

Is Mercury in Retrograde?

Revisiting and Understanding the
Removal of Mercuric Chloride
Stains at the Canadian Museum of
Nature



Historic Pesticides and Toxic Collections

- Used to prevent **insect and mold damage** in organic collections, sometimes during specimen preparation
- Applied to **botanical, zoological, entomological**, and **ethnographic** materials
- Common historical pesticides: **arsenic, mercuric chloride, DDT, naphthalene**
- Often **not documented**, leading to unknown contamination risks
- Present-day concerns: **health hazards**, long-term preservation effects



<https://mci.si.edu/pesticide-residues-collections>

Mercuric Chloride in Herbaria

- **Mercuric chloride** has historically been used in herbarium preservation
- Present in collections at the **Canadian Museum of Nature (CMN)**
- Can cause **dark staining** on labels and paper
- Stains can **obscure critical data**, compromising research - also Health and Safety concerns
- Heavily stained specimens are **quarantined** from the main collection

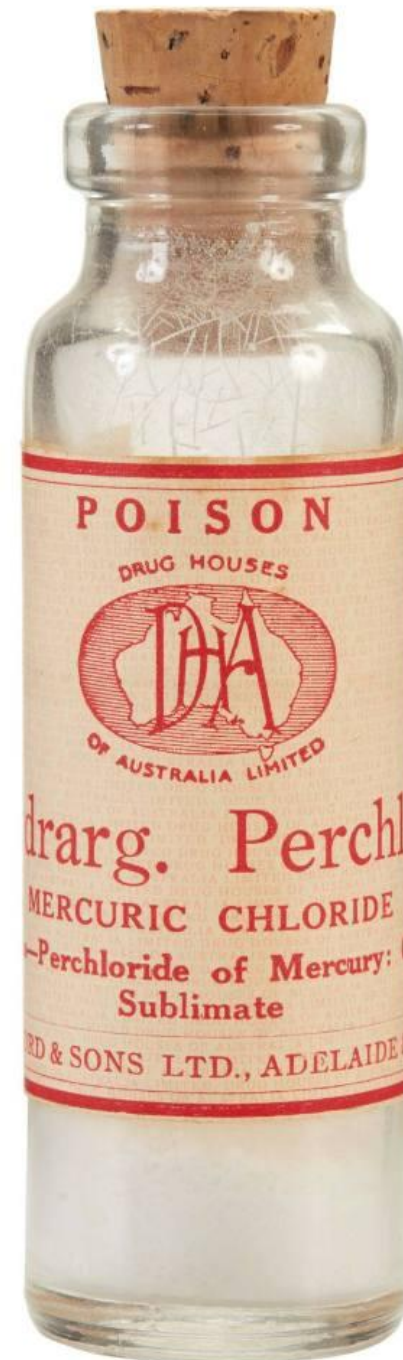


A Brief History of Mercuric Chloride in Herbaria

- **Synthesized as early as the 11th century**, in Arabic alchemical texts
- Adopted in **18th-century Europe** for pest control
- By **mid-1800s**, it was **widely used globally** in botany collections
- Still used into the **1980s** in parts of **Europe, Africa, and North America**
- **Canada:** Rarely used by the 1970s (poorly documented)
- **CMN staff report** no use since **1997**, likely earlier
- **Future testing** will help confirm historical use in our collections

Mercury Health Hazards

- Its toxicity was well known historically, with documented cases of harm to both humans and animals.
- In the past, some individuals believed it could be used “wisely” with proper precautions.
- Vapour and handling risk (absorbed through skin)
- Severe damage to the nervous system, kidneys, and gastrointestinal system, causing neurological disorders, kidney failure, cancers, and gastrointestinal issues (Health Canada 2008)

