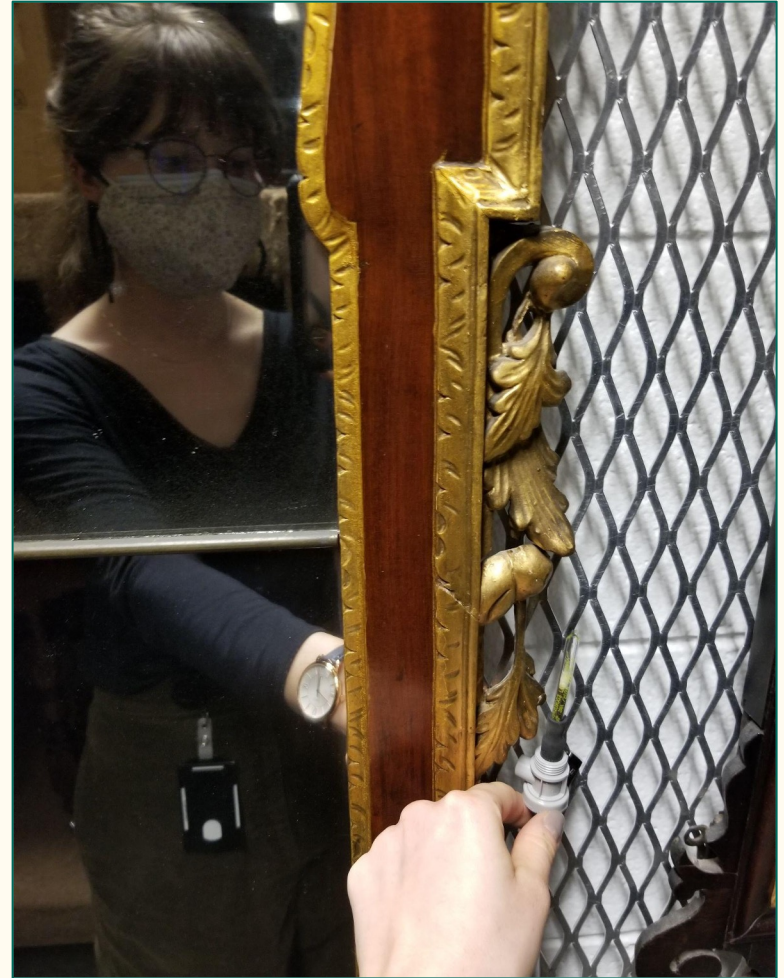
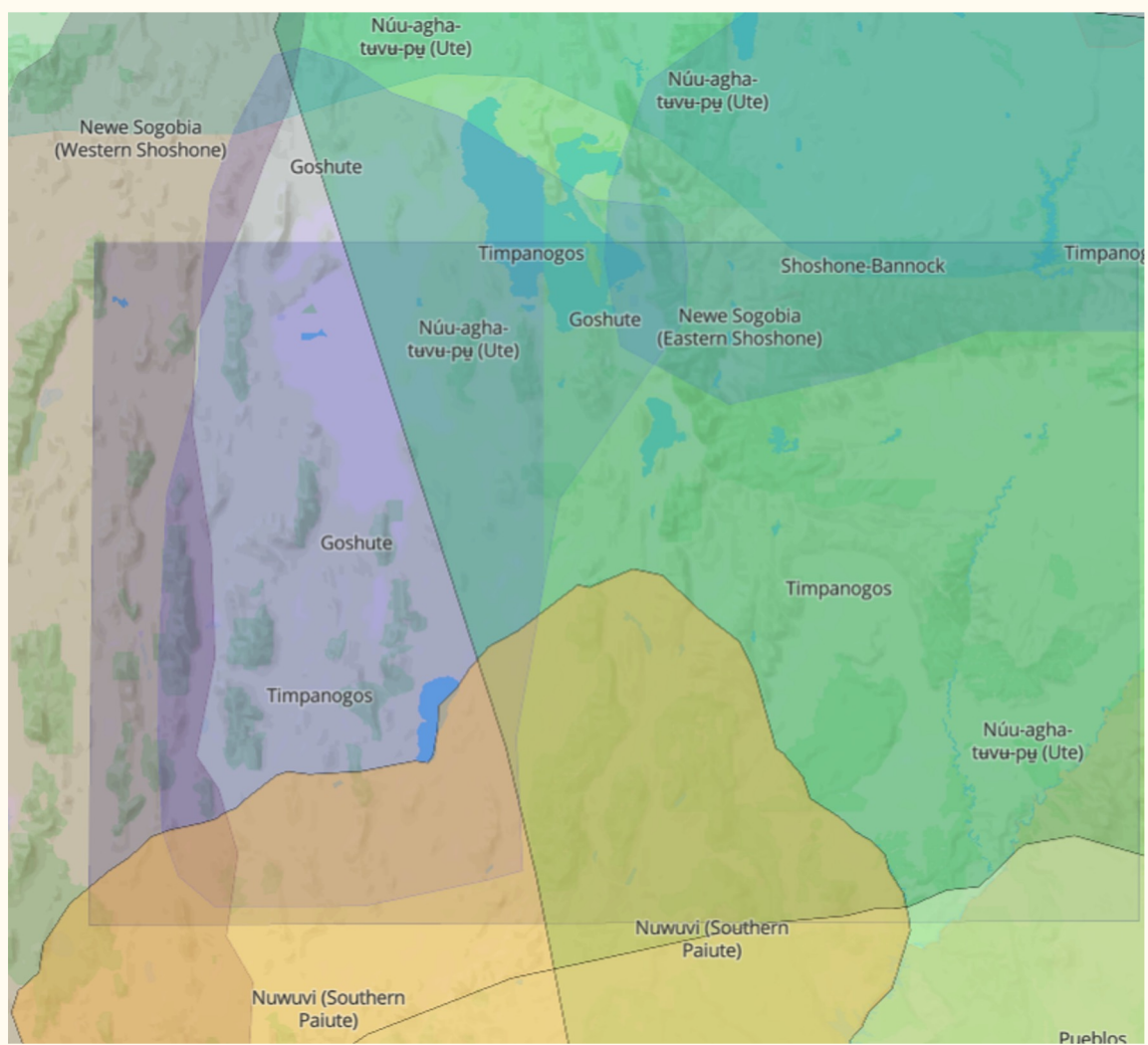


