 Conclusions & Alternative Interpretation Methods ................................................64
  7.4 Recommendations for Further Research ...............................................................70

8.0 Bibliography ................................................................................................................72

9.0 Appendix A: Ceiling Chronology ............................................................................79

10.0 Appendix B: Locations of Cross Sections Revealing Original Finishes ...............82

11.0 Appendix C: Conditions Glossary ..........................................................................87

12.0 Appendix D: Conditions Drawings .........................................................................100

13.0 Appendix E: Salts Testing Results ...........................................................................121

14.0 Appendix F: Environmental Monitoring .................................................................124

15.0 Index ........................................................................................................................125
List of Figures

3.1 Robert Winthrop Chanler, “the last of the Bohemians.” ...........................................6
3.2. Detail photograph showing the ceiling’s construction, northeast quadrant.................8
3.3. Ornament shown to be attached to burlap.................................................................9
3.4. James Deering.........................................................................................................12
3.5. The main house at Vizcaya..................................................................................14
3.6. Chanler’s ceiling at Vizcaya as depicted on a postcard (no date).........................15
3.7. Chanler’s ceiling mural at Vizcaya, as depicted and described in Town and Country, 1917.................................................................16
3.8. Evidence of exposed original aluminum leaf finish..............................................18
3.9. Paint flaking evident in this photograph from the 1930s........................................19
4.1. Catherine Myers and Lucy Midelfort, recording conditions onsite......................25
4.2. Lucy Midelfort, Courtney Magill, and Maddie Cooper, ensuring consistency between drawings.................................................................26
5.1. S.B. 13: Central design, blue-green area. Visible light, 200x..................................31
5.2. S.B. 37: Ceiling, west center, backbone of large long fish. Visible light, 200x.......32
5.3. S.B. 4: South end, near south-central pilaster, tan over-painted sea fan. Visible light, 200x.................................................................32
5.4. S.B. 23: South end, alligator ornament above central pilaster, at edge of jaw. Visible light, 200x.................................................................33
6.1. Yellowed Beva® 371 and facing gauze, left.............................................................37
6.2. Informal monitoring of wind movement using tags (orange) hanging roughly 1-2 feet from the ceiling.................................................................38
6.3. Original nail (left) compared to a much larger repair nail (right).........................44
6.4. Example of original finishes, exposed.................................................................46
6.5. Original nail, corroding and causing flaking paint................................................47
7.1. Left: Detail of ferrous staining (orange) appearing where every original nail (blue) and repair nail (green) exists.........................................................50
7.2. Intralayer plaster separation (pink), widespread and concentrated away from the center of the ceiling.................................................................51
7.3. Left: Detail of lost tellin shells (red) vs. loose tellin shells (pink) in a southwest pendentive.................................................................53
7.4. Evidence of lost small cast fish..............................................................................54
7.5. Detail of lost plaster (fell off) around incisions made for treatment......................55
7.6. Example of later sculpted bas relief as part of a repair/restoration campaign........56
1.0 Abstract

The following thesis addresses the state of conservation of the exterior ceiling mural by Robert Chanler at Vizcaya, the 1916 winter home of James Deering in Miami, Florida. The fantastical depiction of shimmering fish and delicately glazed high relief seashells painted on the ceiling of the pool grotto has deteriorated greatly over time, so much that only ~10% of the original surfaces remain visible today. No comprehensive documentation of the conditions of the ceiling exists, yet the ceiling is a rare example of the artist’s mural work and after having undergone a variety of under-documented interventions, it still impresses. At a time when Vizcaya is considering options for its interpretation, this thesis serves not only as a status report, but also as an analytical tool to be used in considering future interventions. The resulting detailed digital documentation of conditions and synthesis of previous analyses serves as a point of reference for considering alternative interpretive approaches within the context of conservation principles as well as an appropriate treatment plan.
2.0 Introduction

Robert Chanler’s exuberant painted and sculpted ceiling of the pool grotto at Vizcaya in Miami is a rare surviving example of the artist’s mural work, and one of only three surviving examples open to the public.¹ Created for James Deering’s winter estate in 1916, it is a fantastical marine scene that survives over 100 years of existence in a truly adverse environment. The mural’s location just feet from Biscayne Bay leaves it exposed to high levels of humidity and heat, a saline maritime environment, and escalating threats from storm surges. The mural began to exhibit deterioration as early as two years after installation and despite numerous restorations, the work still impresses.

The following condition and integrity assessment was completed in cooperation with Vizcaya Museum & Gardens, with particular support from Lauren Hall, Conservator, and Gina Wouters, Curator at Vizcaya, and under advisement by mural paintings conservator Catherine Myers of Myers Conservation and Lecturer at the University of Pennsylvania. Building on recent investigations on Chanler’s original materials and methods and subsequent “restorations,” the assessment is intended to contribute toward a more comprehensive understanding and consideration of past and current deterioration and treatment options available for its preservation and interpretation.

Today, the ceiling mural is in poor condition and losses of the original work are extensive. Its setting places it at risk, but to remove it from its context would not be possible nor advisable, as removing it from its context would seriously diminish its

¹ The other two Chanler murals open to the public are the Whitney Studio ceiling in Manhattan and the Buffalo Mural at Coe Hall on Long Island.
meaning and value. The saltwater pool that once existed below it has been replaced with freshwater, yet salty humid air leaves it exposed not only to moisture, but also salts, which can also cause significant damage. Some attempts at stabilizing the ceiling have in fact caused further damage, and thus future conservation efforts must proceed with extreme caution. The most critical course of action at this time, and the subject of this thesis, is to improve understanding of the current conditions and causes of deterioration by way of detailed documentation. Thereafter, work can focus on developing an appropriate course of action for treatment and interpretation.

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3.0 History

3.1 ROBERT CHANLER: THE ARTIST

Robert Winthrop Chanler, the artist behind the fantastical pool grotto ceiling at Vizcaya, was born to a large prominent New York family in 1872, the seventh of eleven children who were orphaned when Chanler was a young child. He was the grandnephew of the great Jacob Astor, and descended from a long line of influential families including not only the Astors, but also the Stuyvesants and the Livingstons. He and his siblings were given the nickname “The Astor Orphans” and described as “a pride of lions.”

Given this lineage, Chanler’s chosen vocation as an artist was met with surprise by those who knew the family. He left home in 1889 to study art in Rome with Jose Villegas and “Jack” John Elliot. Soon afterward, he took a large studio in Rome and split time between Rome and Paris, studying under a variety of sculptors and painters for the following decade. Soon, he began to earn a reputation as a decorative artist as his style developed, painting large wall panels and elaborate screens for wealthy patrons. His work combined traditions of Art Nouveau, Asian art, and traditional western painting, and thus felt new while drawing on many established traditions.

Following some great success at a variety of salons in Paris and at the New York Armory Show, he swiftly painted *Parody of Fauve Painters in the Armory Show* while it was still underway. This piece ridiculed what Chanler considered to be “the primitive qualities of modern art” with a satirical device of “the painter-as-ape, as Goya and Chardin had

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3 Vollono, 36.
4 Ibid.
done before him.\textsuperscript{5} In the painting, a group of adoring artists gather around an ape, identified to be Matisse by the paintings scattered around him, which glow with bright color against the Old Master brown color that dominates the painting.\textsuperscript{6}

Following this satirical success, Chanler developed somewhat of a playboy reputation, as his popularity surged among wealthy clients. He divorced his first wife, remarried the opera singer Lina Cavalieri -- whom he divorced ten days later -- and spent time and money furnishing his lavish Manhattan apartment dubbed “The House of Fantasy,” as well as later a house in Woodstock, New York.\textsuperscript{7,8}

In 1922, his art was described as follows in The Christian Science Monitor:

These decorative paintings seek their themes in the bottom of the sea, among strange flora and fluent monsters; in the firmament, among stars and whirling spheres; in tropical wonderlands, pulsating with diapasons of color; on barbaric shores, among savage dancers and boatmen. Mr. Chanler’s art is never descriptive; in the retort of his genius the world he sees is changed, so that what he expresses are not facts but fantasies, his own responses to ordinary materials.\textsuperscript{9}

Retrospectively, Chanler belonged to a group of early 20\textsuperscript{th} century artists working within the genre of Modernist Fantasy. As modernism developed, these artists began to work from discoveries of psychology and the subconscious mind, and create art that depicted

\textsuperscript{6} Ibid.
\textsuperscript{8} Wolf, 70-71.
subjective inner fantasies.\textsuperscript{10} This movement is closely linked to the formation of Surrealism in 1924, though Chanler was exploring such themes as early as the turn of the century.

Later in life, Chanler moved to Woodstock full time and became a member of Hervey White’s artist colony. His art largely shifted to portraiture, and his portraits

\textsuperscript{10} Vollono, 39.
depicted his subject as he saw them, sometimes as “wolves, with dripping jaws” or “hideously bloated serpents,” which led to some dissatisfied clients. At the time of Chanler’s death in 1930, some called him “the last of the Bohemians.” He succumbed to heart failure at the age of 58 after a life full of indulgences, and was buried among in the Chanler vault at Trinity Cemetery in Manhattan.

3.2 CHANLER’S WORKING TECHNIQUES

Despite a renewed interest in the works of Robert Chanler over the last decade, relatively few people have written about his working techniques. An important master’s thesis completed in 2010 by Lauren Vollono at the University of Pennsylvania focused on Robert Chanler’s decorative plaster ceiling at the Whitney Studio in New York. It included a description of what is known of Chanler’s working techniques as well as a limited amount of analysis of materials he used in constructing the ceiling, including his use of oil-modified distemper paints. A good detail of the construction of the ceiling at Vizcaya, which was aided by the removal of the northeast pendentive, is included below. It shows the substrate plaster applied on a metal lath, and hanging from a ferrous structure:

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11 Ibid., 42.
12 Wolf, 70.
13 Lauren Vollono’s later publications appear under her married name, Lauren Drapala.
A more general overview of Chanler's working techniques on painted screens, the Whitney fireplace, and his murals (including the ceiling at Vizcaya) can be found in Lizzie Frasco's 2013 “The Chanler Fireplace Project: Historic Assessment.”\(^{15}\) The 2016 compilation of essays *Robert Winthrop Chanler: Discovering the Fantastic* contains some description of the artist's working techniques at Vizcaya, particularly the article “Evaluating the Swimming Pool Grotto Ceiling Mural” by Lauren Hall.\(^{16}\) However, the study of Chanler's working methods over the course of his career has not been addressed.\(^{17}\)


Despite the limited study of Chanler’s specific techniques, research on other works of *in situ* art offer context for the types of deterioration one may find with similar materials or techniques. Georgia Amicarella et al. have extensively researched the construction techniques of a wall painting by Galileo Chini on the outskirts of Florence that was painted on lime-based plaster (laid quickly, in a single day) and gypsum, and finished with a light tempera and animal glue, which due to the speed of application and similar materials may be of use to those studying Chanler’s work.18

Recent conservation of an 18th century Belgian octagonal ceiling constructed of plaster and stucco bas relief panels provides certain parallels due to the similar materials used, salt content and high humidity, and interventions that have taken place to access air space above the ceiling. Though the temperature management of the space above Chanler’s ceiling at Vizcaya has not yet been specifically found to cause damage to the ceiling, this case study in Belgium is a source for information on how to deal with mold, fungus, and other damage connected to the installation of HVAC systems of heating and cooling.

Additionally, The Getty Conservation Institute’s conservation efforts on the Los Angeles mural América Tropical have brought to light challenges that arise when exterior murals are subjected to layers of overpaint, like Chanler’s ceiling at Vizcaya. In that case, the layers of whitewash and tar overtop the painting were removed, the surface cleaned and consolidated, flaking paint reattached, and losses filled. This comprehensive treatment resulted from an interpretation plan that sought to fully restore the mural. Of course, the direction of treatment and interpretation for Chanler’s ceiling at Vizcaya has yet to be determined, and this is presented only to serve as an example of one possible conservation approach.