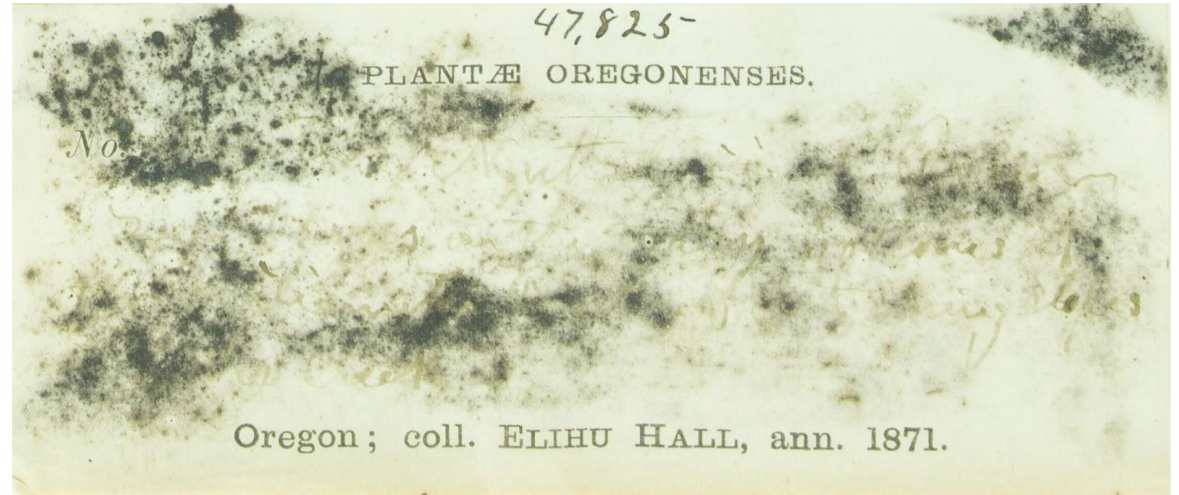


<https://collections.sea.museum/objects/14585/bottle-of-perchloride-of-mercury-from-the-medicine-chest-of>

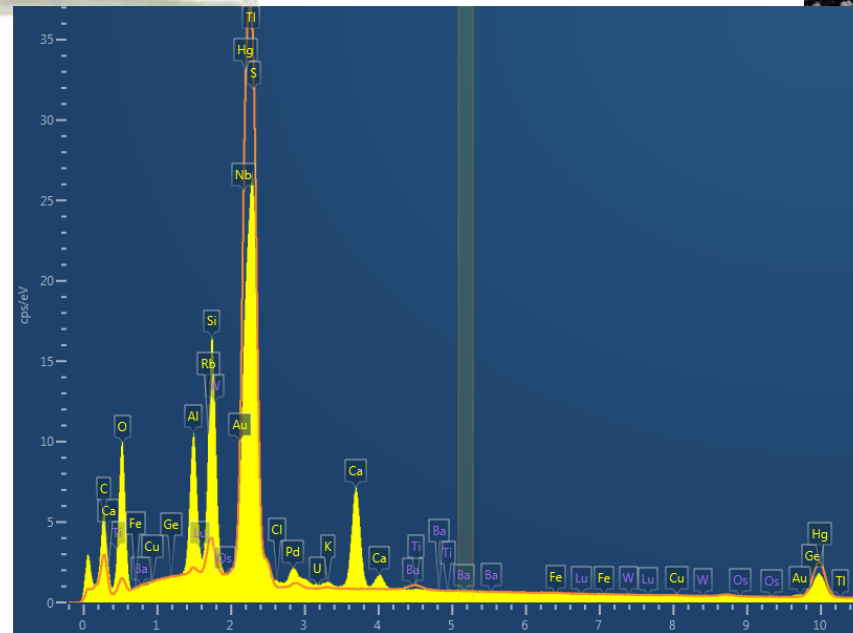
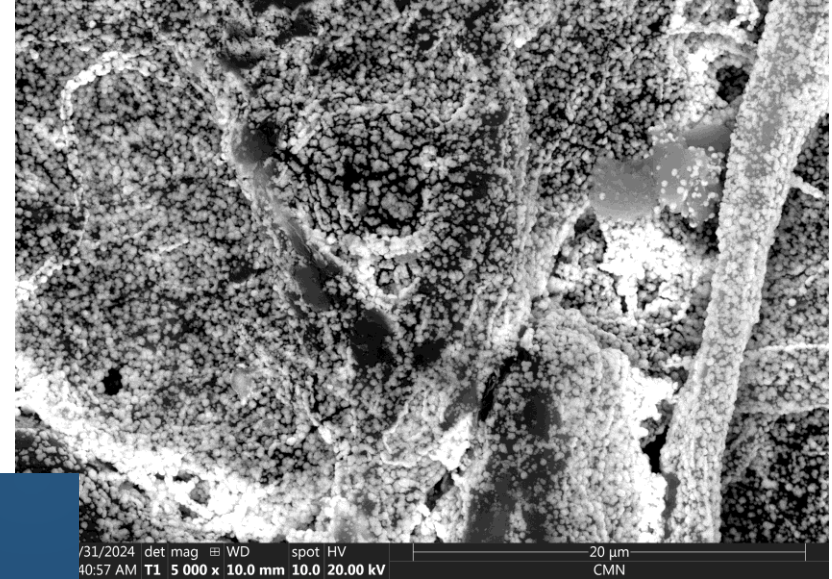
Revisiting a Treatment Method