# Care of Tin- Mercury Amalgam Mirrors

Marie Desrochers, Preventive Conservator  
Utah Division of Arts and Museums



# Land Acknowledgement



# Overview

- How tin-mercury amalgam mirrors were made
- Health risks and routes of exposure for mercury
- Methods for mercury testing
- Safe handling, cleaning, and care protocols for tin-mercury amalgam objects

- How tin-mercury amalgam mirrors were made



Image Source: Payne de Chavez, K. 2010.

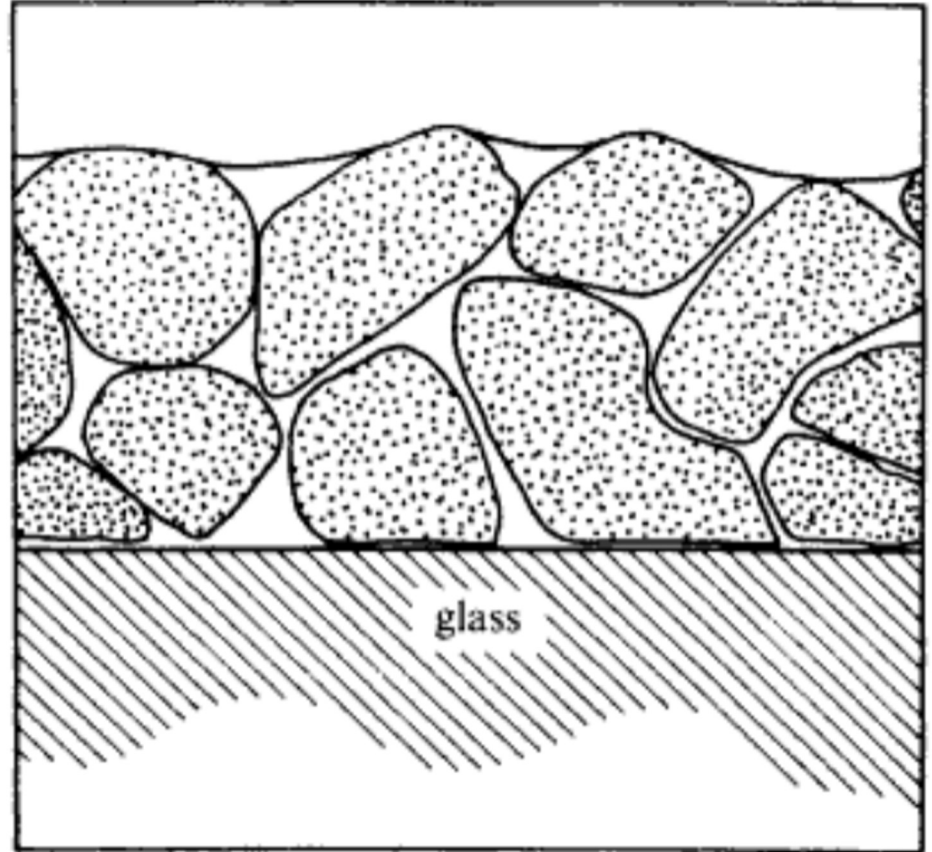


Image Source: Payne de Chavez, K. 2010.



- How tin-mercury amalgam mirrors were made



Image Source: Diderot Encyclopedia: The Complete Illustrations 1762–1777. Harry N. Abrams Inc. Publishers, 1978.

