Wooden Artifacts Group Postprints

Presentations from the 2017 AIC Annual Meeting in Chicago, Illinois
Wooden Artifacts Group Sessions
Wooden Artifacts Group

Postprints of the Wooden Artifacts Group Session and Joint Session of Architecture + Wooden Artifacts

Chicago, Illinois

45th Annual Meeting American Institute for Conservation
Chicago, Illinois

Compiler(s): Genevieve Bieniosek, Andrew Fearon, Rian M.H. Deurenberg-Wilkinson
INDEX

Wooden Artifacts Group Session

Count Lamberg’s Roman Table in the Rijksmuseum
Jan Dorscheid and Arie Pappot ................................................................. 1

Interpreting Thonet: Treatment of a Gebrüder Thonet Bentwood Rocking Chair
Paige Schmidt, Jonathan Thornton, Aaron Shugar, Rebecca Ploeger, and Juan Juan Chen .......... 7

A New Tool for the Traditional Toolbox
Alton J. Bowman ......................................................................................... 21

Understanding Currently Accepted Practice: Wood Fills and Conservation Material Decision Making
Megan Narvey ................................................................................................ 29

Conservation of the Immaculate Conception at San Xavier del Bac
Matilde Rubio and Timothy L. Lewis .......................................................... 39

Preservation of the Endangered Cultural Assets of the Traditional Egyptian Storytellers’ Heritage and Its Instruments and Tools
Hany Hanna .................................................................................................. 47

Old Meets New: Consolidation Techniques
Elizabeth Peirce .......................................................................................... 69

Conservation and Analysis of a Pair of Qing Dynasty Lacquer Clothes Wardrobes in the Collection of the Philadelphia Museum of Art
Wei Kao, Kate Duffy, Hiromi Kinoshita, Peggy Olley, and Behrooz Salimnejad ........................................ 77

Joint Session Architecture + Wooden Artifacts

Aimee Spencer Gorham’s Wood Marquetry of the Pacific Northwest
Nina Olsson and Suzana Radijovevic ........................................................... 87

Treatment of the Appleton Organ at the Metropolitan Museum of Art
Jennifer Schnitker and Manu Fredericky .................................................... 101
2017 ABSTRACTS (WRITTEN PAPER NOT SUBMITTED)

Wooden Artifacts Group Session

Manufacture and Treatment Study of Coffin and Mummy Cartonnage, at Egyptian Museum in Cairo
MOAMEN OTHMAN, EMAN H. ZIDAN, RANIA EL ATFY, MOHAMMED A. HUSSEIN, RANDA EL HELW, AND SABAH ABDEL RAZEK........ 111

Wood Working Tools as Art
JONATHAN THORNTON .................................................................................................................................................................. 111

Technical Analysis and Conservation Treatment of a Mid-Eighteenth Century Chinese Carved Wood Lacquer Bodhisattva Sculpture
LISA ACKERMAN, JONATHAN THORNTON, DR. AARON SHUGAR, DR. REBECCA PLOEGER, AND JUAN-JUAN CHEN ............... 112

Joint Session Architecture + Wooden Artifacts

The Framing of a Masterpiece: The History and Conservation of a Monumental Tabernacle Frame
WILLIAM B. ADAIR, AND STEPHAN C. WILCOX....................................................................................................................... 112

Structural Treatment of Wooden Beams
MOSTAPA SHERIF............................................................................................................................................................................. 113

Exposing Graffiti in George Washington's Cupola
STEVEN STUCKEY ............................................................................................................................................................................ 113
ABSTRACT—The article discusses the technical aspects and conservation treatment of the Works Progress Administration marquetry mural titled *Send Us Forth to be Builders of a Better World*, created in 1938 by Aimee Gorham. The mural is considered in the context of the artist’s *opus* and her access to innovative, engineered wood materials manufactured in the Pacific Northwest. The article highlights the unique nature of Spencer Gorham’s work, which combined the ancient technique of wood marquetry with the newest, cutting-edge industrial wood products of the era, mechanical presses, and industrial furniture coatings.

1. INTRODUCTION
The abundance of old growth forests of the Pacific Northwest seemed limitless in the early 20th century, and they provided the raw materials for the creation of a flourishing wood products industry. It was in this forested and highly industrialized backdrop in Portland, Oregon, that Aimee Spencer Gorham produced an extensive series of large-scale wood marquetry murals under the Works Progress Administration (WPA) from 1936 on. Gorham revived the Italian Renaissance craft of figurative marquetry for the decoration of numerous educational and cultural/recreational architectural spaces buildings in Oregon during the New Deal era, and beyond into the 1960s for religious and commercial spaces.