- **1999 Hawks & Bell method** uses **Lugol's iodine** to treat stains
- **Little follow-up** or additional testing since publication
- **CMN tested** both lab-made and commercial iodine solutions
- Used **pXRF** and **SEM-EDS** for analysis and refinement





SEM analysis and pXRF (before treatment)

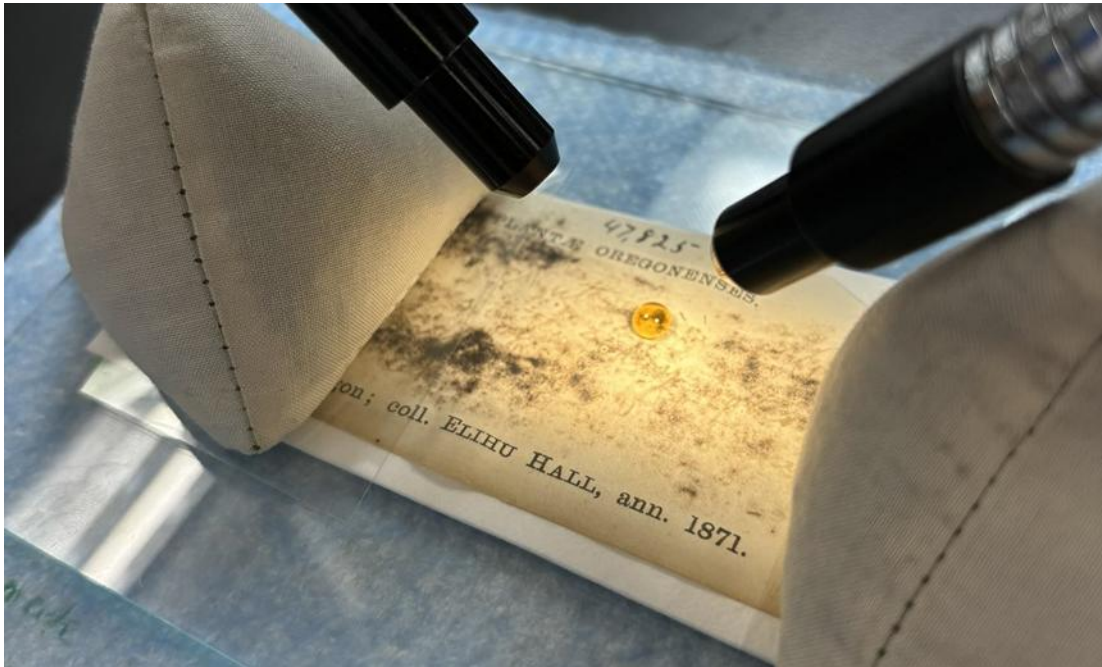


