Identification and Attempted Removal of Asbestos Fibers From an 18th Century Monograph

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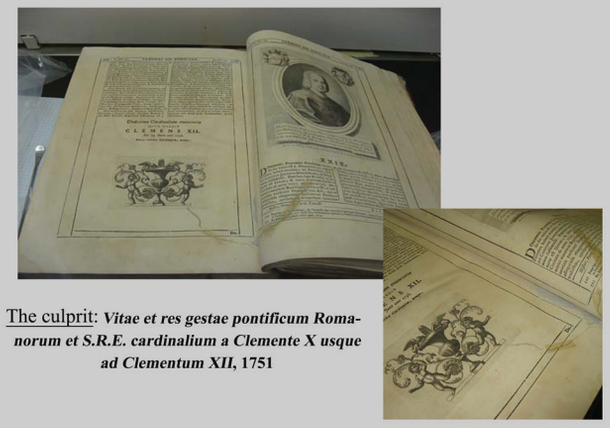
The Getty Conservation Institute

Introduction

The discovery of a suspicious gray powder within an 18th c. monograph led to a joint project between conservators at the Getty Research Institute (GRI), scientists at the Getty Conservation Institute (GCI), and Risk Management of the J. Paul Getty Trust. Aeroscopic, Inc. (specialized in asbestos removal) was also called upon for advice. This monograph was acquired in 1985 as part of Contessa Anna Laetitia Pecci Blunt's (1885-1971) library, however the powder was only recently discovered during a more thorough cataloguing of the book.

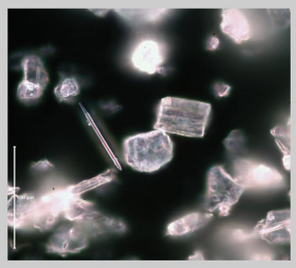
Scientists from the GCI's Museum Research Laboratory identified the presence of both tremolite (a form of asbestos) and talc in the powder. When or why the tremolite-talc was applied to the book is not known although water damage suggests it was applied as a drying agent. But how to remove this powder?

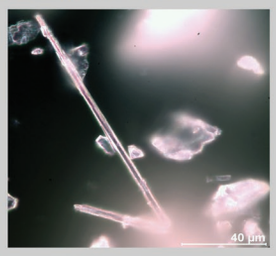


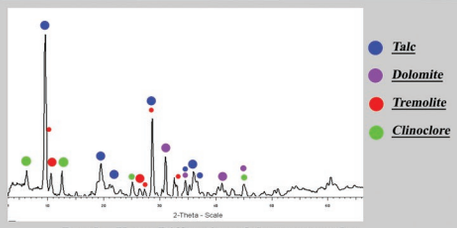
The culprit: ***Vitae et res gestae pontificum Romanorum et S.R.E. cardinalium a Clemente X usque ad Clementum XII*, 1751**

Analysis

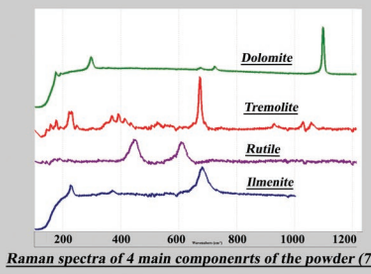
Prior to the analysis of the gray powder, an elemental study by X-ray Fluorescence (XRF) spectroscopy of the different constituent parts of the book (paper and ink) was completed. The powder was not a degradation product of the paper or the ink but was composed of irregurarly shaped crystals and long fibers (10 to 100mm long) (see figures below). XRF & ESEM-EDS* of these crystals and fibers showed then to be primarly composed of iron (Fe), silicon (Si), and calcium (Ca). Mineralogical characterization of the crystals by Raman Microscopy and X-ray Diffraction analysis revealed the presence of silicate minerals such as talc ($Mg_3Si4O_{10}(OH)_2$), tremolite ($Ca_2(Mg, Fe)_5Si_8O_{22}(OH)_2$) and some secondary minerals such as dolomite ($CaMg(CO_3)_2$), rutile (TiO_2), clinochlore ($(Mg_5Al)(AlSi_3)O_{10}(OH)_8$) and illmenite ($FeTiO_3$) (see spectra below).



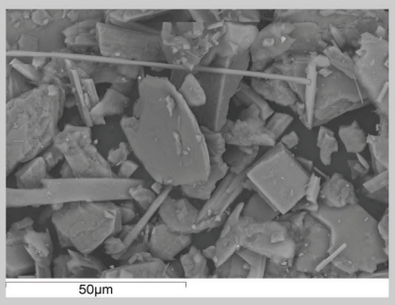




Powder X-ray Diffraction of the gray powder



Raman spectra of 4 main componenrts of the powder (785 nm)



Light Microscopy -left- and Electronic Microscopy images -above- (electron backscattering) of the gray powder

Tremolite-talc was an industrial product of low grade talc produced at the beginning of the XXth c. Some of the commercial products from this time marked as talc contain over 50% tremolite. This tremolite-rich talc was sometimes preferred to "pure" talc, because of the high hydrophilic properties provided by the tremolite structure. The fibrous variety of tremolite is believed to be a possible source of silicosis or asbestosis diseases and therefore toxic. Tremolite-talc is also considered noxious by the *United Nations Environment Program*.

Test Cleaning

GRI conservators chose a water aspirator as the primary cleaning tool assuming it would effectively collect the powder and contain any airborne asbestos. However, after 50 minutes they determined the aspirator was not effectively capturing the powder. All work was halted and exposure monitoring samples were sent by Risk Managment for analysis. Detectable levels of asbestos fibers were found in the samples but were below the applicable Cal-OSHA standards. What was alarming was that the values found in the fume hood were the same as the values found outside of the fume hood (on the lab coat). Although the exposure itself was not significant, GRI conservators called Aeroscopic, Inc. for consultation.

Cleaning proposal from Aeroscopic Inc.

1) Under a local containment (possibly a glove bag enclosure with HEPA exhaust), HEPA vacuum each page with a soft bristle, conductive (for 'static' reasons) brush attachment, followed by a wipe down with a dry-cleaning sponge and a dry air blast with an air knife (@ 10-20 psi).

2) Insert the book into new a glove bag (without HEPA exhaust), run a high volume sample pump (utilizing a filter cassette) replicating an asbestos abatement clearance procedure while turning pages (routine use). This would tell us what exposure might be for those who would examine the book in the future.

The gray powder collected throughout the gutter of the book for analysis and characterization

Katie Taylor, GRI conservator, aspirating the gray powder from the book

At the time this text was written, removal of the tremolite-talc had not yet taken place and the discovery of another book with the same powder has come to light. We are currently assessing Aeroscopic's Inc. suggestion. A follow-up to this poster on the outcome of our treatment and any other new discoveries is planned. Questions, comments, and suggestions are most welcome.

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*ESEM-EDS: Environmental Scanning Electron Microscope-Energy Dispersive x-ray Spectroscopy