

Testing, Analysis, and Conservation of a 1566 Tyndale Bible

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Introduction

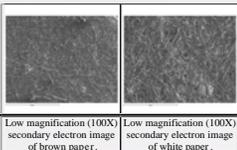
Conservation science is a quickly expanding field that has extended its boundaries past basic restoration and into the realm of high-tech instrumentation and experimentation. Methods such as scanning electron microscopy, energy dispersive spectrometry, UV-Vis spectrometry¹, X-Ray fluorescence, and Raman Spectroscopy² can be used to identify pigments in a painting or manuscript, monitor the stability of an artifact or artwork during the conservation process, and even to replicate materials needed for conservation of a deteriorated textile.



The subject of this research project is an English Tyndale Bible circa 1566 that was owned by a prominent family in Cornwall, England for many years and now resides in the Rare Books Collection at The Ohio State University. This Bible is unique in that all of its pages are covered in a yellow "paint" that was deliberately placed sometime before the book was rebound around 1800. This treatment is very rare and basically unstudied. Other Tyndale Bibles as well as a few other Bibles from this period happen to have a similar looking yellow dye although no waxy coating.

Previous Research

The previous research conducted on the Bible includes analysis by scanning electron microscopy (SEM) and energy dispersive spectrometry (EDS). These revealed that the spores found on the yellow paper are covered with an inorganic "paint." The crystalline structure observed could be part of this "paint" and therefore the yellow color is likely due to a paint-like mixture of organic and inorganic materials.



Low magnification secondary electron image of brown paper. Low magnification (100X) secondary electron image of white paper.

Figure 1. Scanning Electron Microscopy images of Bible paper and reference paper at 100X magnification

(Unpublished research, Dr. John Olesik of The Ohio State University)

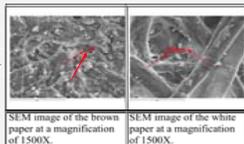


Figure 2. Scanning Electron Microscopy images of Bible paper and reference paper at 100X magnification

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Current Research

The specific questions that this project addresses are:

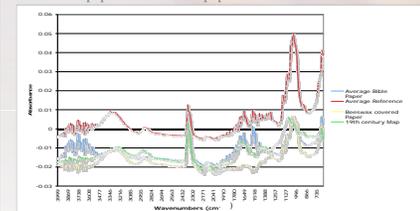
- What is the exact chemical profile of the yellow "paint"?
- Does the genealogy of the Bible pertain to its yellow state in any way?
- If not then why is the Bible "painted", in other words, what purpose did the paint serve?
- Why is this coating so rare? Why does it seem that Bibles seemed to be the only printed materials receiving the yellow treatment?
- What is the best method of conservation for the Bible?
- Is there a simple identification test that can be done on the coating that any conservator could do without major laboratory equipment if another example of the coating is found?



Methods and Results

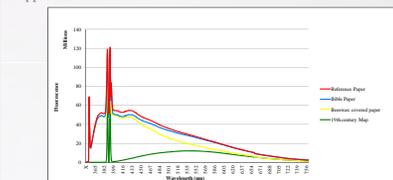
Attenuated Total Reflectance

ATR is a good method for testing the surface of the paper without penetrating below the paint layer. This graph shows the comparison between the Bible paper, Reference Paper, a piece of a map from the 19th century covered in shellac, and the beeswax covered paper. The beeswax paper and the Bible paper share similar curves.



Emission

With Emission Fluorescence testing, the difference between the 19th century map and the Bible paper is clear. The similarity between the Bible paper and the Beeswax covered paper is also apparent.



Period Materials

Some non-analytic testing has also been done on plain paper from the same period as the Bible paper including the application of beeswax³. The beeswax was dissolved in turpentine and retained the brush strokes but retained an obvious wax layer not apparent in the Bible. From these results as well as the previous testing it appears that the "paint" is really a waxy substance with yellow dye added for color.



Bible Paper, 785 nm, 30% Intensity, 60 s

Raman Spectroscopy

Several wavelengths, including 514 nm and 785 nm, were tested with the Raman Spectrometer. The tests were inconclusive because the coating on the paper fluoresced enough to interfere with the readings. The higher wavelengths showed less fluorescence but no peaks were reproducible.

UV-Vis Diffuse Reflectance/UV Light

The data from this test was inconclusive because the background paper absorbed significantly more than the Bible paper. The "paint" could be causing a high amount of reflectance that interfered with the results. The Bible paper sample appeared a dark purple when exposed to plain UV light which suggests an organic material.

Archives

Research at the archives in East Sussex and Truro, England yielded many details about the history of the families that owned the Bible. Research at the British Library resulted in the discovery of three other Tyndale Bibles which are also yellow although they were printed in 1534. No research has been done on the reasoning behind the yellow pages of these Bibles.



Cornwall Record Office

pH

The pH level of several of the pages were tested to aid in the future conservation of the Bible. An Ion Selective Electrode applied directly to the center of each specific page was used to test the pH. Overall the pages are acidic; having an average pH of 4.587. However, the newer (attached) pages are much more acidic than the original pages.

	Front Added Pages (Newer)	Front Added Pages (Older)	Original Yellow Pages	Back Added Pages (Older)
Number of Pages Sampled	5	3	17	3
Highest value	4.57	4.36	5.64	4.92
Lowest value	4.07	4.12	4.21	4.53
Average pH	4.34	4.25	4.996	4.76

pH values of pages sampled from Tyndale Bible

Theories

- Copying Anne Boleyn's Vellum Bible
- Increasing the value by making the paper appear like a more expensive material
- Experimenting in paper conservation
- Saffron Paper (or imitating saffron paper)

Significance

This research project is important to the field of paper conservation because the coating on the pages is so rare and has not been subjected to extensive study. Analyzing why the "paint" was applied could reveal important information concerning how people of the 17th and 18th centuries treated their important literature. Also, developing a simple test for similar substances will allow fellow conservators to better analyze their own samples if they also encounter strange dyes or paper coatings.

Literature Cited

- ¹Rene de la Rie, E. (1982). Fluorescence of paint and varnish layers (part iii). *Studies in Conservation*, 27(3), 102-108.
- ²Clark, R.J.H. (1995). Raman microscopy: application to the identification of pigments on medieval manuscripts. *Chemical Society Reviews*, 187-196.
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Acknowledgments

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