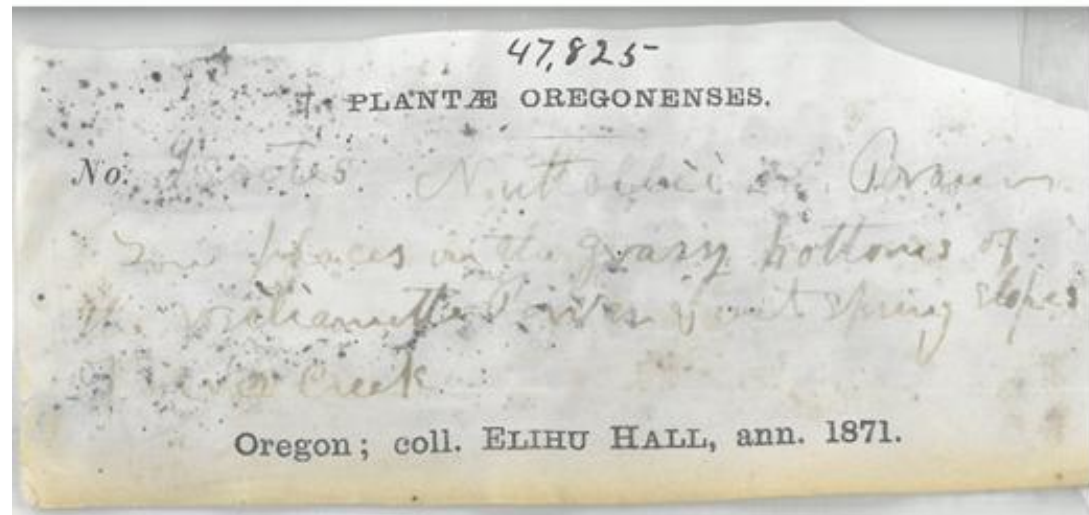
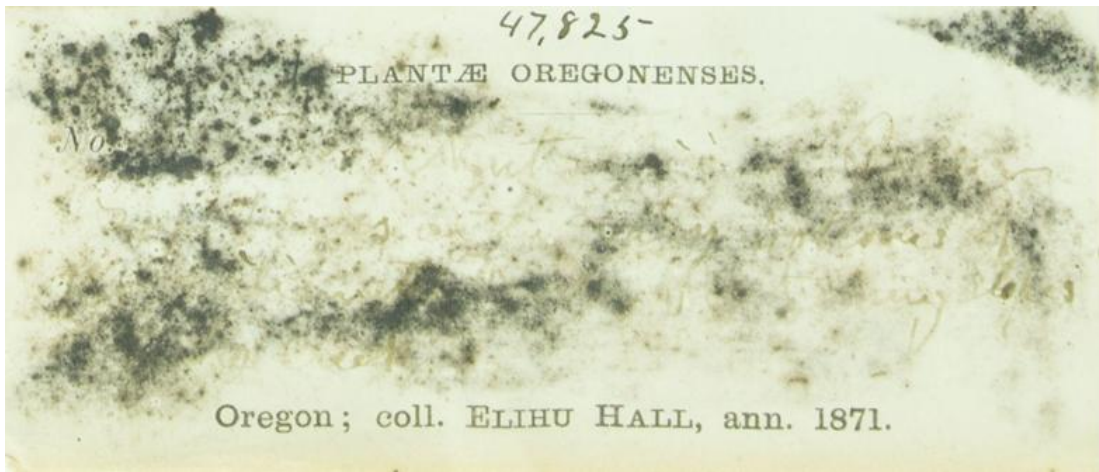
Lugol's Iodine

- Oxidizing agent - a solution of iodine, potassium iodide and distilled water.
- Neutral pH (commercial Lugol's a bit more acidic)
- Prepared in Lab (\$8.50 CAD/120 ml) (specialized equipment)
- Commercial Lugol's(\$35CAD/120 ml) (ready to go)