21 Ibid.
3.3 VIZCAYA AND JAMES DEERING: THE PATRON

Vizcaya, the estate built by and for the farm machinery mogul James Deering, was designed and constructed in a remarkable period of American architecture and economic prosperity. The period of the first few decades of the 20th century saw soaring success in American industry, and wealth was concentrated among very few. The Gilded Age was the first time when wealthy Americans were among the richest people in the world, and as ever, great wealth was accompanied by great architecture. Patrons of the Gilded Age were not only attracted to Europe; they were unapologetically obsessed with the Renaissance, a period they perceived as allowing “any man who had the necessary luck, brains, and will, might struggle to the top and fight for the privilege of staying there.”

James Deering was one such man. He grew up as the son of a successful wool merchant who saw great success after investing all his capital into an automatic hay-baling machine that did not leave behind dangerous scraps of metal for cows to ingest. William Deering’s success was immediate, and from there the Deering Manufacturing Company was born. By 1900 the company employed 9,000 and manufactured over 300,000 pieces of farm equipment per year.

The company grew rapidly, with James and his brothers gradually taking over for their father. After an unsuccessful merger with their old arch-rival McCormick, and a reorganization of the company, James Deering found himself both enormously wealthy

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24 Rybczynski and Olin, 10.
and with ample time on his hands to improve his properties. He retained Paul Chalfin, a flamboyant and openly gay assistant to New York decorator Elsie de Wolfe, to help decorate a house he had bought on Chicago’s Lake Shore Drive. Chalfin immediately impressed Deering by identifying two sets of furniture Deering had bought as fakes; as a result, Deering invited Chalfin to travel with him to Europe that summer as an artistic adviser.  

Fig. 3.4. James Deering. (Vizcaya Museum & Gardens)

It was on this trip that the two gentlemen hatched the plan to build a winter estate in Florida, an Italian Renaissance palazzo that would be designed by novice architect Francis Burrall Hoffman, Jr. Hoffman found the general inspiration for Vizcaya during a

25 Ibid., 15.
visit to Italy in the Villa Rezzonico at Bassano del Grappa, an “austere stucco-faced building with a shallow pantile roof between corner towers.”26 The three together embarked on the design of the estate intended to hold vast quantities of collected art and artifacts.27 On Deering’s insistence, it was situated close to the bay, a decision that required the building and gardens to be raised several feet above the level of high tide.

Chalfin, who had become somewhat of a companion to Deering, also insisted that the villa at Vizcaya withstand the rigors of a tropical climate. Hoffman’s response was a variety of outdoor rooms, including a central court, shaded arcades, and several loggias. “There are no interior corridors; instead the guestrooms are reached by means of a roofed outdoor gallery.”28 In this seamless integration of indoor and outdoor spaces, Vizcaya recalls Mediterranean sources more than other American “country houses.”

Construction began in 1914. The villa was built primarily of concrete, with steel beams supporting the floors but not the walls. Extreme care was taken to create, according to Chalfin, “this house where no uniform style is worn by the sweet and human objects within, but where a garment of beauty is spread over the things of centuries by the understanding of a single mind.”29 The work took two years to complete, and, though Deering never revealed the exact cost, it may have totaled $3 million ($60 million in today’s dollars).30

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27 Ibid., 35.
28 Rybczynski and Olin, 43.
30 Rybczynski and Olin, 58.
Too soon after the building’s completion in 1925, and while garden completion was still underway, Deering passed away at the age of 65 after having fallen into a coma and put on the SS City of Paris, returning home from Europe. The estate passed to Deering’s nieces and nephew, who used it as a winter home and gradually sold off portions of the estate until finally, in 1951-2, they sold the remaining 50-acre parcel to Dade County for $1.4 million, and donated all the interior furnishings and art (valued also at $1.4 million).31

Since then, Vizcaya has been operated as Vizcaya Museum & Gardens. Schoolchildren traipse through it to view the elegant interiors and art, and occasionally it

31 Ibid., 240.
appears as a glamorous backdrop for a film. All the while, it showcases a different time. As Henry James wrote of old Italian villas, “Part of the brooding expression of these great houses comes, even when they have not fallen into decay, from their look of having outlived their original use.”

3.4 THE CEILING MURAL

The magnificent ceiling mural Robert Chanler created for Vizcaya was one of a half-dozen immersive projects he completed for wealthy clients. Today, just three are open to the public: the Vizcaya pool grotto ceiling, the Whitney Studio ceiling, and the Buffalo mural at Coe Hall.

Fig. 3.6. Chanler’s ceiling at Vizcaya as depicted on a postcard (no date). (Vizcaya Museum & Gardens)

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33 Wouters and Gollin, 130.
The ceiling was designed to fit within the Gilded Age interpretation of Renaissance aesthetics, in which the grotto was an important part. Deriving from the 16th century French notion of grottos as mystical, sacred, and philosophical places, they tended to be incorporated into private gardens as essential aspects of the landscape design and places of refuge from the heat. 34 There were five artificial grottoes at Vizcaya. The one holding Chanler’s ceiling mural was the largest of them and the only one with a swimming pool.

Vizcaya’s swimming pool grotto is the only grotto on site with such ornate decoration. The immersive space originally contained fountains, decorative sculpture,
Italian furniture, and the Chanler painted ceiling. Together, these elements were intended to create an experience of being underwater, even while being poolside.

The mural was completed in just a few months in early 1917 on a vaulted ceiling with eight pendentive panels. Each panel has high relief moldings and real seashells attached to a flat plaster finish, within which are bas-relief cartouches. Inspiration for the idea of incorporating cast flora and fauna into Chanler’s work has been traced to the practice by 16th century French Huguenot scientist and ceramicist Bernard Palissy, who used molds of dead fauna in a grotto created at Tuileries Palace for Queen Catherine de Medici and on later productions of earthenware. Chanler’s family home contained several examples of a revival of that earthenware dubbed “Palissyware” and has been used as a concrete connection between Chanler and the concept of incorporating cast flora and fauna into artwork. The fascination with “coquillage” and shells’ incorporation into Renaissance art is also well known; Botticelli’s Birth of Venus depicts Venus standing in a shell, and whole illustrated books were created in the 18th century depicting a wide variety of seashells.

Crates of cast flora and fauna were pre-fabricated and delivered by rail to Miami from New York. Archival documents indicate that multiple assistants assisted Chanler with the installation of the ceiling, and that the structural elements were installed before Chanler arrived. Aspects of the assistants’ work such as scoring to attach plaster elements, some of which are now exposed due to finish plaster loss, show a variety of patterns and

35 Ibid., 142.
36 Ibid.
differences in techniques. The bas-relief portions were created with cheesecloth-backed high relief ornament, attached to a plaster base. Some of the plaster joints are smooth, others are buttered, raised, or incised with *sgraffito*. The ceiling showcased a wide variety of marine species, many of which could have been found in Biscayne Bay nearby: turtles, octopuses, lobsters, eels, alligators, fish, and to pay homage to his home, even four Hudson River sturgeons. These fauna were cast in plaster from specimens of the species, resulting in biologically accurate ornament. The fauna were originally covered with an aluminum leaf meant to emulate shimmery scales, but have since been covered by multiple layers of overpaint. In a few cases, overpaint removal tests have revealed the original finishes; the image below shows original greens, blues, and aluminum leaf visible on the fish’s head underneath layers of dull overpaint.

![Evidence of exposed original aluminum leaf finish. (M. Cooper, 2017)](image_url)

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39 Wouters, 147.
The decision to paint over the surfaces was most likely a response to deterioration of the original finishes. Although it is not known when the first campaign of repainting occurred, James Deering complained that the ceiling was already showing signs of decay as early as 1918.\textsuperscript{40} That deterioration has only worsened over time. As Lauren Hall has noted, it appears to be related to one of three general causes: an “unsuitable environment, inherent material vulnerabilities, and previous incompatible interventions.”\textsuperscript{41}

\begin{figure}[h]
\centering
\includegraphics[width=0.5\textwidth]{fig39}
\caption{Paint flaking evident in this photograph from the 1930s. (Vizcaya Museum & Gardens)}
\end{figure}


It seems that though Chanler took great care in considering the context of his art, he rarely took durability into account. In his ceiling mural at Vizcaya, he used weakly bound oil-modified distemper paints in a semi-outdoor setting just feet from a brackish bay, in a highly humid climate, periodically wracked by storm surges. Though additional analysis of the performance of Chanler’s paints in a saline environment is recommended, the ceiling was not set up for success.

A chronology of what is known of the ceiling’s history, from its creation to investigative studies and interventions, can be found in Appendix A, Ceiling Chronology.

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42 Original finishes in the grotto were determined to be oil-modified distemper paints by Susan Buck in her 2014 report. Further investigation into the binders of Chanler’s original paints could be worthwhile to determine whether the glue and oil binders were intended to coexist, or whether they had different intended purposes. Susan Buck, “Cross-section Paint Microscopy Report, Vizcaya, Robert Winthrop Chanler Painted Pool Grotto, Robert Winthrop Chanler Painted Screen, Miami, Florida,” presented to Gina Wouters, Curator of Vizcaya Museum & Gardens, February 25, 2014.
43 See Appendix A, Ceiling Chronology.
4.0 Methodology

The concept of documentation as an essential act of conservation is well established.\textsuperscript{44} In the field of wall paintings conservation, thorough documentation in the form of an analytical and critical report illustrated with drawings, photographs, or other visual aid.\textsuperscript{45} This documentation should not only include the details of current conditions, but also features pertaining to the creation of the painting and its history.\textsuperscript{46} Its purpose resides not only in increasing the ability to make good, evidence-based decisions about the future treatment or interpretation, but also to ensure that future generations are informed of the precise location and nature of previous interventions.\textsuperscript{47}

Since Chanler’s pool grotto ceiling mural has never been systematically documented, comprehensive documentation of present conditions and a synthesis of previous studies is required before a treatment plan or methods of interpretation can be

\textsuperscript{44} The importance of documentation in conservation was first codified in international charters acknowledged by many countries’ conservation communities worldwide such as the Venice Charter (1964). Documentation requirements were also incorporated in the Principles for Practice of such organizations as the American Institute for Conservation of Historic and Artistic Works (AIC) and the International Council on Monuments and Sites (ICOMOS). See International Council on Monuments and Sites (ICOMOS), “International Charter for the Conservation and Restoration of Monuments and Sites (The Venice Charter 1964)” produced from the \textit{IInd International Congress of Architects and Technicians of Historic Monuments}, (Venice, 1964), 4 and American Institute for Conservation of Historic and Artistic Works (AIC), Articles 24-28 of the “Code of Ethics and Guidelines for Practice” originally produced by the IIC-American Group Committee on Professional Standards and Procedures (Detroit, 1961) and updated to include documentation in 1991, 9.


\textsuperscript{46} Ibid.

developed. This practice of documenting conditions in advance of any intervention is an essential preliminary exercise that not only aids in diagnosing conditions and ascribing causes, but informs decisions of treatment and interpretation. The importance of conditions assessments and how they should be conducted and presented has been discussed extensively by such wall paintings conservators as Elke Behrens, who asserts that though the question of whether documentation of conditions should be manual or digital can be debated, the question of whether visual documentation should be undertaken is no longer a matter of debate.48

Robert Chanler’s ceiling, though it has undergone a large number of treatment campaigns, has generally lacked sufficient documentation. Given Vizcaya’s intention to use documentation as a tool for developing a conservation and interpretation plan, the author reviewed seven specific model projects that demonstrate not only a systematic approach to documentation of conditions, but also careful planning and responsible sharing of findings.49 The following examples of such studies all demonstrate a dedication to thorough, visual and legible documentation of conditions and have served as models for this assessment of Chanler’s ceiling at Vizcaya:


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49 Letellier, 44.
• Mogao Grottoes, Gansu Province, China. Cave 85 Condition Assessment, The Getty Conservation Institute, 2014.\textsuperscript{51}

• The Frescoes of Michelangelo on the Vault of the Sistine Chapel, Rome, Italy. Fabrizio Mancinelli, 1991.\textsuperscript{52}

• Caesarea Maritima, Israel. Hippodrome Fresco Conditions Assessment, Jaques Neguer, Inga Zeitlin, and Nicky Davidov, 2000.\textsuperscript{53}


• Skenduli House, Gjirokastra, Albania. Skenduli House Wall Paintings: Conservation and Assessment Report, Institute of Cultural Monuments (Albania), 2014.\textsuperscript{55}

• Texaco Road Map: New York State Pavilion, Flushing Meadows Corona Park, New York. Exposed Terrazzo Tile Floor Conditions Assessment, Architectural Conservation Laboratory, The University of Pennsylvania, 2006.\textsuperscript{56}


Using the examples above as models, the following section outlines the methodology used to report on the state of conservation of the Chanler mural.