In 2015, efforts began for conservation of Gorham’s 1938 mural *Send Us Forth to be Builders of a Better World*, the first since its installation, and the first technical examination and treatment of a Gorham marquetry mural. The mural, measuring 128 sq. ft., was custom designed for the entrance foyer of Chapman Elementary School in Portland. In preparation for and during the course of treatment, examination and research into the materials and technique of the murals have provided insights into the artist’s working methods that embraced the regional veneration of wood, the historic aspects of the craft of marquetry, and modern technological advances in tools and manufacturing that resulted in unique and unprecedented works.

2. BACKGROUND
2.1 Historical context: 20th century currents in decorative and fine arts in the Pacific Northwest
Aimee Spencer was 22 years old when the City of Portland mounted the ambitious Lewis and Clark Centennial Exposition in 1905. The World’s Fair achieved the intended result of promoting Portland, previously known as Stumptown, to emerge as the “Rose City.” The natural beauty of the setting, surrounded by old growth forests, was featured in the fair ground design, as were regional wood products (Kriesman and Mason 2007). The expo highlighted the virtues of local handmade craft, as well as the wonders of recent advances in industrial products, due to the immense economic benefits that the timber industry had brought to the city. One of the most prominent features of the exposition was the Forestry Building, constructed with colossal old growth trunks in the style of an oversized log cabin (fig. 1). Its rustic hand-built character was to codify the regional vernacular of a strong connection between art, architecture, and the forest. Architects, artists, and craftsmen were inspired to celebrate the territory’s beauty of pristine timberlands by creating with native wood materials.

Riding the success of this grand civic venture, the local arts and crafts movement was also nascent. Julia Hoffman opened School the Metal Work in 1907 in a repurposed building from the fair, which offered the first art classes in the city, and in the same year she founded the Arts and Crafts Society of Portland (today the Oregon College of Art and Craft). In 1909, the Portland Art Museum opened the Museum Art School, with traditional fine arts classes offered mostly to female students.

Simultaneously, the women’s suffrage movement was growing, and the two milieus of women’s rights activists and the artistic circles were quite meshed. Two aspirational figures dominated the cultural overlap: the writer Abigail Scott Duniway, who was crucial in passing the women’s suffrage amendment in 1912, and C. E. S. Wood, lawyer, advocate, painter, and activist, who represented these interconnected spheres more than any other. Wood served as conduit to several high-profile East Coast artists such as J. Alden Weir, Albert Pinkham Ryder, Childe Hassam, and Olin Warner, which elevated the cultural landscape of the city (Bullock 2004). It was in this context that Spencer Gorham came of age.

Not to be understated was the immense influence that the WPA had on Gorham in the 1930s, which represented a period of intense artistic evolution for the artist, not only within the context of her own *opus* but also in connection to the wider landscape of artistic production at Timberline Lodge. Timberline Lodge was the crown jewel of Northwest New Deal projects.
American Craft, curated the room. More than 600 works were on view in an environment built entirely from materials native to Oregon, such as madrone wood chairs, caned furniture made with Oregon willow, glass lighting, paintings, books, and prints. Included in the room were examples of inlaid wood on a guitar and cello, made by the early Oregon pioneer W. R. McCord, which provided a direct inspiration to Gorham on the beauty and possibilities of marquetry.

Following a short-lived marriage, in the mid-1920s Gorham became a single mother with two children and worked to support her young family as a designer and craftswoman of stained glass for the successful and influential Povey Brothers Glass Company, known as the Tiffany of the West Coast. During her time at Povey, and later under the new ownership of W. P. Fuller & Company, Gorham created glass windows for the principal architects of the area on major commissions, such as the Temple Beth Israel (1929).

From 1930 to 1934, she attended summer workshops at the University of Oregon taught by Viennese Secession architect Eugene Steinhof (student of Josef Hoffman), who had been formed in the culture of the opulent decorative surface treatments so characteristic of the Secession.

In 1934, under the Public Works of Art Project, Gorham was commissioned to produce a carved relief of Abigail Scott Duniway. She remained quite active during the later New Deal Arts Projects and produced as many as 25 wood marquetry works, 16 alone for Portland Public Schools. The first marquetry commission was in 1936, for the mural Ali Baba and the Forty Thieves, from the Arabian Nights Entertainment (fig. 2). Exotic and the principal beneficiary of the budget for Region 6 (AK, WA, OR, ID, MT), which empowered the project manager, Margery Hoffman Smith, to commission textiles, wood, ironwork, paintings, and works on paper for the highly designed interior from the leading artists and craftsmen in the region (Munro 2009). At Timberline, Gorham connected with Ray Neufer and his crew of furniture makers, with whom she continued to collaborate to produce her marquetry designs through the 1960s (Allen 2017).

2.2 Biography: Aimee Spencer Gorham

Aimee Spencer (1883–1973) was born in St. Paul, Minnesota and moved to Portland at age 15. After briefly attending the Museum Art School, Spencer transferred to Brooklyn to attend the Pratt Institute between 1910 and 1913. There she thrived in an environment where distinctions between the fine and decorative arts were quite fluid. It is probable that she was also exposed to the explosive modern art scene in Manhattan, seeing, for example, the Armory Show in 1913. Duchamp’s Nude Descending a Staircase traveled to Portland in the same year.

