The Poison Book Project

What You Need to Know About Heavy Metals in Historical Bookbindings

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A Brief History of the Project & Where We Are Now

- Discovery of mass-produced, emerald green cloth bookbinding

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- Analytical survey of 19th-century cloth bookbindings

Collection Survey
- English-language, cloth-case bindings published 1837-1900 (Victorian era)
- Portable XRF elemental ID
- Raman spectroscopy molecular structure

Intern Sara Leonowitz performs in situ XRF analysis at Winterthur Library.
A Brief History of the Project & Where We Are Now

- Discovery of mass-produced, emerald green cloth bookbinding
- Analytical survey of 19th-century cloth bookbindings
- Crowd-sourcing data

wiki.winterthur.org/wiki/Poison_Book_Project
A Brief History of the Project & Where We Are Now

- Discovery of mass-produced, emerald green cloth bookbinding
- Analytical survey of 19th-century cloth bookbindings
- Crowd-sourcing data
- Ongoing analytical research
- Ongoing collaborations with health & safety professionals

Epidemiology

Toxicology

Conservation

Industrial Hygiene
What do ‘poison books’ look like?

Mercury
unconfirmed compound

Chrome, Lead
chrome orange

Chrome, Lead
chrome yellow

Arsenic
emerald green

Chrome, Lead
chrome green (chrome yellow + Prussian blue)

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What do ‘poison books’ look like?

**Benign Blues**
*often still contain lead*

- synthetic ultramarine
- Prussian blue

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What do ‘poison books’ look like?

Emerald Green

- Emerald green pigment
- Decorative onlays & paper labels
- Bookcloth
- Textblock edges
- Paper
  - < hard cover
  - soft cover >

Courtesy of the Baldwin Library of Historical Children’s Literature, Special and Area Studies Collections, George A. Smathers Libraries, University of Florida. Annotated by Winterthur Poison Book Project team.
Heavy Metals & What We Know About Hazards

Emerald green pigment

Arsenic trioxide

Vermillion

Chrome Yellow

Image credit: Wikimedia Commons (Public Domain)

Image credit: jeffpeachey.com/tag/18th-c-french-bookbinding/
Heavy Metals & What We Know About Risk

Emerald green pigment

Arsenic trioxide

Vermillion

Chrome Yellow

Image credit: Wikimedia Commons (Public Domain)

Image credit: jeffpeachey.com/tag/18th-c-french-bookbinding/
Identification Strategies
Identification Strategies - Visual analysis

Write “Emerald Green Bookmark” in the subject line and include your name and postal address.
Identification Strategies - Visual analysis

Cost: Free!

Time: How big is your collection?

Safety precautions: Wear gloves and wash your hands!

Important other considerations: No insect damage; pigment may not be visible or present on the spine:

Courtesy of the George A. Smathers Libraries, University of Florida.
Identification Strategies - Arsenical Books Database

http://wiki.winterthur.org/wiki/ARSENICAL_BOOKS_DATABASE

Known emerald green containing books are listed with title, OCLC, publication date.

Also available as a .csv file upon request.
Identification Strategies - Arsenical Books Database

**Cost:** Free!

**Time:** Very quick with CTRL + F

**Safety precautions:** Wear gloves and wash hands.

**Important other considerations:** Not comprehensive... yet!
Identification Strategies - XRF

**XRF:**
- Requires x-ray fluorescence spectrometer, which gives elemental information
- In survey mode, a two-person job (analysis and documentation)
Identification Strategies - XRF

Nothing to Eat
1857
Identification Strategies - XRF

**Cost:** $100-1000s for a contractor; $50k+ for an XRF; consider safety costs of radiation program

**Time:** Quick measurement, but interpretation requires time and expertise.

**Safety precautions:** X-ray safety requirements (differ per state); handling precautions followed
Identification Strategies - PLM

Polarized Light Microscopy
- Must remove a sample
- Mount between glass slip and mounting medium
- Observe under plane and cross polarized light.
Identification Strategies - PLM

Emerald Green

Chrome Green
Emerald Green

**Cost:** Contract a conservator (hourly rate for analysis + reporting); microscope and chemicals $50k-60k+

**Time:** Sample removal and preparation time; interpretation requires time and expertise.

**Safety precautions:** PPE for possible arsenic exposure during analysis and sampling; **ventilation** while working with heated mounting medium

**Important other considerations:** Permission required for sample removal.
Identification Strategies - environmental testing

Intern Jess Ortegon (WUDPAC ‘22) trials test kit efficacy at Winterthur Library.
Identification Strategies - environmental testing

Environmental testing
- Water and soil testing standards for arsenic
- Destructive testing of samples
- Labs require swabs or wipes
  - Ghost wipes are not suitable for use on objects due to their pH & moisture content
- Off-the-shelf kits require significant PPE and ventilation.
Identification Strategies - environmental testing

**Cost:** $25/sample analysis with a certified lab. Kits are affordable but have to consider cost of hazardous waste disposal.