4.1 PHASE 1: SUMMARY OF FINDINGS OF PRIOR INVESTIGATIONS

Prior to beginning the conditions assessment, all prior documentation of interventions and investigations were reviewed to determine what is already known about the ceiling’s construction, its original appearance, and alterations made to it. A variety of reports from conservators and engineers were collected from Lauren Hall, and outlined in an overall chronology. Additionally, primary and secondary sources containing information about the ceiling, including newspaper articles announcing the completion of the ceiling and other reports with information about it, were consulted. This phase results in a summary of what is known about the ceiling’s past.

4.2 PHASE 2: HAND RECORDING OF CONDITIONS

A recording team led by mural paintings conservator Catherine Myers included the author, Courtney Magill, and Maddie Cooper. Together they hand-recorded present conditions of the mural on rolling scaffolds over a period of one week in January 2017.

57 See Appendix A, Ceiling Chronology.
58 Catherine Myers, of Myers Conservation and Lecturer in the Graduate Program in Historic Preservation at the University of Pennsylvania.
59 In addition to Catherine Myers, the team included the author, Lucy Midelfort (Historic Preservation Master of Science Candidate, The University of Pennsylvania, 2017), Courtney Magill (Manager of the Architectural Conservation Laboratory at The University of Pennsylvania), and Maddie Cooper (Conservation Technician at Vizcaya).
Once on site, the team examined the range of conditions and created preliminary symbology for recording each condition. They then proceeded to record conditions with colored pencils and pens on reverse prints of the digital photomontage reflected ceiling plan created for Vizcaya in 2015. Sections of this high resolution digital photomontage were printed for hand recording, each of which followed the boundaries of and contained 4-6 of the grid sections laid out by M. C. Harry Associates in 2015. The team adjusted the symbology chosen for each condition after completing a single grid section, to ensure that the symbology would work well and be legible on the drawings.

Plaster conditions were recorded on one set of drawings and finishes conditions were recorded on a second set. Recording took place in two teams of two, each with one
person pointing out conditions and the other recording the conditions as found. At critical points in the process, completed grid sections were laid out together to identify trends and ensure consistency among the two recording teams.

Fig. 4.2. Lucy Midelfort, Courtney Magill, and Maddie Cooper, ensuring consistency between drawings. (C. Myers, 2017)

A total of 40 conditions were recorded on the ceiling, including plaster and finish losses, loose or detaching plaster, plaster/finishes deterioration, cracks, biological activity, repairs/restorations, evidence of original craftsmanship, and locations of prior analysis or testing. Photographs were taken of representative examples of each condition. In an effort to observe patterns of air flow, paper tags were hung approximately one to two feet from the ceiling with fine filament and attached with tape to locations where paint was missing, so as not to damage any remaining finishes. They were evenly distributed over the surface of the ceiling for six days as a method of generally determining which portions of the
ceiling experience stronger air circulation than others. Additionally, several samples of friable plaster were taken to be tested for presence of salts.

4.3 PHASE 3: DIGITIZATION

The hand-recorded conditions were each digitally scanned and overlaid over the appropriate section of the photomontage. Conditions were recorded digitally in AutoCAD by tracing over the scans of the hand-recorded conditions and placing each condition in its own AutoCAD layer for ease of future analysis, but also to facilitate correlation of certain conditions. Each condition was coded with its own distinguishable symbol, and these conditions were overlaid on a high-resolution photomontage of the ceiling (not a reflected ceiling plan) that was completed by David Almeida for Vizcaya prior to the conditions assessment. Locations of paint cross sectional sampling and analysis and salts sampling by the author were notated.60

4.4 PHASE 4: SALTS TESTING

Highbridge Materials Consulting found only traces of salts in samples from the ceiling, which was surprising, given the marine environment and past storm surge

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inundation of the ceiling. They found small concentrations of chloride ions in multiple samples, as well as hexahydrate (suggesting contact with seawater) in one sample.  

Because it seemed likely that there would be water soluble salts in the plaster on the conditions assessment team took eight small friable plaster samples from the site for salt testing in the lab. Plaster samples were dissolved in de-ionized water, and used for dipping MQuant test strips to identify sulfates, nitrates, and chlorides. For full salts testing results, see Appendix E: Salts Testing Results.

4.5 PHASE 5: SUMMARY AND CHARACTERIZATION OF CONDITIONS

Following digitization of the hand recorded notations, conditions were summarized and described with regard to their prevalence and general locations. Thereafter, those conditions posing the greatest risk to the ceiling were posited. Correlations between overlapping conditions were noted where they occurred. Where an association was feasible it was posited.

Following this characterization and summary, conclusions covering an overall assessment of the general condition of and greatest risks to the ceiling were presented. From these conclusions, Vizcaya should be better informed about the state of the ceiling and the greatest risks to its condition, which can then be used in determining an appropriate conservation treatment and interpretation plan.

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61 For a summary of Highbridge's findings, please see Section 6 of this thesis, Summary of Prior Investigations.
62 See Appendix E, Salts Testing Results.
5.0 Summary of Prior Investigations

Since a renewed effort to conserve it began in 2013, many conservators have assessed the conditions, analyzed samples and conducted aspects of treatment on the Chanler ceiling, including Rosa Lowinger & Associates, Christopher Mills Conservation Services, Highbridge Materials Consulting, Douglas Wood Associates, Susan Buck, Catherine Matsen at the University of Delaware (for Christopher Mills), and EverGreene Painting Studios. This work has generally provided Vizcaya with a greater understanding of the composition and method of manufacture of the ceiling, as well as its general state of deterioration. One recent emergency intervention, which stabilized the severely damaged northeast section of the ceiling, also introduced new problems. Below is a summary of previous investigations and treatments:

- **2006, EverGreene Painting Studios:** This study briefly assessed conditions and summarized of emergency stabilization treatments. Treatment included application of Beva® 371 for surface consolidation, Rhoplex™ for delaminated areas,
and Paraloid™ B-72 for stabilization of actively flaking and delaminating surface paint.\textsuperscript{63} \textsuperscript{64} \textsuperscript{65}

- **2011, Rosa Lowinger \& Associates (including Rosa Lowinger and Lauren Hall), Lauren Drapala:** This preliminary visual assessment considered what could be easily gleaned about Chanler’s methods of manufacture from unaided visual examination. It noted prior interventions and provided general descriptions of the conditions affecting the ceiling. It proposed general next steps in its conservation.\textsuperscript{66}

- **December 2013, Susan Buck:** Buck microscopically examined and photographed 38 cross sectional samples from the ceiling, concluding that the original Chanler color palette for the ceiling was darker/more vibrant than the current overpaint suggests. Binding media characterization with biological fluorochrome stains to mark the presence of proteins, carbohydrates, and oils suggested that the original

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\textsuperscript{65} Paraloid™ B-72 is a thermoplastic resin (an ethyl-methacrylate copolymer) created by Rohm and Haas for use as a surface coating. It is commonly used as an adhesive in art conservation. “PARALOID™ B-72 100% Solid Grade Thermoplastic Acrylic Resin,” Rohm and Haas, accessed April 2, 2017, http://www.dow.com/assets/attachments/business/pcm/paraloid_b/paraloid_b-72_100_pct/tds/paraloid_b-72_100_pct.pdf.

finish was distemper, with a minor oil additive applied to an oil-bound base coat. This report also suggested further instrumental analysis of metal leaf found in some samples, and demonstrated as many as four overpaint campaigns. The later overpaints were suggested to be oil-bound.

The following examples of photomicrographs taken by Susan Buck show four cross-sections that exhibit original finishes:

Fig. 5.1. S.B. 13: Central design, blue-green area. Visible light, 200x

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68 Ibid., 55.
Fig. 5.2. S.B. 37: Ceiling, west center, backbone of large long fish. Visible light, 200x

Starting from bottom: Campaign 1. Plaster with sealant or consolidant, followed by white base coat, followed by greens/blues wet-on-wet, followed by metal leaf on resinous size, followed by blue glaze or scumble, Campaign 2: Light blue overpaint with silvery paint, Campaign 3: White and blue overpaints (Photo and analysis by S. Buck, 2014)

Fig. 5.3. S.B. 4: South end, near south-central pilaster, tan over-painted sea fan. Visible light, 200x

Starting from bottom: Campaign 1: Plaster, followed by white base paint, followed by pale yellow paint, Campaign 2: Dull pink overpaint (Photo and analysis by S. Buck, 2014)

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69 Ibid., 56.
70 Ibid., 57.
Susan Buck’s findings suggested that the central field of the ceiling was blue-green. The finding of original aluminum leaf on more than one fish sample indicate that other unsampled fish may have been finished in the same manner. Despite the general palette appearing to have been blue-green, the presence of original yellow on a sea fan indicates that at least some elements were decorated differently. The finding that large ornament such as the alligator jaw were originally painted with blue-green, a stark contrast from the dark brown it is now painted, suggests that further analysis of the large ornament should be conducted to determine whether they all were painted similarly, or not. More original finish may still exist under

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71 Ibid., 58.
overpaint. Future study should center on determining the extent to which additional original paint remains.

• January 2014, Douglas Wood Associates: This structural analysis of the ceiling concluded that structural steel encased on three sides by concrete and supporting the ceiling is rusting, but that the structure overall is not compromised due to rust.72

• February 2014, Chanler Ceiling Advisory Committee (Frank Matero, Lauren Drapala, Mark Rabinowitz, Lauren Hall, and Vizcaya Curator Gina Wouters): This report included section drawings of the ceiling’s construction, a general assessment of the ceiling’s condition and endemic threats, and a proposal for a strategic methodological approach to its conservation.73

• Summer/Fall 2014, Christopher Mills Conservation Services: In the summer and fall of 2014, Christopher Mills conducted tests to examine the feasibility of removing overpaint, following Susan Buck’s cross section analysis. From exposure windows in some 20 locations, he found that a xylene/benzyl alcohol carbopol gel allowed to dwell for ten minutes was most effective in removing the bulk of the overpaint. It was determined, however, that the overpaint directly on top of Chanler’s paints (usually light blue) could not be completely easily be removed without compromising the original glaze layers.74

• October 2014, Catherine Matsen for Christopher Mills: Matsen conducted SEM-EDS analysis of samples. She confirmed the original leaf on a sample of high relief ornament to be aluminum leaf. Matsen also analyzed the binding media of the overpaint layers and found primarily oil-based overpaints. Her findings were consistent with Susan Buck’s.75

• April 2015, Highbridge Materials Consulting: This analysis used petrography and XRD to reveal the substrate finish plaster to be an unsanded lime-gypsum blend, and Chanler’s low/high relief plaster to be unsanded gypsum. This analysis also included testing for water soluble salts. Highbridge identified chloride ions in three out of four samples, and halite in two out of four samples. Hexahydrite (which suggests exposure to salt water) was also identified in one sample.76 Deliquescence analysis by Highbridge also aimed at determining the performance of the compositional plasters at 30%, 45%, 60%, and 75% relative humidity. No adverse effect was found at any of the tested relative humidities.