Soon after her return, Spencer was selected to show a painting at the San Francisco Panama Pacific International Exposition of 1915. The setting for the exhibition was within the Oregon Building, which again was created as literally a temple of timber. Her painting titled Sand Dunes was shown in a gallery called The Art Room (Lundberg 2000). Allen Eaton, then professor at the new Allied Arts and Architecture School at the University of Oregon, who would later come to be known as the Dean of American Craft, curated the room. More than 600 works were on view in an environment built entirely from materials native to Oregon, such as madrone wood chairs, caned furniture made with Oregon willow, glass lighting, paintings, books, and prints. Included in the room were examples of inlaid wood on a guitar and cello, made by the early Oregon pioneer W. R. McCord, which provided a direct inspiration to Gorham on the beauty and possibilities of marquetry.

Following a short-lived marriage, in the mid-1920s Gorham became a single mother with two children and worked to support her young family as a designer and craftswoman of stained glass for the successful and influential Povey Brothers Glass Company, known as the Tiffany of the West Coast. During her time at Povey, and later under the new ownership of W. P. Fuller & Company, Gorham created glass windows for the principal architects of the area on major commissions, such as the Temple Beth Israel (1929). From 1930 to 1934, she attended summer workshops at the University of Oregon taught by Viennese Secession architect Eugene Steinhof (student of Josef Hoffman), who had been formed in the culture of the opulent decorative surface treatments so characteristic of the Secession.

In 1934, under the Public Works of Art Project, Gorham was commissioned to produce a carved relief of Abigail Scott Duniway. She remained quite active during the later New Deal Arts Projects and produced as many as 25 wood marquetry works, 16 alone for Portland Public Schools. The first marquetry commission was in 1936, for the mural Ali Baba and the Forty Thieves, from the Arabian Nights Entertainment (fig. 2). Exotic
and figured veneers were used to emulate the effects of drapery, chiaroscuro shading, and even perspective. Blue and green tints and other painted effects were used to further enhance and embellish the amber tonal range of the veneers. Another mural at the school, Swans, was described as being rendered in “soft wood tones,” indicating diverse methods of finishing and coating of the surfaces. Gorham makes use of an epithet that will become a recurring method of giving a title to her murals: “Square thyself for use. A stone that may fit in the wall is not left in the way.”

Gorham produced a second Orientalist subject in the 1937 work titled Solomon for the Curry County Regional Art Center, today in the collection of the Portland Art Museum (fig. 2). The small panel is designed with opulent use of pattern and exotic veneers reminiscent of the style of the Viennese Secession.

Gorham is perhaps best known for her two works at Timberline Lodge (fig. 3). Coyotes from 1937, and Mountain Lions, from 1937 to 1938, are located in the observatories of the main lobby of the lodge. In 1938, two colossal murals, The Forest—Nature’s Great Gift to Mankind and Only God Can Make a Tree, were created for the Oregon State University (OSU) School of Forestry, each one measuring 12 x 18 ft. Each of the panels bears an inlaid band with the name of various indigenous wood species.

Under New Deal programs, Gorham produced numerous murals for Portland Public Schools, including the 1938 mural Send Us Forth to be Builders of a Better World for Chapman Elementary in Northwest Portland under the WPA Federal Arts Project. The mural is composed of four panels that surround a double door in the entrance foyer, and the mural surface may be divided into three compositional areas (fig. 4). Wide horizontal bands of alternating veneers in the background visually unify the four panels into a single mural. The aspirational title of the work is further developed in the subject matter of the lower panels that portray two students with symbols of peace and resourcefulness set among the flora and fauna of the Pacific Northwest (fig. 5). The lower left panel depicts a girl standing barefoot on a small mound with unfurling fern fronds, a flowering tree, and a flowering iris. The girl wears a dress and supports a white dove that perches on her proper left arm. The lower right panel depicts a boy standing on a mound with crocus, trillium, and a fruit-bearing tree. The boy wears pants, shoes, and a shirt, and holds a wheel in his hands. Across the entire width of the upper section of the mural are stylized images of corn, an eagle in the lowered position, and a central image of a conifer within a semicircular frame above the title epithet (fig. 6). As was often the case for WPA works destined for schools, the iconography and materials were devised with a didactic purpose to inspire young students to be industrious, live in harmony with nature, and appreciate the natural resources and beauty of the region.