- How tin-mercury amalgam mirrors were made



Image Source: The Nautical Sextant



Image Source: Harrison Dental Group



# ● How tin-mercury amalgam mirrors were made



Image Source: Incollect, Winterthur Primer



Image Source: Speaker



Image Source: Speaker



- How tin-mercury amalgam mirrors were made



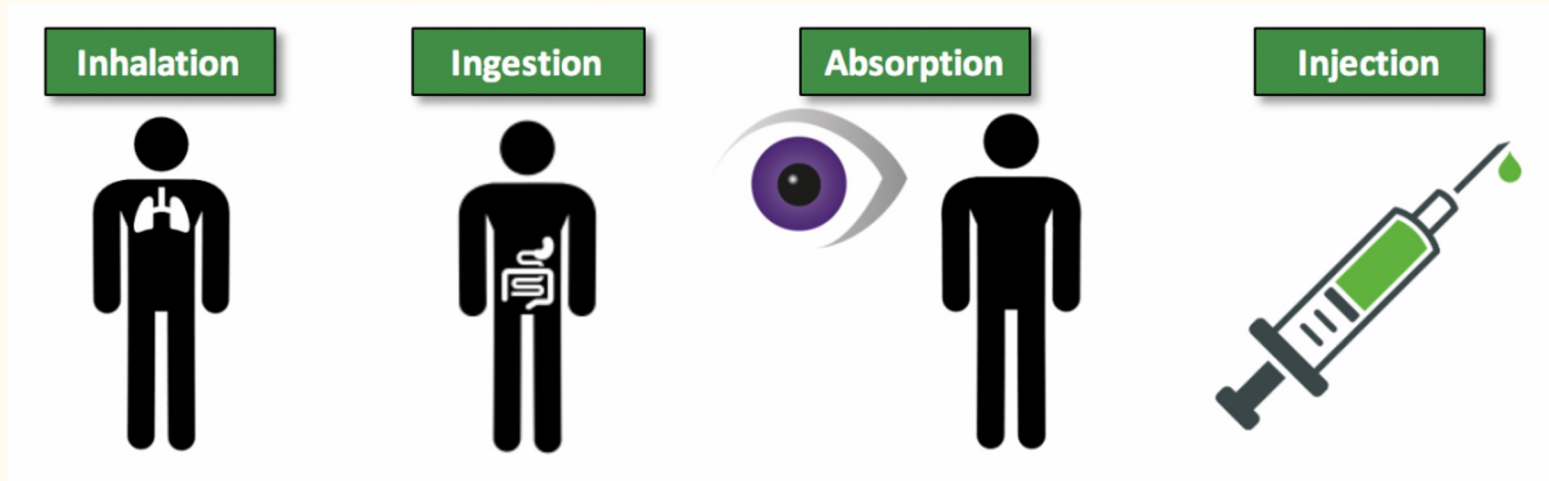
Image Source: Speaker



Image Source: Speaker



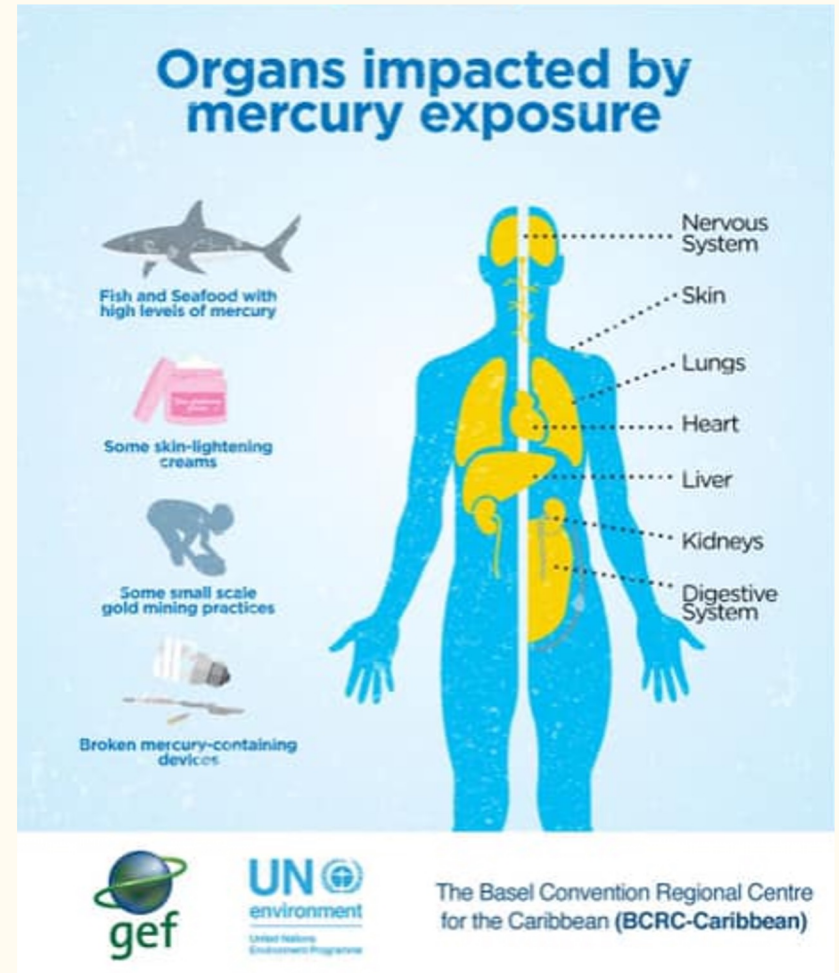
- Health risks and routes of exposure for mercury



**Route**- site of exposure, will determine the ultimate dose of the exposure and health impact

# ● Health risks and routes of exposure for mercury

There are three basic exposure pathways: **inhalation**, **ingestion**, or **direct contact**. The degree or extent of exposure is determined by measuring the amount of the hazardous substance at the point of contact.



# ● How tin-mercury amalgam mirrors were made



**Mercuric nitrate** was used in manufacture of felt used in many different products, including hats such as this. This is where the term “Mad as a Hatter” comes from.



Image Source: New Atlas



Image Source: Mercury Stories



# MERCURY EXPOSURE IMPACTS HEALTH

Eating contaminated fish and shellfish...

Using certain skin lightening soaps and creams...

Mercury is used in small-scale gold mining...



This form of mercury is toxic to the brain and kidneys.



The same applies to mercury fumes from broken thermometers and blood pressure devices.



World Health Organization

Is toxic to the brain and affects brain development in unborn babies and young children.



Is toxic to the kidneys.