**Time:** 5-7 business days turnaround

**Safety precautions:** If using off-the-shelf test kits, **full PPE** and use of a **working fumehood** is required due to the production of arsine gas during testing. Used kits must be disposed of as **hazardous waste**.
Safer Handling & Storage Practices

Hierarchy of Controls

- **Elimination**: Physically remove the hazard
- **Substitution**: Replace the hazard
- **Engineering Controls**: Isolate people from the hazard
- **Administrative Controls**: Change the way people work
- **PPE**: Protect the worker with Personal Protective Equipment

Image by NIOSH
https://www.cdc.gov/niosh/topics/hierarchy/default.html

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Hierarchy of Controls for Toxic Library Collection Materials

**Library Staff**
- **PPE**
- Administrative Controls
- Limit Handling/Access
- Most effective

**Library Users**
- PPE
- Assisted/supervised access with training
- Exhibit in case
- Digital surrogate
- Restrict access to physical item
- Physically remove the hazard
- Replace the hazard
- Isolate people from the hazard
- Change the way people work
- Protect the worker with Personal Protective Equipment
- Least effective

Tedone & Grayburn 2023. Modified from NIOSH graphic.
https://www.cdc.gov/niosh/topics/hierarchy/default.html
Safer Handling Practices

Nitrile gloves
N95 masks are not required*
Mindful interaction
Hand washing
D-lead soap & wipes

Cotton gloves

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De-lead (heavy metal removing) wipes and soaps are not all equal.

pH 7.0-8.0 = safe to use for arsenic

pH 6.0 or lower = UNSAFE to use for arsenic
Emerald green bookcloth vs. bookbinding paper

Cloth binding

35x magnification with Hirox digital 3D microscope

Paper binding

60x magnification with Hirox digital 3D microscope
Safer Handling Practices: Exposure Risk

**Higher risk** of arsenic exposure

Pigment is in **bookcloth** or on **textblock edges**, where it is inherently friable and must be touched directly to use the book.

Pigment is present in paper with larger surface area and/or on exterior binding: **endpapers, paper book covering**.

Pigment is present in smaller quantities & direct contact can be avoided: in **illustrations** within textblock or on maps; **spine labels**, decorative **onlays**.

**Lower risk** of arsenic exposure
Safer Handling Practices

- **Digital-first strategy**

- **Serving lower-risk** arsenical materials to users

- **Higher risk** materials (emerald green cloth bindings) are not served to users.

Winterthur Library Guidelines

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Safer Storage Practices: Rehousing

Recommended: zip-top polyethylene bags (4 mil.)

Intern Alison Chew tests storage options.
Dust Jackets
Not recommended for emerald green cloth bookbindings

Gaps allow arsenic shedding
Safer Storage Practices: Updating Disaster Plans

Update written disaster plan

Add warning to salvage-related shelf signage

Ensure appropriate PPE are included in disaster response kits

ARSENIC

This bookcloth contains friable copper acetoarsenite (emerald green) pigment.

- Wear nitrile gloves to handle.
- Wash hands afterwards with soap and water.
- Use only on hard, nonporous surfaces.
- Wipe down surfaces that have come in contact with bookcloth using a damp, disposable cloth.
- Dispose of gloves and wipe cloth as trace hazardous waste.
Safer Storage Practices: Labeling

Labelling objects

Recording information in your CMS

Collections Management System

Catalog handling notes; coded to alert users and staff to a poison book
Disposal of Hazardous Waste

Trace* hazardous waste: used gloves, polyethylene bags, wipes

U.S. Environmental Protection Agency (EPA)

www.epa.gov/hw

State Governance of Hazardous Waste Disposal

Delaware: dnrec.alpha.delaware.gov/waste-hazardous/management/hazardous/
Removal of Arsenical Books from Collections

**Responsible Stewardship**
- What does this mean for your organization?
- Whose problem are arsenical books?

**Goals**
Removal of arsenical books from circulation/access vs. removal from collection/institution: what is the goal and why?

**Options**
- Responsible storage
- Selling/donating (with full disclosure)
- Disposal as hazardous waste
Removal of Arsenical Books from Collections

Responsible Stewardship
- What does this mean for your organization?
- Whose problem are arsenical books?

Goals
Removal of arsenical books from circulation/access vs. removal from collection/institution: what is the goal and why?

Options
- Responsible storage
- Selling/donating (with full disclosure)
- **Disposal as hazardous waste = destruction of historically significant collection material**
Communicating with the Public

Why we call our research the **Poison Book Project**

Talking about ‘poison books’:
- Don’t use evasive/euphemistic language
- Put potential risk *in context*
- Offer sensible, achievable, affordable solutions

*We do not* recommend ‘upcycling’ 19th-century cloth bookbindings!

Image credit: instructables.com/How-to-make-a-purseclutch-from-a-Book/

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Biblio = relating to books

Toxicology = the study of poisons

Bibliotoxicology Working Group

- ID toxic substances in bookbindings and archives materials
- Define safer management strategies
- Make reliable information broadly and publicly accessible
With Gratitude for Our Research Community

Winterthur Museum, Garden & Library

- Joy Gardiner, Director of Conservation
- Conservation: Catherine Matsen, Dr. Patricia Elena Gonzalez Gil, Mina Porell, Matt Cushman, Jim Schneck, Natale Caccamo
- Library: Rebecca Parmer, Sarah Lewis, Carley Altenburger, Allie Alvis, Emily Guthrie, Linda Martin-Schaff
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Bibliotoxicology Working Group

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