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75 Catherine Matsen, report presented to Chris Mills of Christopher Mills Conservation Services, LLC, October 8, 2014.
6.0 Summary of Conditions

6.1 GENERAL

The large majority of the ceiling is in poor condition, but the problems lie primarily with the materials that were applied after Chanler arrived: finish plaster and ornament. The ceiling’s superstructure is sound, and the substrate plaster is also in good condition. Every quadrant of the ceiling, however, exhibits vast areas of cleaving paint, paint loss, and overpaint from previous under-documented restorations. Intralayer plaster separation between the finish and substrate plaster also is widespread, and appears to be equally distributed throughout the ceiling. A number of large plaster losses (focused near the center of the ceiling and in the northeast quadrant) have resulted from either storm damage or prior work requiring access to the air space between the ceiling and the first floor above. Included in these losses are a large number of fauna that were applied as bas relief. Many shells lining the pendentives have also been lost over the years, particularly in the pendentive corners.

The northeast quadrant of the ceiling (closest to Biscayne Bay and opening out into the uncovered area of the pool) is in the worst condition, having been subjected to multiple campaigns of repair (likely due to worse conditions than other areas of the ceiling) that have resulted in large “scars” across this quadrant. One pendentive (the north-facing pendentive in the northeast quadrant) was removed to provide access to the space above for structural repairs, and placed in storage at Vizcaya. A large portion of the northeast corner was treated with Beva® 371, Rhoplex 1950, MC-76, and ASE60, and facing gauze. These adhesives and consolidants were applied beneath large incisions made in
the original gauze to attach the relief elements to the ceiling as well as over surfaces as an adhesive. Clearly intended as a temporary emergency treatment, the facing and heavy residues of these materials have remained in place now more than a decade later. They have discolored, are strongly adhered to the finishes behind, and may be difficult or impossible to retrieve.

![Fig. 6.1. Yellowed Beva® 371 and facing gauze, left. (L. Midelfort, 2017)](image)

While far fewer invasive repairs are visible in the northwest quadrant, small incisions are visible in the cartouches in this quadrant, indicating that separation and/or sagging of these areas were treated to adhere them to their substrates.

The southeast quadrant of the ceiling is most protected from strong wind, and appears to be in the best condition. Informal monitoring of wind movement over the course of conditions recording (using tags distributed evenly and hanging 1-2 feet below
the surface of the ceiling) suggest that though the ceiling is surprisingly well protected from strong gusts of wind outside. Air movement is consistent and appears to be strongest on the north half of the ceiling, which is more exposed. All quadrants are well ventilated, though protected. Wind and weather are presumed to affect the northeast and northwest quadrants most, as these quadrants are most damaged.

Fig. 6.2. Informal monitoring of wind movement using tags (orange) hanging roughly 1-2 feet from the ceiling. (L. Midelfort, 2017)

6.2 LOSSES

Losses are found in each quadrant of the ceiling, but are most severe on the north half of the ceiling which is most exposed to the outdoors. The full section of all plaster layers was cross sectioned in four large areas. A plaster fish that detached from the center
of the ceiling and landed in the pool following a 2005 storm was retrieved and is held in storage at Vizcaya. A large number of small cast plaster fish, which were part of the school of fish circling around the center of the ceiling, have been lost. It is possible that the original application of these small fish to the ceiling without gauze backing may have made them more vulnerable to detachment. Finish plaster has also been lost in some areas, typically those close to corroded ferrous reinforcement or areas adjacent to incisions made for repairs. Many small shells lining the edges of the pendentives have also been lost over the years, and a small number of high relief elements such as cast shells have been lost as well.

6.3 LOOSE OR DETACHED PLASTER

Intralayer separation between Chanler’s applied finish plaster and the substrate plaster is widespread and was detected through sounding in most parts of the ceiling. In areas that have been treated with Beva® 371, sounding indicated intralayer detachment despite the relatively stable surface. Sounding detected hollowness or detachment, particularly in low relief areas such as the frames around the cartouches and in low-relief flora and fauna, but that sound may be related to the method of manufacture, which involved placing folded cheesecloth inside the sculpted and/or molded plaster to build up the relief. Additional hollowness detected on the fields inside the cartouches may also result from original fabrication more than actual detachment; these fields are paintings.

believed to have been executed on canvas before being attached to the ceiling. The center of the ceiling (with the exception of large fauna with higher relief) is relatively free of intralayer plaster separation.

More severe plaster detachment, defined as visibly detectable and/or out of plane with surrounding plaster, was found in fewer areas, particularly those where fauna represented by bas relief exist. Such severe detachment was only detected in the northeast corner adjacent to the northeast pendentive, the same area that was recently cut out to access the space above the ceiling.

The most severe cracking is present near the connections between the ceiling and the recently restored north piers. Two long hairline cracks also exist; one runs north-south through much of the ceiling at the center, and the other runs east-west from the center of the ceiling toward the west wall. A large number of small cracks also radiate from corroding ferrous reinforcements like nail heads and wire strapping. In the southeast corner, which otherwise is in relatively good condition, large numbers of microcracks are present; this may indicate structural micromovement in that area.

A small number of shells lining the edges of the pendentives or cast elements like leaves and shells have also come loose. These loose elements are typically found in the ribs around the pendentives, or near the central lobster, turtle, octopus, and alligator scenes in the spandrels at the center of each ceiling edge.
6.4 SURFACE DETERIORATION

The most widespread surface deterioration is cleaving and flaking paint. Cleavage and flaking refer to the loss of adhesion of paint layers to the surface that may be identified as separation or tenting, or of blind cleavage, where separation is not visible but can detected by tapping. Much of the ceiling’s paint (largely overpaint) is cleaving and large areas of paint loss have resulted from full detachment. Where paint has already been lost, areas of nearby remaining paint is more likely to be cleaving.

Friable paint and plaster refers to the loss of cohesive strength within those materials, such that they are crumbling and/or powdering. Friable paint and plaster exist only in isolated areas, particularly those such as the lobster above the north central pier, where salts have been detected (see Appendix E) and ferrous reinforcement has rusted, expanded, and destabilized the plaster. Areas where a later skim coat of plaster was applied are also friable. Though not mapped in this conditions assessment, it has been confirmed that some areas, especially those exhibiting particularly friable plaster and paint, contain chloride and sulfate salts. See Appendix D for full salts testing results.78

Where ferrous reinforcement in the form of original nails, repair nails or staples, and wire strapping exists, the surrounding plaster tends to exhibit ferrous staining. The staining is worse around larger repair nails and original wire strapping than around original nails, which had smaller heads.

A small number of gashes (1-4 inches long) on the ceiling appear to have been caused by debris carried by high water during storms. These scars can easily be confused

78 See Appendix E, Salts Testing Results.
with small incisions made for reattachment, such as those found on the northeast cartouches.

6.5 BIOLOGICAL ACTIVITY

Biological growth is not widespread on the ceiling. Areas of isolated biological growth appear in small areas, particularly those where surface plaster has fallen off and an unknown synthetic resinous material has been applied. Based on EverGreene Painting Studio’s 2006 report, it appears that this growth (which appears to be something like a mold) may have existed before surface plaster fell, suggesting that the void in which the mold grew had existed for some time. The extent of the biological growth has not grown since the 2006 report.

A handful of insect nests also appear on the ceiling, but no pattern as to their placement has been detected, and they are not widespread.

6.6 REPAIRS AND RESTORATIONS

Many repairs and restorations have taken place over the course of the last hundred years, and only recent ones were documented. One large restoration involved not only the application of overpaint, but also a layer of raked plaster skim coat. This skim coat appears in large swaths, swirling around the center of the ceiling, perhaps attempting to recreate

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Chanler's original whirlpool-like swirl in areas where much of the original skim coat had been lost. In these areas, almost all of the paint on top of the skim coat is friable and/or severely cleaving.

Patching of plaster also occurred. In large areas where the original plaster was cut out, the plaster was replaced with large patches, like the large circular patch in the southeast quadrant. Smaller patches also appear but are not widespread.

In two isolated areas, it appears that drywall tape was applied as part of one of the past restorations, and then painted. In one area, it is evident that a piece of drywall tape was applied, but then it either fell off or was removed, after which it was painted over again. This suggests that multiple campaigns of repairs/restorations took place.

A large number of repair nails and staples have also been applied, though the date of these installations is unknown. These nails/staples are typically much larger in size than the original, more delicate ferrous reinforcement, and have resulted in more severe corrosion over time. That corrosion has caused surrounding plaster to become friable and fall off in many cases. Additionally, ferrous staining appears to be worse around these repair reinforcements than original nails.
Large areas of the eastern half of the ceiling were treated as part of an emergency stabilization campaign in 2006 with Beva® 371 and a facing gauze. These areas appear relatively stable today, but the repair materials have discolored and may prove to be difficult to remove. Though not mapped as part of this conditions assessment since it could not be consistently detected, it is known that the majority of the ceiling was sprayed with xylene-diluted Paraloid™ B-72 at the same time. In areas where a glossy sheen is particularly visible (suggesting the presence of B-72), paint appears to be slightly unstable but not actively flaking.

Large incisions have been made in the northeast quadrant to allow adhesive to be applied between the substrate plaster and the surface plaster. In these areas, original
gauze is sometimes visible at the junctures, and small quantities of finish plaster have been lost adjacent to the incisions. According to EverGreene Painting Studio’s 2006 report, the skim coat (applied onto gauze) was displaced and hung (like a flap) for a time while Rhoplex™ resin was applied to increase adhesion of the skim coat to the brown coat. In these areas, some of the paint and plaster were unstable (or lost) after the treatment, and it appears that much of the finish plaster has been reapplied. Some fauna, such as the reeds, have been reworked and repainted in an attempt to recreate the original appearance. It is unclear if this reworking of features occurred during the 2006 intervention or at another time.

In 2006, small incisions were also made for reattachment in the field of the northeast pendentive cartouches. These can easily be confused with a number of small gashes that are the result of high water or debris coming in contact with the ceiling during storm events.

Restoration of the north piers in 2015 involved selective replacement of Florida limestone ashlar blocks and repointing of joints and cracks. In a few cases, particularly around the north central pier, the pointing mortar was also applied in a number of cracks on the edge of the ceiling.

For a complete chronology of known repairs and restorations over the years, please see Appendix A: Ceiling Chronology.80

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80 See Appendix A, Ceiling Chronology.
6.7 EVIDENCE OF ORIGINAL CRAFTSMANSHIP

The vast majority of Chanler’s original finishes are no longer visible. It is unclear if the original finishes were mostly lost before the application of overpaint, or whether they still exist beneath layers of overpaint. A series of samples microscopically analyzed in cross-sections by Susan Buck indicate that about half of the areas sampled retain original paints. Those samples reveal a significantly darker palette for the ceiling than the one that exists today.

Fig. 6.4. Example of original finishes, exposed. (L. Midelfort, 2017)

Those original finishes that are still visible can be found largely inside shells in the ribs around the pendentives. Chanler’s original finishes appear as slightly transparent, matte finishes, which contrast greatly with the opaque overpainting. Original finishes may also be visible on areas of exposed plaster substrate; these finishes are not likely to be the final finish coat, but still may represent remaining traces of original pigment. Small areas
of exposed original finishes also exist on a small number of fish. In these small areas, original aluminum leaf is visible.\textsuperscript{81}

Original nails are visible throughout the ceiling. It is presumed that paint was applied overtop of these nails, and when the nails started corroding, the paint on top of them flaked off, revealing the nails and further exposing them to moisture.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{fig65.jpg}
\caption{Original nail, corroding and causing flaking paint. (L. Midelfort, 2017)}
\end{figure}

In a few key areas, deterioration has exposed features and materials that provide insight into Chanler’s working methods. In particular, one can see an example of original metal lath in the northeast corner where the full plaster substrate has been cut through. Evidence of scoring on the base plaster is apparent in numerous locations. Differences in

\textsuperscript{81} Aluminum leaf was confirmed to be an original finish by Catherine Matsen of Winterthur. Catherine Matsen, report presented to Chris Mills of Christopher Mills Conservation Services, LLC, October 8, 2014.
scoring style suggest more than one worker produced the scoring or more that it was also added in periods of repair. Wire used to reinforce high relief elements, such as the lobster’s legs, is especially evident at the top of the piers, where large crustaceans were molded and installed. Ferrous strapping around the high relief shells, especially the sea biscuits and conchs on the ribs framing the pendentives, are pervasive. Several examples of original Chanler signatures are also seen in high relief cast shells.
7.0 Analysis & Conclusions

Mapping the conditions on the Chanler ceiling at Vizcaya allows one not only to summarize the current state of conservation as gained from detailed examination, but to develop a good understand of the pervasiveness of conditions, their relationship to each other, and to the architecture. While the correlation between conditions and their locations may sometimes be obvious, at other times it is not and may require careful study to reveal unexpected associations. Below is a summary of observations gleaned from the conditions drawings:

- Roughly 10% of the ceiling exhibits original finishes. Some of these finishes are likely not the final original finish layer, but rather finishes that were applied between the substrate plaster and the skim coat. It is possible that much more original finish exists under layers of overpaint, but it is likely that much of the ceiling was overpainted after loss of original finishes. This is supported by the fact that of Susan Buck’s 38 cross sectional samples on the grotto ceiling, only 18 showed evidence of original finishes under the layers of overpaint.