2.3 HISTORICAL DEVELOPMENT OF WOOD PRODUCTS

The Pacific Northwest was the major center of the wood products industry at the turn of the century. In addition to erecting the Forestry Building as the largest log building at the time, the timber industry also sought to showcase new innovative industrial concepts and products as part of the 1905 centennial celebration of the Lewis and Clark Expedition. For the occasion, first softwood plywood, a simple three-ply panel made with
Douglas fir and animal glues was fabricated by Portland Manufacturing Company and exhibited in the Forestry Building, where it was seen by half a million visitors during the expo and was retained as a permanent exhibit (Cour 1955). Following this success, furniture manufacturing markets opened the door to plywood panels, and over the next 25 years, developments in the rotary veneer manufacturing and adhesive technologies allowed for the expansion of plywood production from interior-grade decorative panels to structural building components suitable for exterior applications. By the 1930s, the softwood plywood industry was well established in Washington and Oregon, and included at least 15 independent small-size plywood mills, which came together in 1933 to form a nonprofit trade association—the Douglas Fir Plywood Association (DFPA). The DFPA will take on a pivotal role in developing plywood markets through nationwide promotion, providing assistance with product quality monitoring, and effective promulgation of first industry standards (Cour 1955). Steady technological developments around improving water resistance of animal and vegetable glues, and the introduction of waterproof phenol formaldehyde wood adhesives in 1935, greatly expanded the versatility of plywood products and the number of architectural applications. At the time when Gorham was creating wood marquetry murals, plywood was becoming utilitarian and ubiquitous building material as exemplified by speculative “Plywood Houses” designed in Portland by a prominent Northwest modern architect, and Gorham’s contemporary, John Yeon.

Mass production in the region that extended to other wood products, such as doors and furniture, created a demand for interior-grade plywood finished with decorative face veneers. In the 1930s, some 70 different wood species were readily available, and up to 200 were offered by the wood veneer manufacturers and suppliers in the region. Most decorative veneer stock was cut locally from valuable high-quality logs of exotic hardwoods imported from the world’s forests. Irresponsible logging practices and the lack of regulated industry and markets have since resulted in an endangered status of numerous tree species, which are now protected and subject to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) international trade regulations. Among wood species used for inlay veneers in the Chapman mural, bubinga (Guibourtia spp.) has been included on CITES listing as of January 2017 (CITES 2017). Veneers of several other wood species are not commercially available, such as Queensland maple (Flindersia brayleyana), which is in a short supply due to World Heritage listing of North Queensland rainforests.

3. TREATMENT OBJECTIVES

3.1 MATERIAL RESEARCH

The 2016 conservation treatment of *Send Us Forth to be Builders of a Better World* constitutes the first technical examination of a marquetry work by Gorham, and therefore further investigation of the work from a technical perspective became a core objective of the project to gain an understanding of Gorham’s process, both technical and artistic, and the materials she employed. Study and identification of the substrate support, research into the creative process, and the identification of the wood veneer species and the original adhesives and coatings were compiled into a technical profile of Gorham’s work that accompanied the report on the current condition of the mural.

3.1.1 Plywood

**Objectives**

In all of her wood marquetry murals, Gorham used Douglas fir plywood as a panel backing and support. This configuration provided adequate material compatibility between the marquetry veneers and the plywood veneers, and structural and dimensional panel attributes that will allow Gorham to expand the scale and size of traditional wood marquetry. A brochure for one of her later murals for the U.S. National Bank’s Lakeview branch in Oregon describes the mural as “one of the largest of its type in the world” (“A creation in marquetry” 1963) (fig. 7).

**Methods**

The plywood panels were examined visually for the wood species and panel configuration, and the measurements were taken in situ during restoration.
Plywood used as a backing and a marquetry support for all panels is Douglas fir plywood (fig. 8). Panels are of ¾ in. thickness and composed of two individual ¼-in. three-ply laminations measuring ⅜ in. for face veneers and ⅝ in. for the core (fig. 9). Seams visible on the backsides of the panels (fig. 8) suggest a possibility that two laminations were glued together to increase the size of the panels, since the minimum sizes of 66 x 86 in. for the lower modules and 34 x 106 in. for the upper modules, respectively, exceed the maximum standard Douglas fir plywood sizes of 48 x 96 in. Two panels are pressed together either in a single press cycle or in two separate press cycles. Glue appears to be water-resistant casein or advanced soybean-based glue. The stamp present on the back of one of the panels (fig. 10) confirms inspection or certification by the DFPA, suggesting that the panel production conformed to an early industry standard from either 1936 (DFPA 1936) or 1938 (DFPA 1938). The plywood grade appears to be AA per 1938 standard, which
would correspond to N (natural, clear) at present (S. Zylkowski, pers. comm., October 16, 2016).