Stain Reversal



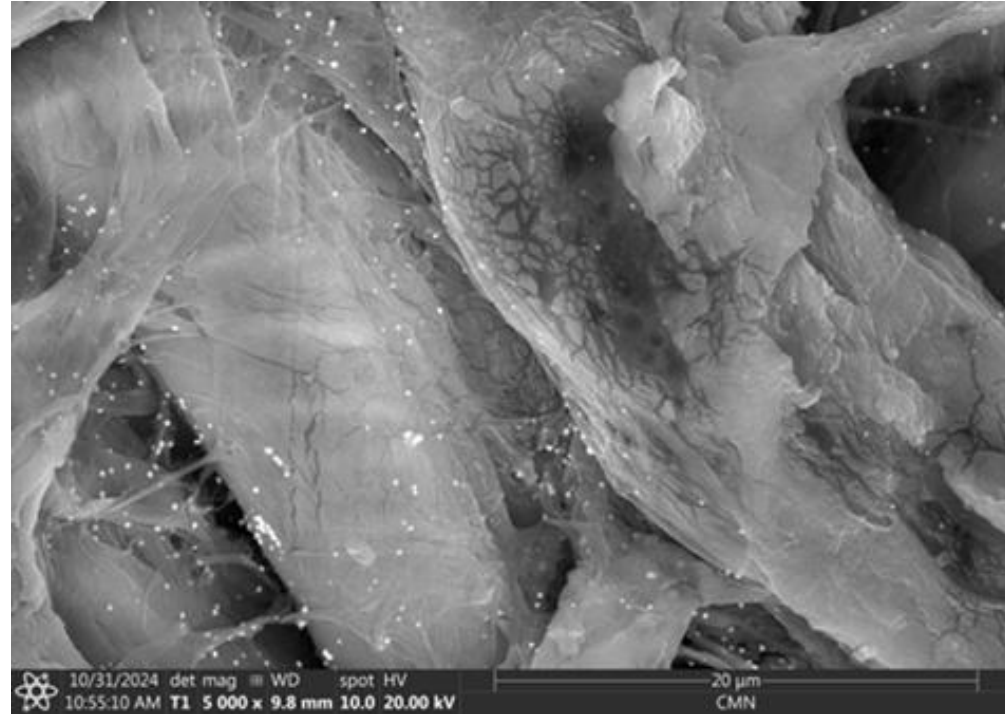
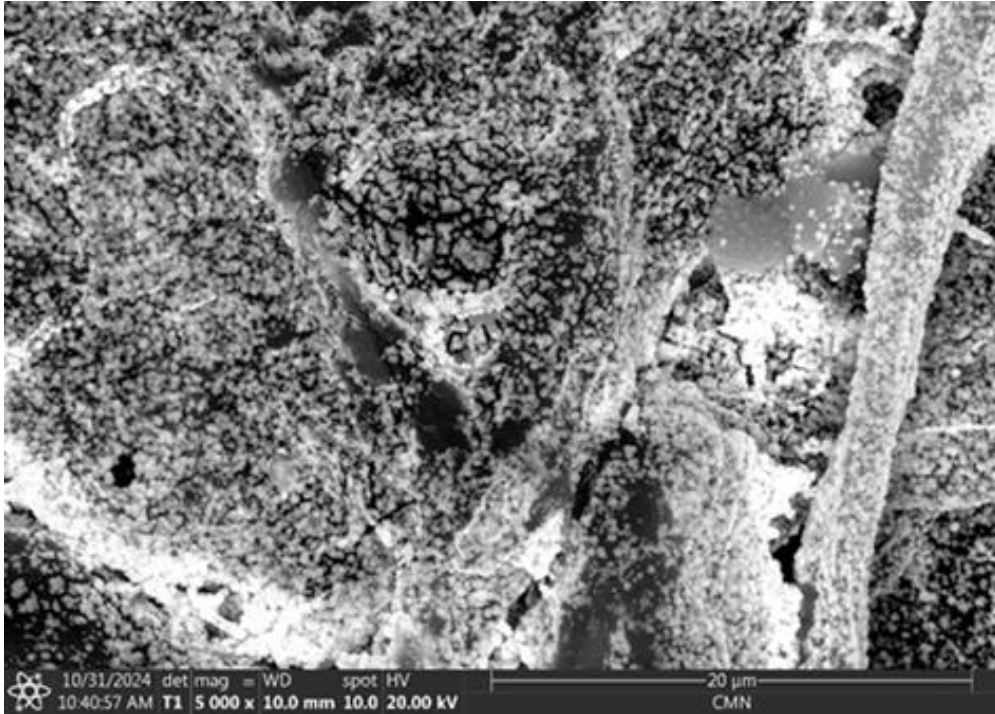


Isoetes Nuttallii cf. Braun Low places on the grassy bottoms of the Willamette River & wet spring slopes of Silver Creek