- Some 80% of the exposed original finishes are not cleaving or friable.

- By contrast, the vast majority (~80%) of the overpainted areas are cleaving. Many of these cleaving areas also present friable paint. One may assume that any original finish remaining beneath these overpaint layers will be
lost together with the flaking overpaint. In particular, finishes are cleaving badly at the center of the ceiling, where numerous skim coat layers have been applied over time. Additionally, some 80% of the yellow and pink fields surrounding the cartouches in the pendentives are also cleaving.

- Some 95%, if not all ferrous reinforcement on the ceiling (original nails, strapping around high relief elements, wire inside large ornament, and repair nails/staples) is already extremely corroded due to the consistent presence of moisture, and possibly salts. These elements may still be corroding as their exposure to air increases. This corrosion is causing expansion of the metal and forcing surrounding plaster and finishes to become friable and/or flake off. Repair nails and staples are larger than original nails, and hence they are causing greater damage to plaster and finishes.

Fig. 7.1. Left: Detail of ferrous staining (orange) appearing where every original nail (blue) and repair nail (green) exists. (Drawing by L. Midelfort, 2017).
Right: Corrosion of nails causing staining and spalling of plaster. (L. Midelfort, 2017).
Extensive areas of ferrous staining also appear on the large ornaments above the piers, such as the octopus, lobster, and alligator. Here the ferrous reinforcement, such as wire, has oxidized from exposure to water, air and possibly salts. These ferrous reinforcements will certainly continue to corrode over time and cause extensive damage. Given that approximately 60% of the surface of the large ornament exhibits ferrous staining, this condition may be considered serious and requiring immediate attention.

- Intralayer separation of the original plaster skim coat and the substrate underneath is widespread, covering approximately 30% of the ceiling. These areas are particularly vulnerable to future detachment, particularly in the event of a large storm with high winds and rising water. There is no correlation between the locations or intensity of intralayer separation and exposure to wind (i.e. greater separation on the north half of the ceiling. The plaster does appear to be more stable at the center of the ceiling, with more detachment surrounding the center.

*Fig. 7.2. Intralayer plaster separation (pink), widespread and concentrated away from the center of the ceiling.*
*(Drawing by L. Midelfort, 2017).*
• Biological activity (growth or insect nests) cover less than 5% of the ceiling and are not a large concern, despite the humid climate.

• Friable plaster is not widespread (<5% of the ceiling), and is located primarily around corroding ferrous reinforcement.

• Severe cracking exists primarily at the corners of the ceiling, particularly between high relief ornaments. This cracking is most severe in the northeast and southeast corners. Limited cracking can also be found radiating out from corroding nails, and two long hairline cracks cross the ceiling, perpendicular to the grotto’s walls.

• Roughly 20% of the ceiling exhibits severe plaster loss (either cut out or fallen off). Where these losses have occurred, one can see evidence of original methods of construction, including the presence of metal lath onto which the rough plaster layer was applied, in addition to original scoring to key the finish plaster, and original pencil marks.

• Scoring is visible on about 10% of the ceiling, in at least 3 patterns, indicating that at least three hands may have been involved in the attachment of cast ornament.

• Approximately 25% of the tellin shells surrounding the pendentives are currently lost. The remaining shells are expected to continue to detach in the future.

• Approximately <5% of other ornament on the ceiling, including both shallow and high relief cast ornament, is loose and will be particularly vulnerable in the event of large storms.
Chanler’s original signature appears in four locations. Typically, it is carved into cast sea biscuits that are featured in the ribbing surrounding each pendentive. These signatures and cast elements appear to all have been painted over at some point with a later finish. Generally, that finish is not cleaving or friable.

Despite the large percentage of intralayer plaster separation, as detected by sounding, less than 5% of the ceiling shows any evidence of distortion or discernable displacement. Similarly, severely detached substrate plaster only exists in the northeast corner adjacent to the removed pendentive.

Some 60% of the small fish attached without gauze backing have fallen off. This suggests that the original attachment without gauze was less sturdy and stable than the gauze-backed larger ornament.
Drywall tape was used in one of the repair campaigns, perhaps applied at the same time as the later central skim coat of plaster. It covers only about 5% of the ceiling, and has been lost in at least one area where its imprint remains.

Paraloid™ B-72 application was widespread, but somewhat inconsistent. It is difficult to detect its presence.

Beva® 371 application with gauze covers approximately 20% of the ceiling, and has discolored and hardened such that removal may be quite difficult.

Facing gauze was applied in 95% of the areas where Beva® 371 was applied, but small areas of Beva® 371 exist without gauze. These areas may also have been treated with the Rhoplexes, but the exact locations of Rhoplex applications are undetermined.
Large cuts through the skim coat of plaster are visible, particularly in the northeast quadrant of the ceiling. In areas near these cuts, skim coat plaster has either been lost or destabilized, and in many areas that perhaps were entirely detached at some point, plaster patches exist. In about 15% of these areas that may have been fully detached, some later bas relief has been crudely sculpted to imitate the original ornament. A small number of smaller incisions were made to attach the center of the cartouches to the substrate plaster, but these incisions exist nearly exclusively in the north-facing pendentive in the northwest quadrant. A small number of smaller cuts through the plaster appear to have been caused by high water or storm debris rather than treatment for detachment.
7.1 OVERALL CONDITION & GREATEST THREATS

The overall condition of the ceiling is severely changed from its original state. This fact, even discernible in a glance, and the wide variety and great extent of conditions underline that the ceiling is severely deteriorated. Not all of these conditions, however, present serious threats to the longevity of the remaining original ceiling. For instance, biological activity appears to be limited, even in spite of the humid climate, and therefore does not likely pose significant future threat.82 Ferrous staining, though unsightly, is not

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82 Conditions were assessed in January, a time of relatively lower humidity in Miami. In the absence of comprehensive environmental data in the grotto, it is difficult to draw conclusions; therefore, consistent environmental monitoring is greatly needed over a period of at least a year.
causing further damage in and of itself, even though the weakening of corroded ferrous members will continue and eventually cause loss of the plaster they support.

Environmental monitoring of the grotto has been in place since 2014 and shows that the humidity and temperature of the grotto are consistently high, which indicates that risk of considerable efflorescence is low. The areas of application of Paraloid™ B-72 were not mapped as part of this conditions assessment since the exact extent of the application was difficult to determine, but the application does appear to be somewhat inconsistent, appearing in some areas but not others. This application does not appear to have caused damage to the ceiling.

Other conditions do present greater risks. Long hairline cracks through large portions of the ceiling portend of future plaster and finish loss or detachment. The corrosion of nearly all the ferrous reinforcement used on the ceiling (both original and repair) is causing expansion and therefore forcing plaster and finishes to flake off around these reinforcements, leaving rusted ferrous material to stain not only stain but weaken and promote loss of surrounding plaster. That process is likely to continue if not arrested, due to the highly moist climate. Though some of the overpaint campaigns appear to be stable, others, which cover large swaths of the ceiling, are badly cleaving. When the finishes eventually fully detach, they may be taking valuable original finishes with them.

The Beva® 371, Rhoplex, and gauze stabilization has proven to be problematic. The thick applications are now discolored and certainly affecting the vapor permeability of the plaster and paint, which may lead to accelerated deterioration of the adjacent plaster and paint. In addition, the strong adherence of the gauze will be difficult to treat. Though it
performed its function as an emergency measure, the treatment was never intended to be permanent and is long overdue in being re-treated.

Wind intensity may correlate with the level of damage on the ceiling. The recording team conducted an informal study of air flow in the grotto during their survey in January of 2017, which included some gusty days. They attached small “flags” made of notepaper to dental floss, and taped them to areas of paint loss on the ceiling, hanging 1-2 feet below the ceiling. Visual monitoring of the flags’ movements allowed the team to informally observe the intensity and direction of air movement near the ceiling. Even on the gusty days, the flags did not show strong movement. Small differences were observed in different areas of the ceiling; for instance, flags hung from the northern half of the ceiling showed more movement due to wind than those hung from the southern half. The most wind-protected corner of the ceiling was determined to be the southwestern corner, where it was observed that damage overall appears less severe. Conversely, the flags hung from the northwestern corner of the ceiling exhibited the most vigorous movement on gusty days, and it is observed that the greatest damage and greatest number of repairs appear in the northwestern quadrant of the ceiling. This study was quite informal, however, and further technical monitoring of air movement should be undertaken to determine not only if these initial findings are found again, but also to determine the wind intensity during storm events.

Storm events present the greatest immediate risk to the ceiling. By 2060, Miami could experience sea level rises of 9 inches to 2 feet. Between 2000 and 2013, 24 tropical storms and hurricanes were declared in Florida, and those hurricanes may become even stronger, with higher winds and heavier rainfall, over the coming years. In this
increasingly adverse environment, conservation plans must include approaches for mitigating the effects of these unpredictable events that are certain to occur with greater frequency in the future. Given the result of Hurricane Wilma in 2005 and the frequency of large storm events in Miami, one can reasonably assume that terrible storms are likely to occur, and when they do they are likely to have similarly devastating effects on the ceiling, or perhaps even greater effects due to climate change causing higher and higher storm surges worldwide.

While conservation efforts on the ceiling itself are likely to reduce the impacts of these storm events, more drastic measures may be needed to protect the ceiling during these times. A declaration on flood protection for historic sites was adopted by ICOMOS at the 2014 International Conference “Flood Protection for Historic Sites: Integrating Heritage Conservation and Flood Control Concepts” in Dresden, and acknowledges flood protection as a critical discussion point at historic sites particularly vulnerable to these effects. In the case of Vizcaya’s Chanler ceiling, flood control is a major issue that should be addressed swiftly.

While a wide variety of flood control options exist, the concept of a deployable protective barrier (like a storm wall) closing off the grotto from the rest of the open air pool area may be one way to lessen the damage due to storm events. Options for this kind

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of barrier vary, but some of them, such as stop logs, require permanent footing, even if the wall itself is deployable only in times of expected flooding. Clearly, installation of permanent footing is less than ideal at Vizcaya, where changes to the historic fabric are to be avoided if at all possible.

One option that does not require permanent footing is inflatable tubing. This method involves an inflatable tube with a skirt which lies on the ground on the flood side. "When flood water covers the skirt, the water’s own weight squeezes the skirt against the ground forming a seal." Though further research would be required to determine how high an inflatable tube might be able to reach (and thus how much protection may be possible to get from this method which may require custom-built high-reaching tubing), this sort of deployable flood protection could mean saving the Chanler ceiling from irreparable damage over the coming years.