3.1.2 Gorham’s Artistic Process

A small plaque mounted on the wall adjacent to the mural by Gorham in 1938, with the header “Marquetry,” describes the technique used as a “splendid medium for architectural decoration” (fig. 11). Yet she also characterizes her own work as a “purely modern development of an ancient art” and goes on to describe her artistic process. Her approach began quite traditionally, creating first a sketch, which was then enlarged to a full-scale cartoon. From the cartoon, a copy was created as a cutting pattern, including annotation on the type of veneer, and indications of the direction of the grain to best exploit the figurative qualities. A pair of ink preliminary sketches for The Forest murals at OSU provides evidence of her manner of visualization of the veneer wood grain directions and colors during her initial composition. Gorham used an extensive selection of domestic and exotic wood veneers, usually between 20 and 30 distinct species per mural, to achieve remarkably varied effects of chroma, grain, and chatoyance. Highly figured veneers were used to great effect to emulate waves in the figure’s hair (fig. 12), feathers, atmospheric effects, and dewy iridescence of plant surfaces. She notes that the diverse origins of the veneers she used, and that they were acquired by a local import company that distributed to the entire West Coast.

It is interesting to note that Gorham states that the veneer contours were cut not with a conventional coping saw but with an electric jigsaw. With exception to scattered gaps that arrive at 1.5 mm maximum width, the veneer joints are generally quite
precise. Gorham used modern cellophane and Scotch tape to position the veneer pieces prior to adhesion to the plywood sub-strate (Laroff 2013). The pieces were laminated in a large, cus-
tom-made press manufactured by fellow marquetry artist Jerome 
Selinger (Munro 2009). Gorham also describes that the veneered surfaces were then scraped, smoothed, sanded, and finished.

3.1.3 Wood Species Identification

Objectives
Identification of wood species and mapping of marquetry veneers was done to enable exact specification of wood species for future repairs of veneers and to facilitate the understanding Gorham's artistic expression.

Methods
Standard microscopic wood identification techniques were not readily applicable for marquetry veneers because of the small thickness of veneers that precludes examination of the anatomical features of wood in the cross section and, in most instances, tangential section. The available sampling surface on the faces of the veneers was predominantly radial and presented only limited opportunities for extraction of thin sections due to sensitivity of veneer surfaces to destructive sampling. Wood identification was, as a result, based on the combination of several analytical approaches: the use of archival documentation available about the mural, macroscopic investigation, and light microscopy of thin sections that were collected from the panels.

A list of 14 veneer wood species documented by Gorham on the original plaque that accompanied the Chapman mural provided invaluable preliminary information about wood species used in panels. Listed wood species comprise maple, sycamore, aspen, gumwood, and walnut (from the United States); East India Rosewood, narra wood (red), koa (brown stripe), and aydus (white) (from India); lacewood (from China); Philippine

Fig. 12. Details of lower right panel, showing chatoyance of veneers made evident with change in directional light.

Fig. 13. Oriental wood—Queensland walnut (Endiandra palmerstonii)—used in Eagle’s wings. Australian curly maple—Queensland maple (Flindersia hayleyana)—used in Eagle’s body.
3.1.4 Coatings Identification

**Objectives**

Surface coatings were identified to inform cleaning protocols and gain understanding of the artistic process. Results were compared to recorded and anecdotal information about Gorham's use of traditional and modern industrial coating materials.

**Methods**

Gorham states in the original wall plaque that her final finish is a wax coating. Yet other sources have suggested her use of Fuller “Nitrokote,” a nitrocellulose furniture coating manufactured by W.P. Fuller and Company (Ball 2004). Gorham worked in the stained glass department of Fuller and may have been familiar with their products (Laroff 2013).

Visual examination and photo-documentation of UVt fluorescence of the mural surface was conducted. The characteristic orange fluorescence of shellac was identified along the external edges of the panels, dispersed in a bleed pattern that was readily visible in areas that had been hidden/masked by the perimeter-molding frame, indicating that the surface coatings were applied after installation.

Four samples of the coating were taken for FTIR analysis. The findings revealed spectral features that are consistent with varied amounts of wax and natural resin, possibly amber resin or seedlac (Appendix 3). One sample had spectral features that may indicate the presence of nitrocellulose, but the findings are inconclusive.

3.1.5 Condition

Despite the mural's prominent location in the entrance foyer of the school, the marquetry mural had languished in neglect. Close to 80 years of accumulated age, wear, accidental damage, vandalism, and inopportune custodial maintenance had compromised the condition of the delicate surface, which not only obscured the quality of the mural and its glowing figural effects of the wood grains but also threatened its long-term...
preservation. The high traffic and fluctuating environmental conditions of the mural location had severely impacted the veneer adhesion. Extensive delamination of the veneer from the substrate was identified during examination (fig. 15), with visible points of lifting of the veneer edges and blind delamination identified through surface percussion. Lifting had resulted in several losses of the veneer from opportunistic vandalism. The structural stability of the plywood substrates has allowed the mural panels to remain quite planar despite the unstable environmental conditions in which they have been housed.

Perhaps most disfiguring was the devastating vandalism present in the form of graffiti, which primarily affected the bottom panels (fig. 15). Scratches of various depths were at times oriented cross grain and therefore created frayed and open fibers that were subjected to inopportune remedial local application of wood stains. The entire surface was covered with surface grime and also coated with a polyurethane finish that had become darkened and opaque with time. Further damage to the surface coatings was caused by the repeated use of tape to attach posted announcements to the mural surface, which, when later removed, resulted in a “strappo” of the coatings.