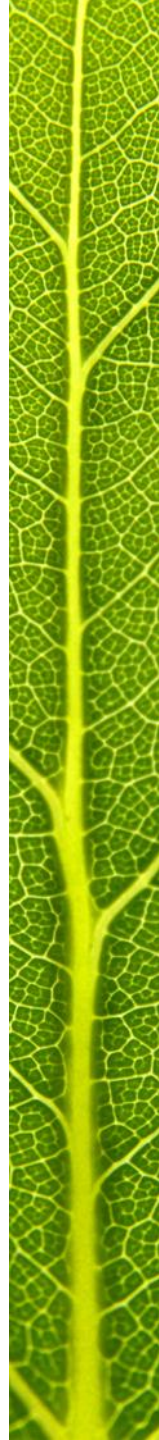
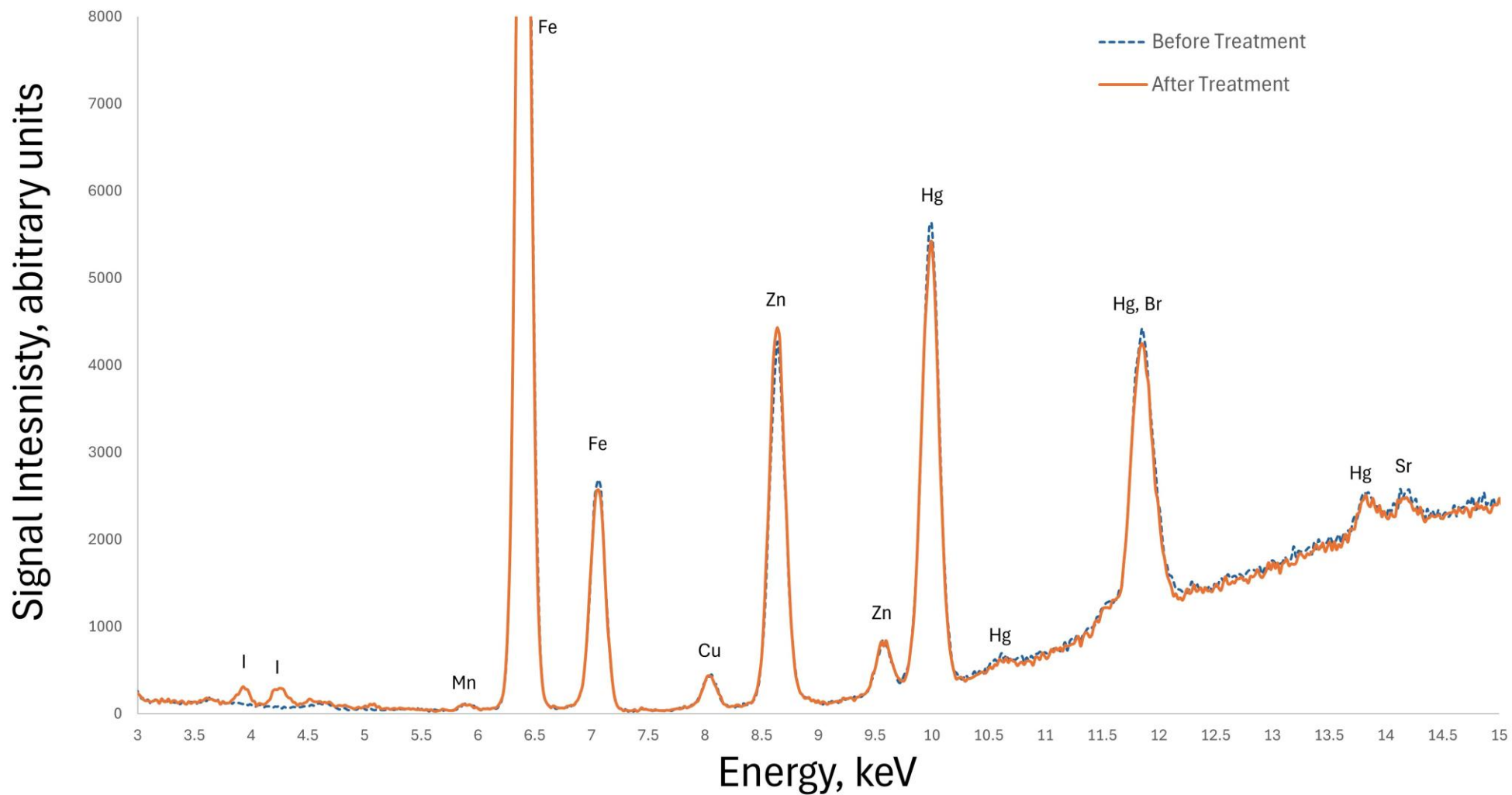
Isoetes Melanopoda G. ag. Var pallida Engelm. Houston Texas June 1872 E Hall

After Treatment Analysis - SEM



After Treatment Analysis - pXRF

47812 Location 1: Before and After Lugol's Iodine Treatment



Conclusions

- Photo editing software – good but not great – and we need more time to test different methods
- Lugol's Iodine: Great at stain removal!
 - Removes surface discolouration and can reveal lost data
 - Does not remove embedded mercury
- Not effective as a hazard remediation treatment
- Limitations: small sample size, never enough time!
- Future: Vapour studies for herbarium cabinets