7.2 WALL PAINTINGS IN MARINE ENVIRONMENTS

The exposure of the grotto ceiling to high relative humidity, atmospheric salinity, and high water levels during storm events is not unprecedented. In order to benefit from others’ research and work, a review of conservation literature focused on the performance of wall paintings in marine environments. A 2012 symposium sponsored by the Southeast Asia Regional Centre for Archaeology and Fine Art (SEAMEO SPAFA) considered the conservation of material culture in tropical climates. It proved to be a good resource for

information on how materials specifically degrade in warm, moist environments like the one at Vizcaya.\textsuperscript{86}

Since high humidity can have a significant deleterious effect on \textit{in situ} art, it has been discussed thoroughly. Despite the fact that biological growth does not appear to be one of the main problems in Chanler’s ceiling at Vizcaya, useful discussions on their effects are below.

K.L. Garg, Kamal K. Jain, and AK. Mishra are a good resource concerning the general adverse effects of fungal growth due to high humidity in wall paintings.\textsuperscript{87} Anna A. Gourbushina and others have written on the role that biological growth can play in deterioration in wall paintings, particularly in marine environments and where care is not taken to ensure that repair materials are vapor permeable.\textsuperscript{88} Plaster of Paris has also been found to set differently and become less workable in tropical environments, requiring different use guidelines.\textsuperscript{89}

Atmospheric salinity and weathering have been identified as often playing large roles in the deterioration of \textit{in situ} art in marine environments. Liz Karen Hererra, Hector Videla, Elisabetta Rosina, Antonio Sansonetti, and Silvia Erba have all considered the effects that salts transport can have on wall paintings, such as subsurface and surface

\textsuperscript{86} Nicole Tse and Cotte, Sabine, “AICCM National Newsletter” no. 121, issued following the symposium, \textit{The Conservation of Material Culture in Tropical Climates: the 3rd APTCCARN Meeting} (Nakornpathom, Thailand, 2012).
crystallization.\textsuperscript{90} \textsuperscript{91} There is general acceptance from these sources that in situ art exposed to consistently high humidity is at lower risk of damage due to atmospheric salinity than those exposed to humidity cycling.

Deterioration of wall paintings specifically has also often been traced purely to changes in moisture and temperature, which affect differently composed paint layers differently. Xiang He and Myra J. Giesen have both considered the subject with regard to ancient wall paintings; Giesen did so specifically with regard to the effects of climate change on rock art panels, supporting other conclusions that changes to temperature and humidity can cause deterioration.\textsuperscript{92} \textsuperscript{93} No literature has been found specifically concerning the effects of storm surge on in situ art, though it has obviously been very damaging at Vizcaya and certainly at other mural painting sites throughout the world.

In the case of Chanler's ceiling at Vizcaya, the performance of oil-modified distemper paints and metal leaf in a marine environment is an important question that deserves further study. Though Chanler's finishes at Vizcaya are understood to be oil-modified, they are still soluble in water, and yet architectural paint researcher Patrick Baty discusses the fact that oil-modified distempers are sometimes more durable than traditional distempers. He notes that they are still somewhat moisture permeable, which


can especially cause problems when combined with layers of overpaint.\textsuperscript{94} Further
discussion of oil-modified distempers, and causes of alteration, has been done by
Conservator G.Z. Bykova and Mary Culver at the University of Pennsylvania.\textsuperscript{95, 96} Specific
research on the impacts of salts on distempers in wet environments can also be found by
V. Massa, G. Pizzigoni, and M. Chiavarini, whose study resulted in a useful map of salt
content type and severity on a fresco in Siena, which contributed to a better
understanding of the decay phenomena.\textsuperscript{97}

The body of research on the causes of deterioration and treatment of wall
paintings is too vast to be handled in this paper. However, given the tropical marine
context of Chanler’s ceiling at Vizcaya and the fact that it has already undergone several
underdocumented treatments and overpaint campaigns, the aforementioned common
problems that \textit{in situ} art faces and the wide body of research on wall painting treatments
should be closely considered, consulted, and tested by those designing an appropriate
conservation plan.

\textsuperscript{94} Patrick Baty, “Paint Colour and Paintwork” in eds. Michael Forsyth and Lisa White, \textit{Interior Finishes and
\textsuperscript{95} G. Z. Bykova, “Modern Easel Distemper Painting: Technique, Characteristic Alterations and
\textsuperscript{96} Mary Culver, “Performance Evaluation of Traditional and Modified Distemper Paints,” MS thesis, The
\textsuperscript{97} V. Massa, G. Pizzigoni, and M. Chiavarini, “The Study of the Salts Distribution on Frescoes: A Non-
     destructive Assessment Method,” in ed. Fulvio Zezza, \textit{Origin, Mechanisms and Effects of Salts on
     Degradation of Monuments in Marine and Continental Environments: European Commission Research
     Workshops Proceedings} (Brussels, Belgium: European Commission. Directorate-General XII, Science,
7.3 CONCLUSIONS & ALTERNATIVE INTERPRETATION METHODS

The present condition of Robert Chanler’s ceiling mural at Vizcaya is severely compromised, and its interventions have changed how it appears considerably. From large portions of plaster loss, to overpaint campaigns that have not only covered what original finishes remain but also changed the general color palette of the ceiling, to repairs that have introduced new problems, the ceiling is simply not how it once was.

It is, however, an important example of the artist’s mural work that still impresses. Despite these changes and its compromised state, the ceiling offers an intangible sense of magic and mystery, and still has the power to transport visitors to another time, when Gilded Age barons commissioned truly incredible works of art by the bohemians of the early 20th century. The fact that the ceiling can transport people remains one of the ceiling’s greatest strengths. The ceiling should be preserved sensitively, not only to offer future generations the experience of such a wondrous place, but for future research into Chanler’s working techniques, methods, and materials.

How to conserve and protect the remaining fabric of the mural while also accurately representing its totality is a question of great importance requiring reconciliation of two disparate needs. On the one hand, conservation must protect and preserve original fabric by way of prevention and stabilization. On the other is the need to recapture either the original appearance of the grotto mural or to otherwise interpret it in a cogent and rational manner. In the process, it challenges the conservation professional to resolve the principles of practice that were first codified some fifty years ago—namely
the requirement to differentiate between original and restoration, to not commit falsification, and to do no harm—with the curatorial need to achieve an acceptable level of visual presentation. The fine line that distinguishes between original fabric and interventions touches on important philosophical questions of authenticity and falsification, a subject that has been given much thought for decades. Particular resources on this topic are Mora, Mora, and Phillipot, and Cesare Brandi. Frank G. Matero has summarized Brandi’s argument, stating that interventions should be “clearly differentiated from the original, “thus preserving the integrity of the original text and the possibilities for alternative interpretations now and in the future (that is, reversibility or retreatability).”

These same conservation principles underscore the need for documentation and study in advance of any intervention. As stakeholders deliberate about the most practical and appropriate way to interpret Chanler’s ceiling, this paper serves as the essential precursor to future intervention and as an archival record on which additional research and investigation may build.

One thing can be certain; the ceiling is actively deteriorating. The deterioration is already severe, but finishes and plaster continue to detach over time, corrosion of ferrous reinforcement continues to speed that process, large areas of intralayer separation of

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99 Extensive scholarship on this subject exists, but the source that set the standards for wall painting conservation was Mora, Mora, Phillipot. Mora, Paulo, Laura Mora, and Paul Philippot. Conservation of Wall Paintings. London: Butterworths, 1984.

substrate and finish plaster and the existence of many loose high relief elements indicate a
danger of losing more historic fabric over time. Conservation, stabilization and prevention
of future deterioration of the ceiling are of the utmost importance.

One could consider the conservation and interpretation of the ceiling along a
number of different preservation philosophies. Indeed, a variety of alternative
interpretation methods exist for deteriorated in situ art. At the Wren Library of Lincoln
Cathedral, Conservator Susan Thomas has proposed the merits of revealing original
finishes only in an isolated area and leaving the majority of the overpaint in place, either
because full exposure might endanger the original finishes or because it would be cost-
prohibitive. 101 Digital reconstruction, either through projection on a screen or virtual
reality, of how art and architecture may have looked originally has become popular in
recent years due to its ability to showcase multiple interpretations of how in situ art or
architecture may have looked. 102

Another method of interpretation used for areas of extensive loss is to suggest the
genral shape or contour of lost areas, as proposed by Constantin Papaodysseus et al. 103

The established practice of treating large areas of loss, so-called non-reintegrable lacunae,
as discussed in detail by Mora, Mora, and Phillipot, has a distinguished history.\textsuperscript{104} Examples of the remnants of ancient murals handled in this way are many, despite the limited publication.\textsuperscript{105}

The active deterioration, environmental threats, and limited amount of remaining paint on the Chanler ceiling opens consideration interesting opportunities to explore the benefits and limitations of the range of options, from preserving the mural as an archeological ruin to exploring innovative interpretation. If Vizcaya chooses to stabilize the ceiling as a ruin, conservation efforts would be aimed solely at stabilization of the existing fabric and removing later interventions. Accompanying interpretive display could be conventional or involve digital tools like iPads or large screens to envision its original appearance, such as curators used at the Mexican Muralism exhibit at the Philadelphia Museum of Art.\textsuperscript{106} The MediaLab at the Metropolitan Museum of Art also successfully digitally projected the likely color palette that had originally finished the Temple of Dendur in the Egyptian Wing, allowing for a new way for visitors to understand the temple.\textsuperscript{107} While this is a minimally invasive approach that leaves a lot to the visitor’s imagination, it might be more difficult for visitors to truly grasp how it may have originally looked.

\textsuperscript{104} Mora, Paulo, Laura Mora, and Paul Philippot, \textit{Conservation of Wall Paintings} (London: Butterworths, 1984), 310-315.
Vizcaya could go a step further following stabilizing of the existing material and removal of later interventions by pictorially reintegrating areas of loss in one of two ways. The most academic approach would favor the application of neutral colors on non-reintegrable lacunae, as mentioned above, such that losses visually recede and do not interrupt the visual unity of the whole. A second approach would allow a greater margin for interpretation by attempting to estimate the appearance of the whole ceiling using documentary and physical resources available and imitating closely Chanler’s working methods. It would certainly give visitors a greater sense of the appearance of the ceiling but could also be confusing.

Frescoes that have been in-painted from the Minoan palace of Knossos in central Crete, for example, do provide a more vivid visual experience than simply the ruins that were stabilized as found, but the new pictorial representation can easily be mistaken for preserved original fabric, so care should be taken not to be able to mistake new changes to be original fabric.  

A third approach to interpretation that could be made is digital representation of what the original ceiling may have looked like, paired with stabilization of the existing fabric. One award-winning example of such digital projection of a ceiling mural from San Francisco is the Mission Dolores Digital Mural Project, where the 18th century mural hidden behind a later dome was photographed, and then the photographs of the mural were projected onto the interior dome.  

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108 For an example of how pictorial inpainting of Minoan frescoes can be confusing to the eye, see Jeremy McInerny, “Bulls and Bull-leaping in the Minoan World,” Expedition 53 (2011): 11.
could be an excellent way of representing the appearance of the ceiling as long as care is taken that light damage due to projection does not adversely affect the mural itself. Though light damage is unlikely in areas where the ceiling has been overpainted, care should be taken to prevent damage to any exposed original finishes if this approach is to be undertaken.

Lastly, if it is determined to be possible to effectively remove enough overpaint to create an exposure window of Chanler’s original finishes on the ceiling, exposing a small area of preserved finishes would be a delicate way of interpreting the site for visitors so they could easily get a true sense for the appearance originally. Exposure windows have successfully aided the interpretation of murals in a wide variety of architectural settings where detailed original finishes were painted over (like the Sherry-Netherland Hotel in New York City). Based on Chris Mills’ overpaint removal tests, it is unclear if this approach would damage the existing original finishes. It is also unclear to what extent original finishes beneath overpaint layers remain. Based on the examination of cross sectional samples, some 50% of the areas sampled retained original paint. If extrapolated to the entire ceiling, one may expect that about half of the overpainted surface may retain original finishes, amounting to ~20-30% of the entire surface of the ceiling. Representation of the appearance of these two approaches using digital methods, such as Photoshop, would be helpful in visualizing the end result.