Image Source: William Donnelly



# An Individual's Risk is Unique



# An Individual's Risk is Unique

- While hazards may present universal risks, the impact a hazard has on an individual depends on many factors.
- We cannot know all factors influencing a person's experience of a different hazard.
- Depending on health, and both visible and invisible disabilities, people may experience higher risks than others.
- This is one reason why it is so important to be aware and cautious of collections

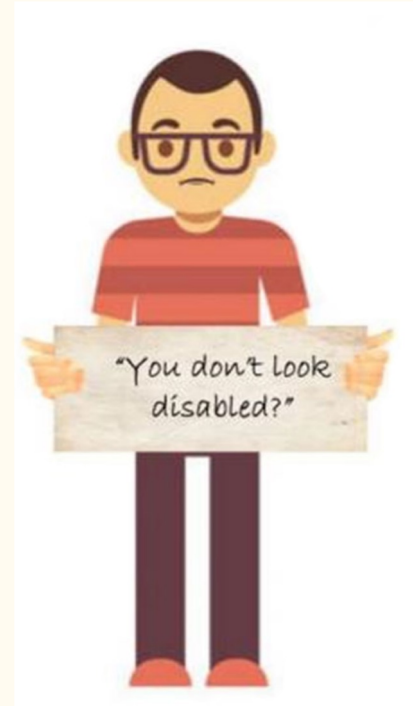


Image Source: WeCapable

“Unlike industrial workers who are likely to encounter higher doses of potentially hazardous materials resulting in **acute** exposure, museum workers are more likely to be exposed to low-level doses of heavy metals [and other toxins] over an extended period of time, resulting in **chronic** health problems.”

*-American Institute for Conservation, 2008*

# Types of Exposure

**Acute exposure**- is a short contact with a chemical. It may last a few seconds or a few hours. For example, it might take a few minutes to clean windows with ammonia, use nail polish remover or spray a can of paint. The fumes someone might inhale during these activities are examples of acute exposures.

New York State Department of Health



# Types of Exposure

**Chronic exposure-** is continuous or repeated contact with a toxic substance over a long period of time (months or years). If a chemical is used every day on the job, the exposure would be chronic. Over time, some chemicals, such as PCBs and lead, can build up in the body.