4. CONSERVATION TREATMENT

4.1 OBJECTIVES

An interdisciplinary group of architectural, objects, wood panel, and painting conservators collaborated on the project. The scope of treatment was to stabilize and repair the damaged veneer, thin or remove the aged and opaque surface coatings, and improve visual legibility of the image with the application of a new surface coating and retouching. Due to the logistical needs for the veneer repair and necessary solvent use, the murals were temporarily removed from their location and transported to the laboratory for treatment.

4.1.1 Consolidation

A custom support structure was positioned below the panels, which was connected with lateral clamps to a sliding mobile bridge across the width of the panels. The bridge served as a housing for mobile sections, clamped into place and fitted with threaded rods that would allow targeted pressure to be applied to delamination points on virtually all areas of the panels. The support and mobile bridge is an adaptation of the systems used for wood panel support treatment (fig. 16).

A 20% hide glue solution was used for consolidation of the veneer, heated to 37°C. Prior to injection of the glue, isopropanol was injected to improve migration and flow of the glue. Pressure was sustained during the drying process.

4.1.2 Testing and Surface Cleaning

Treatment involved surface cleaning and the removal of various inopportune coatings, including a polyurethane varnish applied during the 1980s that had darkened and obfuscated the lively grain of the wood veneers. The cleaning protocol was formulated to conserve the original shellac and wax coatings. Once the surface had been stabilized, it was possible to proceed with surface cleaning.

Testing was conducted to determine the solubility parameters and the most effective mode of solvent application: free solvent solutions, methylcellulose, and carbopol gel. Because of the varied porosity and hardness of the wood species, surface cleaning was conducted on isolated veneer areas, applying solvents and removing the materials following the wood grain. Benzyl alcohol and acetone gel (Wolbers’ polyurethane gel) was applied on top of a rayon tissue on selected areas and capped with mylar while it was left to dwell for three to four minutes. The polyurethane coating crizzled on the surface, the bulk remaining adhered to the rayon tissue. Remaining residues were mechanically removed with a spatula, then cleared with acetone and followed by odorless mineral spirits. Scratch sites required further localized cleaning since the polyurethane coating had penetrated...
into the flayed wood grain. The surface, after cleaning, retained the original durable wax surface with a brushy relief. Although the benzyl alcohol partially removed the cloudy appearance of the substrate shellac, it remained in part microfissured, requiring further saturation through coating to improve transparency.

4.1.3 Protective Coating

As a protective surface coating, a 25% solution of Laropol A81 (in 5:4 Gamsol:Xylenes) was applied by brush while the work was horizontal. A final spray coating of Regalrez 1094 (20% in Gamsol) with the HALS Tinuvin 292 was applied following restoration.

4.1.4 Restoration

The deepest scratches and narrow gaps between veneer sections were filled to provide a continuous surface. For some areas, a custom-made pigmented wax resin was made with Regalrez 1094, Cosmolloid 80H, and dry pigments. For areas where the veneers were in the darker tonal range, the natural transparency and dark warm tone of beeswax and colophony (relining wax resin mix) was more visually effective (fig. 17).

Where some of the scratches retained a darkened appearance, inpainting was used to mitigate the disturbing linear graphic effects. Due to the highly reflective, almost metallic effect of some of the chatoyance in the wood grain, reflective mica powders were bound in Laropol A81 (50%) (fig. 18). Gamblin conservation colors were also used to improve the chromatic continuity of the coatings, utilizing the transparent earth colors to glaze areas where the coatings had been stripped off with adhesive tape.

4.1.5 Dissemination

Interpretive panels with biographical information about the artist, historical context, iconography, and technical information were designed to inform and enhance the original didactic purpose of the murals, and to foster appreciation of the murals for K-5 students of Chapman and their community. A teaching curriculum and kit is currently being developed for use in the years to come.

5. CONCLUSION

The project to conserve the wood marquetry mural Send Us Forth to be Builders of a Better World became a significant opportunity to bring attention to the unique work of Gorham as a product of her place and time. Research of the materials provided the first technical profile of the artist’s work, revealing interesting connections to the deep regional connection to the old growth forests as a source of inspiration and an economic resource, and also to the rapidly evolving wood products industry of the time.
Gorham’s work appears on the surface to adopt the arts and crafts’ ideal of handwork, which elsewhere was often a form of reaction against industrialization. In contrast, Gorham embraced industrially produced plywood as a substrate, exploited the industrially peeled and cut veneers that were locally available thanks to the booming furniture industry, used an electric jigsaw and an industrial press, and may have incorporated mass-manufactured nitrocellulose lacquer coatings, resulting, in her own words, in “a purely modern development of an ancient art; and, because of a peculiar aliveness and beauty of texture and color, it is a splendid medium for architectural decoration.” (Gorham n.d.)