Regardless of the approach that is ultimately taken, it is of the utmost importance to have the greatest understanding possible of what was originally there, using what historic fabric remains, so that any interpretation of the original appearance of the ceiling is as accurate as possible and not misleading to visitors. Equally important is the need to better understand the environment and to develop emergency plans for mitigating damage from disaster, such as storm surge, which is certain to occur again in the near future.

7.4 RECOMMENDATIONS FOR FUTURE RESEARCH

Before moving forward with any of the aforementioned conservation and interpretation approaches, it is advised that onsite testing and discussion of approaches should include mural paintings conservators.

Additionally, a more technical study of air movement and wind intensity near the ceiling’s surface would increase our understanding of how much damage on the ceiling is due to air movement. While the informal wind study undertaken as part of this research may provide insight as to how air moves around the space, no quantitative data has been collected and decisions should not be made until the observations included here can be confirmed quantitatively. Moreover, additional environmental monitoring is needed, perhaps including but not limited to placement of an additional datalogger in the space between the ceiling and floor above, as well as a control datalogger placed outside the grotto. Ideally, this environmental monitoring could also inform diagnostics as to why the northeast quadrant is in the worst condition.
Further study of Susan Buck’s cross section analysis and findings should be undertaken, especially if any representative interpretation approach is chosen to be as sure as possible that represented colors match the original color palette. If projection of the mural is deemed to be an appropriate approach, great care should be taken to ensure that colors as projected match closely the digital palette determined to closely match the original palette. This may require the use of a projector specifically designed for color accuracy. In addition, testing on the performance of oil-modified distempers in humid climates would yield a greater understanding of why the ceiling started to exhibit flaking and deterioration so soon after installation.

It would also be useful in the future to do more research to understand the extent to which original finishes are present beneath the overpaint. This research could take the form of attempting more onsite exposures of original finish in combination with more cross section analysis in a wide variety of areas to determine how much of the overpaint is over bare plaster, versus remaining original finish. Additionally, further cross section sampling could help determine if all of the large ornament was finished similarly, or whether the alligator, octopus, turtle, and lobster had different original finishes.

More research into flood and storm protection for the ceiling should be undertaken quickly, as every hurricane season brings great risk to the ceiling. Preventive conservation to avoid high water levels, high winds, and storm debris from coming into contact with the ceiling will be the most successful type of maintenance for the structure, and will help guarantee that Robert Winthrop Chanler’s masterful work of art is preserved for decades to come.
8.0 Bibliography


Vettori, Silvia, Susanna Bracci, Emma Cantisani, Cristiano Riminesi, Barbara Sacchi, and Francesco D’Andria. “A Multi-Analytical Approach to Investigate the State of Conservation


9.0 Appendix A: Ceiling Chronology

- **1916-1917**: Ceiling construction by Robert Chanler. Chanler shipped crates of materials and cast ornament from New York in August 1916. The ceiling was prepared in advance of his arrival in Miami, and historic correspondence suggests he completed the mural in January 1917.

- **1917**: Grotto photographed and featured in *the Architectural Review, Town and Country, Harper’s Bazaar, and Vogue Magazine*. The ceiling is most clearly described in a captioned photograph by Mattie Edwards Hewitt, featured in *Town and Country*.

- **1918**: Letter from James Deering to Paul Chalfin stating the ceiling “ought to have somebody’s attention.”

- **1934**: Photographic evidence of actively peeling paint.

- **1950s-1960s**: Multiple overpaint campaigns (likely oil-bound, alkyd paints) based on later paint analysis by Susan Buck and Catherine Matsen, and conversations with Lauren Hall.

- **Circa 1970s**: Circular cut made through ceiling (slightly southeast of center) to access air space above the ceiling (resulting in total loss of circular area’s surface plaster).

- **2005**: Significant damage to the ceiling due to Hurricane Wilma storm surge.

- **2006**: Emergency stabilization work by EverGreene Painting Studios (localized application of Beva® 371, Rhoplex™ 1950, MC 76, and ASE 60, and widespread
application of Paraloid™ B-72). At this time, loose and imminently failing relief at the northeast corner of the ceiling were also removed.

• **2011:** Preliminary visual assessment completed by Rosa Lowinger, Lauren Hall, and Lauren Drapala.

• **December 2013:** Cross section analysis done by Susan Buck revealing original Chanler color palette to be darker/more vibrant than the current overpaint would suggest.

• **January 2014:** Douglas Wood Associates structural analysis of the ceiling, concluding that structural steel and metal lath are rusting, but not compromised due to rust at this time. The structural analysis was the first of the 2014 analyses completed.

• **February 2014:** Convening of the initial Chanler Ceiling Advisory Committee (Frank Matero, Lauren Drapala, Mark Rabinowitz, Lauren Hall, and Vizcaya Curator Gina Wouters)

• **Summer/Fall 2014:** Christopher Mills Conservation Services tests to examine feasibility of overpaint removal, following Susan Buck’s cross section analysis and sampling locations.

• **October 2014:** Instrumental analysis done by Catherine Matsen confirming original leaf on some ornament to be aluminum leaf. Matsen also analyzed the binding media of the overpaints, and her findings were consistent with Susan Buck’s.
• **January 2015:** Reflected ceiling plan was created by MC Harry Associates, and rectified photomontage of the mural was produced by photographer David Almeida.

• **April 2015:** Highbridge analysis of substrate finish plaster (revealing an unsanded lime-gypsum blend) and Chanler’s low/high relief plasters (unsanded gypsum).

• **May 2015-May 2016:** Removal of northeast pendentive for access to air space above (the pendentive is retained in collections storage at Vizcaya) for structural repairs to embedded steel beams and concrete. Removal and replacement of damaged Florida limestone veneer at the north central pier below the ceiling following the reconstruction of the structural steel and concrete.

• **January 2017:** Catherine Myers, Lucy Midelfort, Courtney Magill, and Maddie Cooper assess the conditions of the ceiling on site in preparation for digital documentation by Midelfort for her thesis at the University of Pennsylvania.

• **May 2017:** Lucy Midelfort completes thesis at the University of Pennsylvania addressing the conditions assessment of the mural.
10.0 Appendix B: Locations of Cross Sections Revealing Original Finishes
Note: All photomicrographs included and their analysis are the work of Susan Buck.
Note: All photomicrographs included and their analysis are the work of Susan Buck.
Note: All photomicrographs included and their analysis are the work of Susan Buck.
### 11.1 BIOLOGICAL ACTIVITY

<table>
<thead>
<tr>
<th>Biological Growth</th>
<th><img src="image" alt="Image of biological growth" /></th>
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</thead>
<tbody>
<tr>
<td>The only biological activity detected was in the form of a black accretion.</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Insect Nests</th>
<th><img src="image" alt="Image of insect nests" /></th>
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</thead>
<tbody>
<tr>
<td>Mud dabber nests were most common.</td>
<td></td>
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</tbody>
</table>
11.2 EVIDENCE OF ORIGINAL CRAFTSMANSHIP

<table>
<thead>
<tr>
<th>Chanler Signature</th>
<th>![Chanler Signature Image]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chanler’s signature was found in four locations, always carved into a sand dollar.</td>
<td></td>
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<table>
<thead>
<tr>
<th>Evidence of Original Finishes</th>
<th>![Evidence of Original Finishes Image]</th>
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<tbody>
<tr>
<td>Original finishes were most often found on high relief elements like shells. Some flat areas may also show original finishes, but they may not be the surface finish.</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Exposed Ferrous Reinforcement</th>
<th>![Exposed Ferrous Reinforcement Image]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strapping was used to support high relief elements.</td>
<td></td>
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<tr>
<td>Exposed Metal Lath</td>
<td></td>
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<tr>
<td>--------------------</td>
<td></td>
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<tr>
<td>Metal lath was only exposed in the Northeast corner.</td>
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</table>

<table>
<thead>
<tr>
<th>Original Nail (left)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Original nails were well distributed throughout the ceiling.</td>
</tr>
<tr>
<td><strong>Pencil Marks</strong></td>
</tr>
<tr>
<td>------------------</td>
</tr>
<tr>
<td>Pencil marks were found primarily where paint has been lost.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Scoring</strong></th>
<th><img src="image" alt="Scoring" /></th>
</tr>
</thead>
<tbody>
<tr>
<td>Scoring was found in areas of plaster loss.</td>
<td></td>
</tr>
</tbody>
</table>
### 11.3 LOOSE OR DETACHED PLASTER

<table>
<thead>
<tr>
<th>Cracks</th>
<th>![Cracks Image]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hairline cracks were found across the center of the ceiling. Microcracks between high relief elements were found in the ceiling’s corners.</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Intralayer Plaster Separation</th>
<th>![Intralayer Image]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intralayer separation was worse around the edges of the ceiling, with less at the center.</td>
<td>Photo not available (detected by sounding).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Loose Shells or Precast High Relief Plaster</th>
<th>![Loose Shells Image]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Only a small number of high relief elements are loose; they are particularly vulnerable to damage.</td>
<td></td>
</tr>
<tr>
<td><strong>Planar Distortion</strong></td>
<td><img src="image1" alt="Image of Planar Distortion" /></td>
</tr>
<tr>
<td>----------------------</td>
<td>-------------------------------------</td>
</tr>
<tr>
<td>Only a small amount of planar distortion was found, exclusively in the Northeast quadrant.</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Severely Detached Substrate Plaster</strong></th>
<th><img src="image2" alt="Image of Severely Detached Substrate Plaster" /></th>
</tr>
</thead>
<tbody>
<tr>
<td>Severely detached plaster was only found in the Northeast corner.</td>
<td></td>
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</tbody>
</table>
### 11.4 LOSS

<table>
<thead>
<tr>
<th><strong>Loss of Shallow Precast Plaster</strong></th>
</tr>
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<tbody>
<tr>
<td>Instances of this loss were primarily small fish, which were adhered without gauze backing.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Loss of Shells or Precast High Relief Plaster</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Large numbers of shells are lost from the ceiling’s pendentives.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Plaster (Cut Out)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Three large areas of cut out plaster exist, made generally for access to the space above the ceiling.</td>
</tr>
<tr>
<td><strong>Plaster (Fell Off)</strong></td>
</tr>
<tr>
<td>------------------------</td>
</tr>
<tr>
<td>Small areas of plaster have fallen off, sometimes due to incisions made for treatment or abrasion by debris.</td>
</tr>
</tbody>
</table>
### 2015-2016 Mortar Repairs

These mortar repairs happened at the north piers, and reach the ceiling in only small areas.

### Drywall Tape

Drywall tape was applied as part of an undocumented repair campaign in the Northeast quadrant.

### Molded Plaster Replacements

(Like Shells)

Some lost shells have been replaced with plaster.
<table>
<thead>
<tr>
<th><strong>Incisions Made for Treatment</strong></th>
<th><img src="image1" alt="Incisions Made for Treatment" /></th>
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<tbody>
<tr>
<td>Cuts through surface plaster have been made to inject adhesives between the skim coat and substrate plaster.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Later Plaster Skim Coat</strong></th>
<th><img src="image2" alt="Later Plaster Skim Coat" /></th>
</tr>
</thead>
<tbody>
<tr>
<td>A raked skim coat was applied primarily around the center of the ceiling.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Plaster Patches</strong></th>
<th><img src="image3" alt="Plaster Patches" /></th>
</tr>
</thead>
<tbody>
<tr>
<td>Plaster has been patched in large areas where plaster was cut out, and small areas where plaster fell off.</td>
<td></td>
</tr>
<tr>
<td>Presence of Beva® 371 or other Synthetic Resinous Material</td>
<td></td>
</tr>
<tr>
<td>----------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Beva® 371 was applied on large areas of the Northeast quadrant as a consolidant and adhesive.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Presence of Facing Gauze</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facing Gauze was applied nearly everywhere that Beva® 371 was applied.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Repair Nails or Staples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large repair nails and staples were inserted and are widespread across the ceiling.</td>
</tr>
</tbody>
</table>
## 11.6 SURFACE DETERIORATION

<table>
<thead>
<tr>
<th><strong>Ferrous Staining</strong></th>
<th><img src="image1.jpg" alt="Ferrous Staining" /></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ferrous staining can be found surrounding all ferrous reinforcement (wire and nails/staples).</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Friable Paint</strong></th>
<th><img src="image2.jpg" alt="Friable Paint" /></th>
</tr>
</thead>
<tbody>
<tr>
<td>Friable paint was found more on overpaints than original finishes.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Friable Plaster</strong></th>
<th><img src="image3.jpg" alt="Friable Plaster" /></th>
</tr>
</thead>
<tbody>
<tr>
<td>Friable plaster was found primarily around corroding ferrous elements.</td>
<td></td>
</tr>
</tbody>
</table>
### Paint Cleavage

Paint cleavage is widespread, and exists more on overpaint than original finish.