New York State Department of Health

- Methods for mercury testing

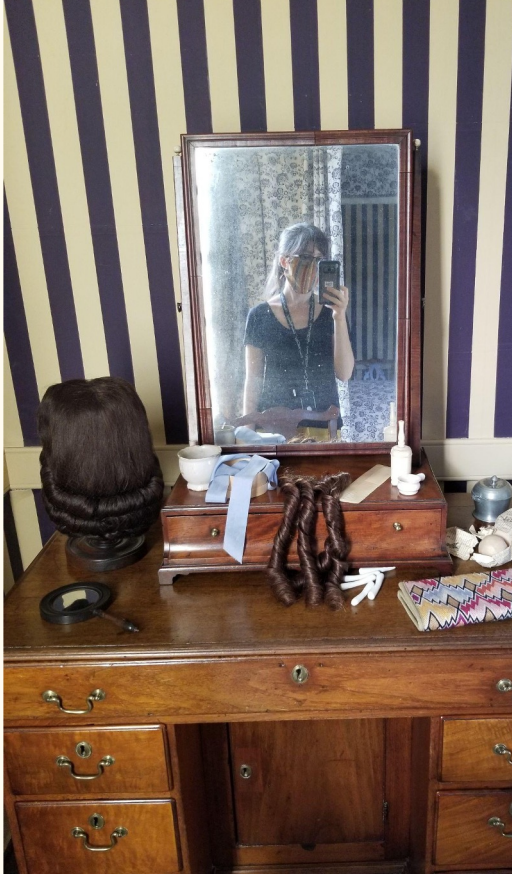


Image Source: Speaker

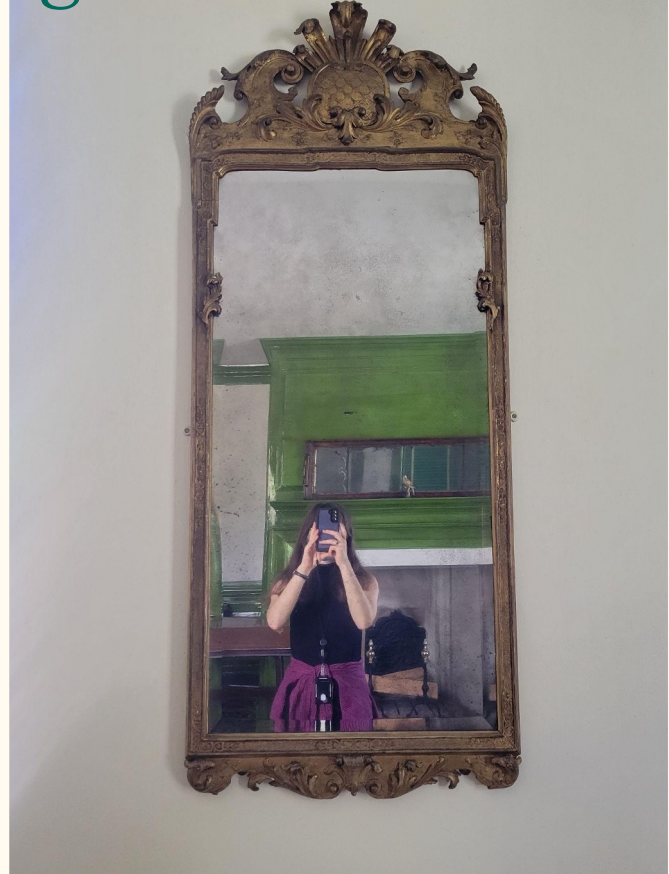


Image Source: Speaker

# ● Survey

## Historic Area and Museum Sn/Hg Mirrors

Accession Number (if visible) included type, legibility?

Your answer

Location

Your answer

Type of Object

Your answer

Verso Characteristics

Your answer

Conservation Notes

Your answer

Follow-Up

- Requires Additional Review
- Consider for deinstallation
- Stable
- Presents hazard for other collection objects
- Presents potential hazard for staff
- Presents potential hazard for visitors

- Methods for mercury testing



Image Source: Melissa King



Image Source: Speaker

Images courtesy of Wikimedia Commons



- Methods for mercury testing



Image Source: Speaker



Image Source: Brookfield Engineering

Images Courtesy of Melissa King

# ● Methods for mercury testing

MERCURY		6009
Hg	MW: 200.59	CAS: 7439-97-6      RTECS: OV4550000
METHOD: 6009, Issue 2		EVALUATION: PARTIAL      Issue 1: 15 May 1989 Issue 2: 15 August 1994
OSHA : C 0.1 mg/m <sup>3</sup> (skin)	PROPERTIES: liquid; d 13.55 g/mL @ 20 °C; BP 356 °C;	
NIOSH: 0.05 mg/m <sup>3</sup> (skin)	HP -39 °C; VP 0.16 Pa (0.0012 mmHg);	
ACGIH: 0.025 mg/m <sup>3</sup> (skin)	13.2 mg/m <sup>3</sup> @ 20 °C; Vapor Density (air=1) 7.0	
SYNONYMS: quicksilver		
SAMPLING		MEASUREMENT
<b>SAMPLER:</b>	SOLID SORBENT TUBE (Hopcalite in single section, 200 mg)	<b>TECHNIQUE:</b> ATOMIC ABSORPTION, COLD VAPOR
<b>FLOW RATE:</b>	0.15 to 0.25 L/min	<b>ANALYTE:</b> elemental mercury
<b>VOL-MIN:</b>	2 L @ 0.5 mg/m <sup>3</sup>	<b>DESORPTION:</b> conc. HNO <sub>3</sub> /HCl @ 25 °C, dilute to 50 mL
<b>-MAX:</b>	100 L	<b>WAVELENGTH:</b> 253.7 nm
<b>SHIPMENT:</b>	routine	<b>CALIBRATION:</b> standard solutions of Hg <sup>2+</sup> in 1% HNO <sub>3</sub>
<b>SAMPLE</b>		