The conservation effort also provided the opportunity to bring together an interdisciplinary group of researchers and conservators, who applied methods customarily used in the fields of painting and wood panel conservation and wood science to a wood architectural object to achieve the optimal final result.

APPENDIX 1. WOOD SPECIES IDENTIFICATION

Table A1. Inventory of wood species in marquetry veneers including species documented by Aimee Spencer Gorham

<table>
<thead>
<tr>
<th>Common name</th>
<th>Latin name</th>
<th>Native range</th>
<th>Name used by Aimee Gorham</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sweetgum, Redgum, Sapgum</td>
<td><em>Liquidambar styraciflua</em></td>
<td>Eastern North America, Central America</td>
<td>Gumwood</td>
</tr>
<tr>
<td>Hard maple, Sugar maple</td>
<td><em>Acer saccharum</em></td>
<td>North America</td>
<td>Maple</td>
</tr>
<tr>
<td>Sycamore, American plane</td>
<td><em>Platanus occidentalis</em></td>
<td>North America</td>
<td>Sycamore</td>
</tr>
<tr>
<td>Quaking aspen</td>
<td><em>Populus tremuloides</em></td>
<td>North America</td>
<td>Aspen</td>
</tr>
<tr>
<td>Black walnut</td>
<td><em>Juglans nigra</em></td>
<td>Eastern North America</td>
<td>Walnut</td>
</tr>
<tr>
<td>Indian rosewood</td>
<td><em>Dalbergia latifolia</em></td>
<td>India, Sri Lanka, and Indonesia</td>
<td>East Indian rosewood</td>
</tr>
<tr>
<td>Amboyna (burl)</td>
<td><em>Pterocarpus indicus</em></td>
<td>Southeast Asia</td>
<td>Narra</td>
</tr>
<tr>
<td>Hawaiian koa</td>
<td><em>Acacia koa</em></td>
<td>Hawaii</td>
<td>Koa</td>
</tr>
<tr>
<td>Ayous, Obeche</td>
<td><em>Triplochiton scleroxylon</em></td>
<td>Tropical West Africa</td>
<td>Ayous</td>
</tr>
<tr>
<td>Brazilian lacewood</td>
<td><em>Panopsis spp.</em></td>
<td>South America</td>
<td>Lacewood*</td>
</tr>
<tr>
<td>Northern silky oak, Australian lacewood</td>
<td><em>Carduilla sublimis</em></td>
<td>Queensland, Australia</td>
<td></td>
</tr>
<tr>
<td>Australian red cedar, Toona</td>
<td><em>Toona ciliata</em></td>
<td>Southern Asia and Australia</td>
<td>Philippine cedar</td>
</tr>
<tr>
<td>Kevazingo, Bubinga</td>
<td><em>Guibourtia spp.</em></td>
<td>Equatorial Africa</td>
<td>Bubinga</td>
</tr>
<tr>
<td>Queensland maple</td>
<td><em>Flindersia brayleyana</em></td>
<td>Northern Queensland (Australia)</td>
<td>Australian curly maple</td>
</tr>
<tr>
<td>Queensland walnut</td>
<td><em>Endiandra palmerstonii</em></td>
<td>Northern Queensland (Australia)</td>
<td>Orientalwood</td>
</tr>
<tr>
<td>White oak</td>
<td><em>Quercus spp.</em></td>
<td>Europe, North America</td>
<td>not listed</td>
</tr>
<tr>
<td>Butternut, White walnut</td>
<td><em>Juglans cinerea</em></td>
<td>Northern Queensland (Australia)</td>
<td>not listed</td>
</tr>
</tbody>
</table>

*Lacewood speciation was inconclusive between Australian lacewood (*Carduilla sublimis*) and Brazilian lacewood (*Panopsis spp.*).
APPENDIX 2. MAPPING OF WOOD SPECIES AND INTERPRETIVE PANELS

Fig. A1. Details from the two interpretive panels mounted next to the conserved mural at Chapman Elementary School, Portland, Oregon.
APPENDIX 3. FTIR ANALYSIS OF COATING SAMPLES

Dr. Tami Lasseter Clare
The Regional Laboratory for the Science of Cultural Heritage Conservation, Portland State University.

INSTRUMENTATION

FTIR Analysis. A Thermo Scientific iS 10 infrared spectrometer with a Nicolet Continuum FT-IR microscope and a 250 µm MCT detector was used to acquire IR spectra from 4000–650 cm⁻¹ with 4 cm⁻¹ resolution with Omnic software. Data was transformed using an N-B strong apodization function and Mertz phase correction. Scrapings of varnish were provided for analysis, and once in the laboratory they were handled using nitrile-gloved hands and stainless steel tweezers. A stainless steel scalpel was used to remove a smaller sample for analysis, using a stereomicroscope for visual magnification. Samples were then pressed to flatness by a stainless steel roller on a diamond slide before spectral acquisition in transmission mode for 32 scans.