---

### Scars Caused by High Water or Storm Debris

A small number of scars that appear to have been caused by abrasion during storm events were found on the north half of the ceiling.
12.0 Appendix D: Conditions Drawings
UNIVERSITY OF PENNSYLVANIA
SCHOOL OF DESIGN
PREPARED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE DEGREE OF MASTER OF
SCIENCE IN HISTORIC PRESERVATION

DATE: MAY 5, 2017

MADDIE COOPER, COURTNEY MAGILL, LUCY MIDELFORT, & CASSIE MYERS

ASSESSMENT & DELINEATION BY LUCY MIDELFORT

SURFACE CONDITIONS & EVIDENCE OF ORIGINAL CRAFTSMANSHIP

SCORING
- SCARLS CAUSED BY STORM WATER OR DEBRIS
- PAINT CLEAVAGE
- FRIABLE PLASTER
- FRIABLE PAINT
- FERROUS STAINING
- INSECT NESTS
- BIOLOGICAL GROWTH
- ARCHITECTURAL ELEMENT (NOT ASSESSED)

LOCATOR MAP

SW 1
NW 1
NE 1
NW 2
NE 2
SW 2
SE 1
SE 2

SCALE: 3/4" : 1'

VIZCAYA MUSEUM & GARDENS
MIAMI, FLORIDA

SHEET NO. C-2

POOL GROTTO CEILING MURAL
BY ROBERT CHANLER

UNIVERSITY OF PENNSYLVANIA
SCHOOL OF DESIGN
PREPARED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE DEGREE OF MASTER OF
SCIENCE IN HISTORIC PRESERVATION

DATE: MAY 5, 2017

MADDIE COOPER, COURTNEY MAGILL, LUCY MIDELFORT, & CASSIE MYERS

ASSESSMENT & DELINEATION BY LUCY MIDELFORT

SURFACE CONDITIONS & EVIDENCE OF ORIGINAL CRAFTSMANSHIP

SCORING
- SCARLS CAUSED BY STORM WATER OR DEBRIS
- PAINT CLEAVAGE
- FRIABLE PLASTER
- FRIABLE PAINT
- FERROUS STAINING
- INSECT NESTS
- BIOLOGICAL GROWTH
- ARCHITECTURAL ELEMENT (NOT ASSESSED)

LOCATOR MAP

SW 1
NW 1
NE 1
NW 2
NE 2
SW 2
SE 1
SE 2

SCALE: 3/4" : 1'

VIZCAYA MUSEUM & GARDENS
MIAMI, FLORIDA
LOCATOR MAP

CHALFER CEILING

BISCAYNE BAY

PLAN VIEW

SW 1

SW 2

NW 1

NW 2

NE 1

NE 2

SE 1

SE 2

POOL GROTTO CEILING MURAL
BY ROBERT CHALFER

UNIVERSITY OF PENNSYLVANIA
SCHOOL OF DESIGN

PREPARED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF SCIENCE IN HISTORIC PRESERVATION

DATE:
MAY 5, 2017

VIZCAYA MUSEUM & GARDENS
SHEET NO.
C-3
MIAMI, FLORIDA

CONDITION RECORDING BY:
MADDIE COOPER, COURTNEY MAGILL,
LUCY MIDELFORT, & CASSIE MYERS
ASSESSMENT & DELINEATION BY LUCY MIDELFORT

SUBSURFACE CONDITIONS:
LOSSES, LOOSE OR DETACHING PLASTER
LOSS OF SHELS OR PRECAST HIGH RELIEF PLASTER
LOSS OF SHELS OR PRECAST HIGH RELIEF PLASTER (CUT OUT)
LOSS OF SHELS OR PRECAST HIGH RELIEF PLASTER (FELL OFF)
LOSS OF SHELS OR PRECAST HIGH RELIEF PLASTER (SEVERELY DETACHED)
PLANAR DISTORTION
INTRAEMON PLASTER SEPARATION
CRACKS

ARCHITECTURAL ELEMENT (NOT ASSESSED)

SCALE:
3/4" : 1'
13.0 Appendix E: Salts Testing Results

Seven samples were tested using colorimetric tests strips by MQuant for sulfates, chlorides, and nitrates on March 1, 2017. See conditions mapping for sampling locations. 

Samples were dissolved in deionized water before test strips were inserted. Testing for nitrates and chlorides was completed once, while two sulfate tests were undertaken; the first attempt produced inconclusive results. The results in the following table indicate the results from the sole tests for nitrates and chlorides, and the second sulfate test.

No nitrates were found in any of the samples. By contrast, sulfates were found in each sample, some with low concentrations and others with high concentrations. Chlorides were found in five of the seven samples, but had generally low concentrations.

The salts testing undertaken as part of this study was a student effort. Further testing is advised, and should be interpreted alongside the results of previous tests by Highbridge.

\[\text{Locations of sampling for salts testing can be found in Appendix D, Conditions Drawings.}\]
<table>
<thead>
<tr>
<th>SAMPLE NUMBER</th>
<th>SULFATES CONCENTRATION (MG/ SO₄²⁻)</th>
<th>CHLORIDES CONCENTRATION (MG/ CL⁻)</th>
<th>NITRATES CONCENTRATION (MG/L NO₃⁻)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VM. G1</td>
<td>&gt;400</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>VM. G2</td>
<td>&gt;400</td>
<td>500</td>
<td>0</td>
</tr>
<tr>
<td>VM. G3</td>
<td>&gt;1600</td>
<td>500</td>
<td>0</td>
</tr>
<tr>
<td>VM. G4</td>
<td>&gt;1200</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>VM. G6</td>
<td>&gt;1600</td>
<td>1000</td>
<td>0</td>
</tr>
<tr>
<td>VM. G7</td>
<td>&gt;1600</td>
<td>500</td>
<td>0</td>
</tr>
<tr>
<td>VM. G8</td>
<td>&gt;800</td>
<td>500</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 1.1, January 2017 salts testing results.

Fig. 12.1. Dissolution of samples in deionized water using magnetism to ensure full dissolution. (L. Midelfort, 2017)
Fig. 12.2. Salt testing strips immersed in water where samples have been dissolved.
(L. Midelfort, 2017)

Fig. 12.3. Test strip results after testing for soluble salts. Control strips are to the left.
(L. Midelfort, 2017)
Temperature (T°F) and relative humidity (RH) were recorded in one location in the pool grotto over three years, 2014-2017. Relative humidity is observed to fluctuate, particularly in winter, but remains quite high, ranging approximately between 50% and 95%. Additional dataloggers should be deployed to record temperature and relative humidity in a wider variety of locations, like on other walls and in the air space above the ceiling. A control datalogger should be placed outdoors, outside the grotto, to serve as a control. An expanded view of the data included here would also allow for more detailed visualization of daily and seasonal fluctuations.
15.0 Index

A

air flow .............................................................26, 58
aluminum leaf......................................................18, 33, 35, 47, 80
Architectural Conservation Laboratory 22, 23, 24, 78

B

bas relief ..........................................................10, 36, 40, 55, 56
Beva® 37i 29, 30, 31, 36, 37, 39, 44, 54, 57, 72, 79, 97
biological activity ..................................................52, 87
Biscayne Bay .....................................................2, 18, 36
Bohemians ...........................................................6, 7
Buck, Susan 20, 27, 29, 30, 31, 32, 33, 34, 35, 46, 49, 69, 71, 72, 79, 80

C

Chalfin..............................................................12, 13, 72, 79
Chanler, Robert Winthrop, 1, 2, 4, 5, 6, 7, 8, 9, 10, 15, 16, 17, 18, 19, 20, 21, 22, 24, 27, 29, 30, 31, 34, 35, 36, 39, 43, 46, 47, 49, 53, 59, 60, 61, 62, 63, 64, 65, 67, 68, 69, 71, 72, 73, 74, 75, 77, 78, 79, 80, 81, 88
Chanler Ceiling Advisory Committee 18, 34, 73, 80
climate change ...................................................59, 62
consolidant .......................................................31, 32, 97
Cooper, Maddie ................................................24, 26, 81
coquillage ..........................................................17
corrosion ..........................................................43, 50, 57, 65

D

Deering, James ..........1, 2, 11, 12, 13, 14, 19, 79
distemper ................................................................7, 20, 31, 62
Douglas Wood Associates 29, 34, 73, 80
Drywall Tape ................................................................95

E

environmental monitoring ......................................56, 70
EverGreene Painting Studios 29, 79
evidence of original craftsmanship ..........................26

F

ferrous reinforcement ........................................39, 41, 43, 50, 51, 52, 57, 65, 98
friable paint ..........................................................41, 98

G

Getty Conservation Institute ................................10, 21, 23, 73, 74, 75, 78
Gilded Age .........................................................8, 11, 16, 64, 78
gypsum ..............................................................9, 35, 81

H

Hall, Lauren .......................................................2, 8, 19, 24, 30, 34, 35, 73, 74, 79, 80
hexahydrite .........................................................35
Highbridge Materials Consulting 27, 28, 29, 35, 74, 81, 101
Hoffman, Francis Burrall 12, 13, 18, 34, 73

I

ICOMOS ..............................................................3, 21, 59, 65, 74
in situ art ............................................................9, 61, 62, 63, 66
intralayer separation .............................................51, 65

L

lime .......................................................................9, 35, 81

M

Magill, Courtney ................................................24, 26, 81
Matsen, Catherine ............................................29, 35, 47, 79, 80
Mills, Christopher ..............................................29, 34, 35, 47, 75, 80
Myers, Catherine ................................................ii, iv, 2, 24, 25, 81
M. C. Harry Associates ........................................25
metal lath .............................................................7, 47, 52, 80

N

non-reintegrable lacunae ........................................66, 67, 68

O

overpaint .........................................................10, 18, 30, 31, 32, 34, 35, 36, 41, 42, 46, 49, 50, 57, 63, 64, 66, 69, 71, 79, 80, 99

P

Paraloid™ B-72 ....................................................30, 44, 54, 57, 80
photomontage ........................................ 25, 27, 81
prior analysis ........................................ 26

R
relative humidity ..................................... 104
reversibility .......................................... 65
Rhoplex™ ........................................ 29, 30, 45, 79
*Rosa Lowinger & Associates* .............. 29, 30, 77
S
salts ................................................. 3, 27, 28, 35, 41, 50, 51, 61, 62, 63, 77, 101, 102, 103
scoring ............................................. 17, 47, 52
sgraffito ............................................ 18
stabilization ....................................... 29, 44, 57, 64, 66, 67, 68, 79
storm surge ....................................... 27, 62, 70, 79
symbology .......................................... 25

V
Vizcaya 1, 2, 4, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19, 20, 22, 24, 25, 27, 28, 29, 30, 31, 34, 35, 36, 39, 42, 49, 59, 60, 61, 62, 63, 64, 67, 68, 69, 72, 73, 74, 75, 76, 77, 80, 81, 104

W
de Wolfe, Elsie .................................... 12
Wouters, Gina 2, 8, 19, 20, 27, 31, 34, 69, 72, 73, 74, 78, 80