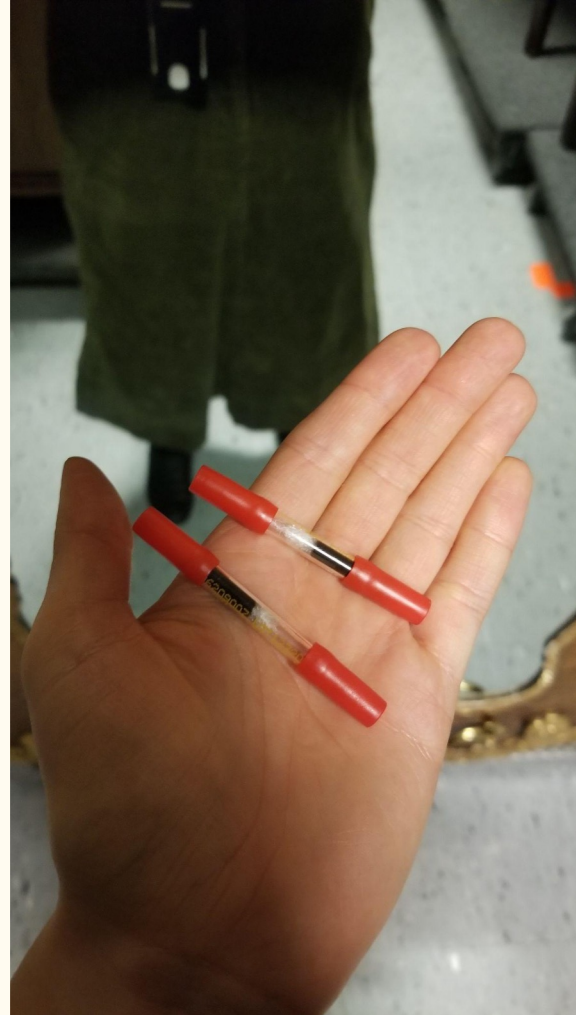


Image Sources: Speaker

Swab sticks ready for analysis

- Safe handling, cleaning, and care protocols for tin-mercury amalgam objects

1. Display
2. Storage
3. Cleanup





## 2. Storage



Image Sources: Speaker

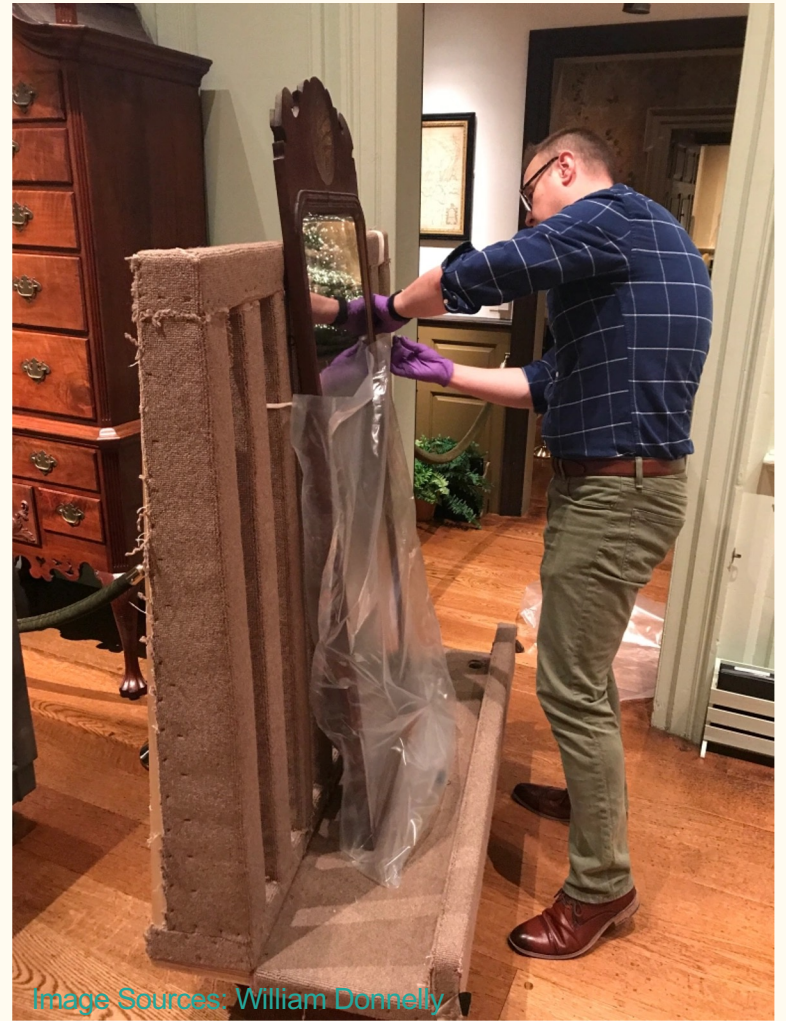


Image Sources: William Donnelly



Image Sources: Speaker

Dripping mirrors shipped in storage at Bruton Heights Wallace



Image Sources: Speaker

Example of historic mirror within historic area exhibition



# 3. Cleanup



Image Sources: New Pig



Manage risks through strong policies, procedures, and training

**BASIC JOB HAZARD ANALYSIS FORM**

**Directions:** Identify a work process and list the steps involved in performing the process. Then identify the potential hazards associated with each step. Finally, identify some controls that can protect you from the hazards.