DATA AND RESULTS

A summary of findings is shown in the following table. Comparative identification of spectral features was conducted using the IRUG database, in reference to Price and Pretzel (2009).

<table>
<thead>
<tr>
<th>Sample Number</th>
<th>Physical Description</th>
<th>Composition as Determined by FTIR</th>
</tr>
</thead>
</table>
| 1             | Transparent              | Major: Wax  
Minor: Natural resin                                                   |
| 2             | Transparent              | Major: Wax  
Minor: Natural resin and carbohydrate fibers                            |
| 3             | Transparent              | Major: Natural resin  
Minor: Wax                                                                |
| 4             | Transparent and amber    | Mixture: Includes natural resin and other components that may be carbohydrate fibers or nitrocellulose and urethane |

The following images show FTIR analysis of four samples of coating from Aimee Gorham, *Send Us Forth to be Builders of a Better World*, 1938.

**Sample 1:** Primarily wax with some natural varnish
- Contains wax with spectral features consistent of a microcrystalline wax such as beeswax.
- Spectral features are consistent with a natural resin such as amber varnish and Dammar. Spectral features are associated with shellacs.

FTIR analysis of coating in sample 1 from Aimee Gorham, *Send Us Forth to be Builders of a Better World*, 1938

**Sample 2:** Primarily wax with some natural varnish and fibers
- Contains wax with spectral features consistent with a microcrystalline wax such as beeswax.
- One area of the sample also contained traces of a natural carbohydrate fiber, such as flax.
- Like sample 1, there is also some varnish present, although wax is the primary component.

FTIR analysis of coating in sample 2 from Aimee Gorham, *Send Us Forth to be Builders of a Better World*, 1938

**Sample 3:** Primarily natural resin varnish with trace amounts of a wax
- Contains a natural resin, such as seedlac.
- It also contained traces of wax.

FTIR analysis of coating in sample 3 from Aimee Gorham, *Send Us Forth to be Builders of a Better World*, 1938

**Sample 4:** Mixture
- Contains natural fibers, such as jute, that could be instead from the wood substrate.
- Also contained traces of wax or varnish. Due to the overwhelming presence of natural fibers, it cannot be determined whether additional varnish is present.
- If there is nitrocellulose present, this sample is the most likely to contain it, although due to the spectral complexity in the key regions where nitrocellulose shows signature peaks, its presence could not be confirmed. A reference spectrum of nitrocellulose is provided to demonstrate the overlapping features between it, the sample, and the jute fiber reference spectrum. If nitrocellulose is present, it is not a major component of the sample.
- This sample may also contain a urethane alkyd varnish, yet similarly to the case of nitrocellulose, the region showing key urethane features is complex in this sample.

FTIR analysis of coating in sample 4 from Aimee Gorham, *Send Us Forth to be Builders of a Better World*, 1938
ACKNOWLEDGEMENTS

We would like to thank the following for their help and support: Linny Adamson, curator at Timberline Lodge; Tami Lasseter Clare, The Regional Laboratory for the Science of Cultural Heritage Conservation, Portland State University; Sarah Munro, scholar in residence at Timberline Lodge; Bruce Pelton, Janet Carlson, Spencer Gorham, Eric Gorham, and Annamarie Pelton of the Aimee Gorham family; Rosie Platt, Chapman Project coordinator; Professor Sara Robinson, OSU; Samantha Springer, Portland Art Museum; and Steve Zylkowski, APA. Special thanks to the Heritage Conservation Group researchers and conservators involved in the project: Ginny Allen, Morgan Hayes, Robert Krueger, Aldo Manzo, and Peter Meijer.

REFERENCES

Lasseter Clare, private report of FTIR findings.

AUTHOR BIOGRAPHIES

NINA OLSSON is a conservator of paintings in private practice and president of Heritage Conservation Group LLC, Portland, Oregon. Olsson earned her B.S. in Art History and Studio Art from the University of Wisconsin, Madison. From 1985 to 2000, she was active in Florence, Italy, where she completed the three-year painting conservation program at the Istituto per l’Arte e il Restauro-Palazzo Spinelli. Olsson’s current research includes the development of heat transfer technology for art conservation (IMAT Project) and the use of monoatomic oxygen for surface cleaning of cultural heritage. Address: 2359 SW Park Place, Portland, OR, 97205. E-mail: ninamolsson@gmail.com.

SUZANA RADIVOJEVIC Ph.D. is a wood scientist and the principal of Ligno Logic LLC and adjunct faculty in the Historic Preservation Program at the University of Oregon. Radivojevic received her B.Sc.F.E. in Wood Engineering from the University of Belgrade, Serbia, and a Ph.D. in Wood Science from the University of Toronto. Her work focuses on research, characterization, and architectural conservation of wood-based materials. Address: Ligno Logic LLC, 1919 Woodlawn Avenue, Eugene, OR, 97403. E-mail: suzana@lignologic.com.