

Solving the Ptolemy Puzzle

ABSTRACT

In 2009, the Rare Book and Special Collections Division of the Library of Congress requested conservation of the 1513 Lessing J. Rosenwald copy of Ptolemy's *Geographia*, an atlas containing forty-seven maps based on Ptolemy's original notes from the 2nd century and European discoveries up to 1513. Printed in Strasbourg on a variety of papers, the maps are woodblock prints with letterpress text, and hand-colored using a limited palette. Johann Schott likely was responsible for the majority of the printing. Although other copies of the atlas exist from 1513, this copy is unique in its color palette, the order of its maps, and their varying condition.

The complexity of the atlas prompted the formation of a research team with expertise from the conservation, preservation science, and rare books curatorial divisions. The goal of the research is to determine how the atlas was assembled; to identify and characterize the binding elements, the paper supports, and the pigments; and to unravel how the atlas arrived in its current condition. Results of this research will help determine a clear treatment approach, especially for the most deteriorated maps. This ongoing project will discuss the research performed thus far towards this goal within the context of the large body of research on the degradation of copper-containing pigments, how they induce paper deterioration, and the most effective means of treating these pigments and their deteriorated paper supports.

The atlas suffers from a number of condition problems, including an overly tight re-binding from a later period, and a degraded copper green pigment, as confirmed through X-ray fluorescence (XRF) spectroscopy (Brostoff et al. 2011). The rebinding both prohibits the book from opening completely and has caused cracks near the guards in many of the pages (figs. 1–2). Seven of the maps exhibit severely degraded copper green pigment and deteriorated adjacent paper supports, while the rest of the maps are in very good to good



Fig. 1. Ptolemy (printed by Johann Schott), *Geographia*, 1513, Lessing J. Rosenwald Collection #624, Rare Book and Special Collections Division, Library of Congress. View of the book's cover. Dimensions: 45.5 x 32.7 x 5.9 cm



Fig. 2. The open book before treatment showing the overly tight binding, which prevented it from opening completely



Fig. 3. Map of Quinta Europa Tabula on crown watermark paper. This map is an example of a map in good condition

condition (figs. 3–6). Close examination, spot tests, additional XRF analysis, and spectral imaging of the pigments and their paper supports have allowed assessment of differences between pages of varying condition.

The advantage of having two additional copies of the 1513 *Geographia* in the Library of Congress also proved helpful. Examination of these uncolored and untreated copies in comparison to the Rosenwald *Geographia* led to the conclusion that three different papers are present across multiple volumes: a crown watermark paper, a fleur-de-lys watermark paper, and an unwatermarked paper (figs. 7–9). Each paper exhibits unique appearance qualities, which reflect their condition. The majority of the crown paper is in very good condition, the fleur-de-lys paper is in good condition, and the unwatermarked paper is in poor condition (fig. 10). Most of the seven maps in poor condition were printed on the unwatermarked paper.

XRF analysis of modern pigments used for inpainting, identification of a modern watermark used in guard papers, and the presence of one silked map all pointed to the atlas undergoing restoration in the 20th century. Another feature of this restoration was the application of a gelatin sizing with a heavy addition of potassium aluminum sulfate to the most deteriorated maps (Brostoff et al. 2011). The potash alum sizing accelerated the degradation of these maps, and led to a curious phenomenon. The copper green pigment deteriorated markedly on these pages, turning brown and powdery, but remained green in the gutter, suggesting the guards protected the pigment from the effects of the potash alum. Extensive XRF readings taken of these maps in different locations show the potash alum sizing was applied to both sides of the map papers, with somewhat lesser quantities detected on the guard areas (Brostoff et al. 2011). The most likely explanation for the curious green phenomenon is that the sizing solution was unevenly applied to the maps after a series of guards had been applied that prevented the folios from fully opening. It may even have been done while the volume was fully bound.



Fig. 4. Map of Tabula Nova Particularis Provinci[a]e Rheni Superioris. This map is an example of a map in poor condition. The deteriorated copper green pigment and offset discoloration are especially prominent features



Fig. 5. Detail of the copper green pigment from a map in good condition



Fig. 6. Detail of the copper green pigment from a map in poor condition



Fig. 7. Transmitted light image of the crown watermark paper from the map of Quinta Europa Tabula



Fig. 8. Transmitted light image of the fleur-de-lys watermark paper from the map of Quarta Asiae Tabula



Fig. 9. Transmitted light image of the unwatermarked paper from the map of Tabula Neoterica Cret[a]e sive Candi[a]e Insuli[a]e



Fig. 10. Comparison of the crown watermark paper from the map of Quinta Europa Tabula in good condition (left) and the unwatermarked paper from the map of Tabula Prima Asi[a]e in poor condition (right)

Although there is still more to understand about the condition of the atlas before it can be conserved, a profile, especially of the maps in poor condition, has begun to form. Based on this profile, two primary goals for treatment have emerged: to treat the text pages and maps in poor condition and to rebind the atlas in a manner that is both historically sympathetic and functional. Multiple institutions around the world also are studying how copper green pigments degrade and the most effective means of treating them. Results established by these mutual efforts will influence how the maps in poor condition will be treated. The paper presented at this year's AIC conference was preliminary and focused on the technical examination and history of the volume. The project continues to be ongoing and the authors hope to present the completed version in the future.

REFERENCE

Brostoff, L., S. Albro, J. Bertinaschi and E. Spaulding. 2011. The Relationship between Inherent Material Evidence in Cultural Heritage and Preservation Treatment Planning: Solving the Ptolemy Puzzle, Part II. Oral presentation at the American Institute for Conservation of Historic and Artistic Works (AIC) 39th Annual Meeting, May 31–June 3, 2011, Philadelphia, PA; paper submitted to Book and Paper Annual.

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