<b>Work Process:</b>		
<b>Steps to Perform the Work Process</b>	<b>Hazards/Potential Hazards</b>	<b>Controls</b>
1.		
2.		
3.		
4.		

# Resources


JOURNAL OF THE AMERICAN INSTITUTE FOR CONSERVATION  
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RAPID COMMUNICATION



## Advances in storing and monitoring mercury-tin amalgam mirrors

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### ABSTRACT

Tin-mercury amalgam mirrors are ubiquitous amongst historical collections worldwide. They present potential human health risks as they degrade, releasing liquid mercury and mercury vapor. Over the last decade, care of degrading mirrors at Winterthur Museum, Garden & Library has evolved to their present storage: removing dripping mirrors from exhibition and into a limited-access storage space. Using a Jerome Mercury sensor, various methods for storage were evaluated for the buildup of mercury vapor. Mercury vapor accumulated within a plastic bag surrounding a dripping mirror, informing an open-design tray storage solution. While these trays catch drips at the source, they are open to ambient air to allow small volumes of vapor to dissipate. Updated practices for mirror storage, monitoring, and maintenance prioritize staff safety and object preservation.


### ARTICLE HISTORY

Received 30 June 2021  
Accepted 28 June 2022

### KEYWORDS

Mercury; amalgam mirrors; looking glasses; tin amalgam; mercury vapor; spill cleanup; safety; storage tray solution

# Resources



Wiki  
*A Collaborative  
Knowledge  
Resource*

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## Tin-Mercury Amalgam Mirrors

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Tin-Mercury Amalgam Mirrors

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# Resources

## Additional Reading [ edit | edit source ]

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# Resources



HEALTH & SAFETY COMMITTEE

## RISK MANAGEMENT PLAN CHECKLIST FOR MERCURY CONTAINING COLLECTIONS

The following checklist can serve as a foundation for a risk management plan for mercury containing collections. While it is specific to mercury, it can be used as a general outline for other hazardous collection materials.

For more information on Risk Management Plans and hazardous collections materials, visit the Health & Safety Committee website: [www.conservation-us.org/healthandsafety](http://www.conservation-us.org/healthandsafety).

### PART 1: ROLES & RESPONSIBILITIES

Name, contact information and responsibilities for:

- ✓ Individuals trained to identify hazards (i.e., registrar, curator, conservator, art handler)
- ✓ Persons to notify when a hazard is identified
- ✓ Persons in charge of safety protocols and training, including
  - Implementation
  - Enforcement
  - Review and updating
- ✓ Safety specialist and/or Industrial Hygienist
- ✓ Individuals allowed to have contact with contaminated objects

### PART 2: EXPOSURE IDENTIFICATION

- ✓ Types of collections that may have been treated (tin-mercury mirrors, pigments, botany, scientific equipment)
- ✓ Institutional history of using specific treatments
- ✓ Types of testing available for identification

### PART 3: EXPOSURE ASSESSMENT

- ✓ Types of risk associated with specific hazard (inhalation, absorption, ingestion)
- ✓ Results of surveys
- ✓ Survey protocols (who, what, where, when and why)

### PART 4: RISK CONTROLS

- ✓ Protocols for treatment
- ✓ Protocols for exhibition and loan
- ✓ Protocols for collection policy
- ✓ Types of materials to use for isolation (exhibition, storage, during treatment)
- ✓ Equipment and materials for decontamination/remediation
- ✓ How and where to dispose of waste
- ✓ Personal hygiene protocols and PPE types and sources

### PART 5: HAZARD COMMUNICATION

Outline procedures for:

- ✓ Labeling objects and storage areas
  - Types of labels
  - Label information (date of test, person testing, date of treatment)

# Thank you!

Marie Desrochers

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