National Museums Scotland

Hazards in Collections Care

NMS Knowledge Exchange Workshop

26th October 2011

National Museums Scotland

Hazard and Risk

- **Hazard - is anything that has the *potential* to cause harm, broadly divided into physical, chemical, biological, ergonomic (the study of work and its environment)**

- **Risk – is the *likelihood* of such harm being realised plus the severity of the consequences**

National Museums Scotland

Risk Assessment

- **A Risk Assessment is a careful examination of what in your workplace could cause harm to people so that you can put in place a plan to *control* the risks and so prevent harm.**

National Museums Scotland

Guiding principles

- **Awareness and Preparation**
- **Take sensible precautions and you will be fine!**
- **Ask an expert if in doubt**

National Museums Scotland

How are Collections a hazard?

- **a physical hazard**
- **made from something that is considered a hazard**
- **has been used with materials that could be a a hazard**
- **Has been treated with something that is a hazard**
- **gives of degradation products that are a hazard**

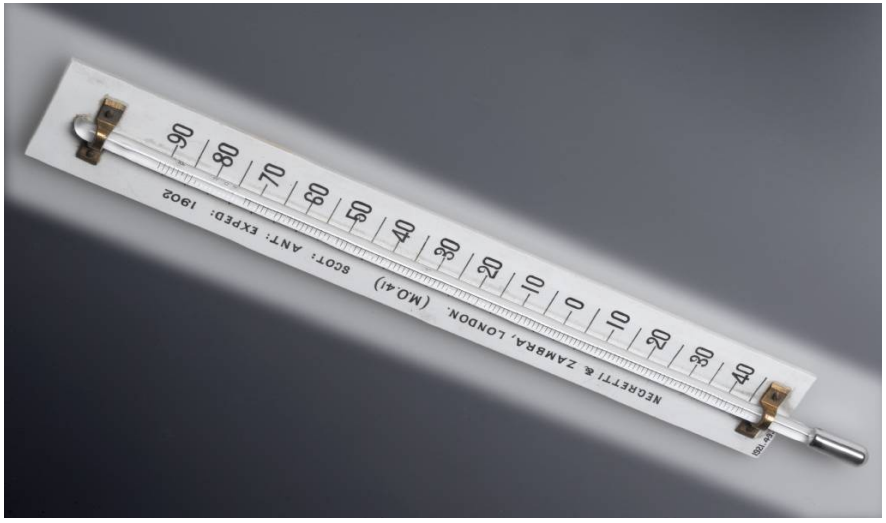
National Museums Scotland

Physical Hazards

- **Sharp edges**
- **Heavy weights**
- **Pointy ends**
- **Live firearms**

National Museums Scotland

Made from hazardous materials



National Museums Scotland

National Museums Scotland

Metals

- **Lead in items such as sculptures, stained glass windows, food cans, and old bullets. Lead corrodes rapidly forming a white powder that is easily inhaled, ingested, or trapped in clothing.**

- **Ceramics may have been covered with lead glazes. Damaged glazes can break up into flakes or powder that can be inhaled or ingested.**

- **The mercury compounds used to coat the back of old mirrors can break down to drops of free mercury that can collect in the edges of old mirror frames.**

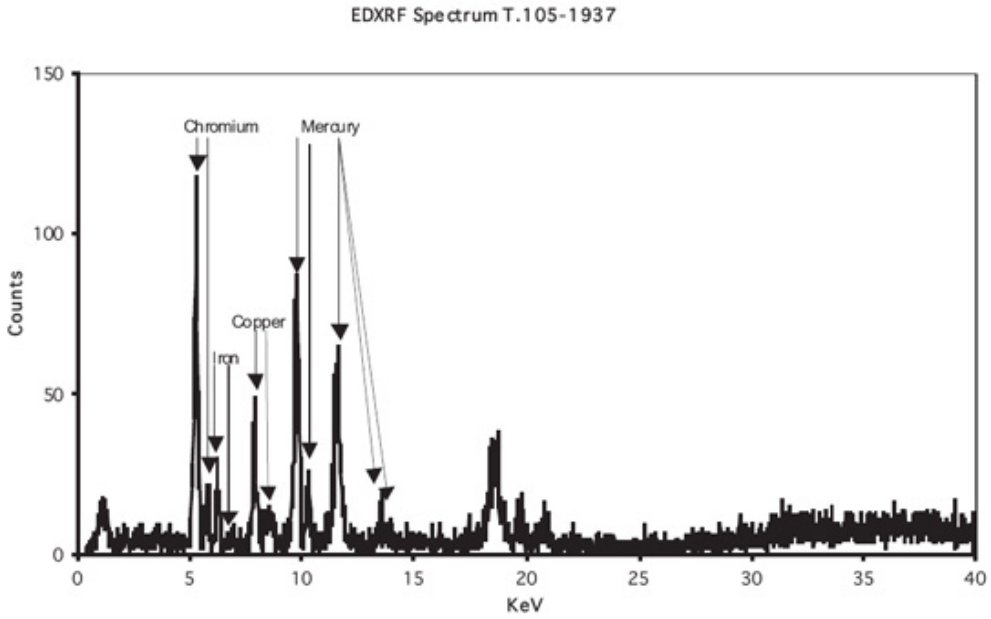
National Museums Scotland

National Museums Scotland

Mad as a Hatter

- **Mercury salts and strong acids/ alkali used to make felt – particularly from Beaver fur**

- **Destructive analysis show 1.1& w/w mercury**



V&A analysis of mercury present in Hat collections

National Museums Scotland

National Museums Scotland

National Museums Scotland

Used with Hazardous material

- **Medical / dental / pharmaceutical / veterinary**
  - Pathogens, bacteria, needles and sharps, medicines
- **Poisons from weapons and other items**
- **Artists materials**

National Museums Scotland

Hazardous materials used in collections

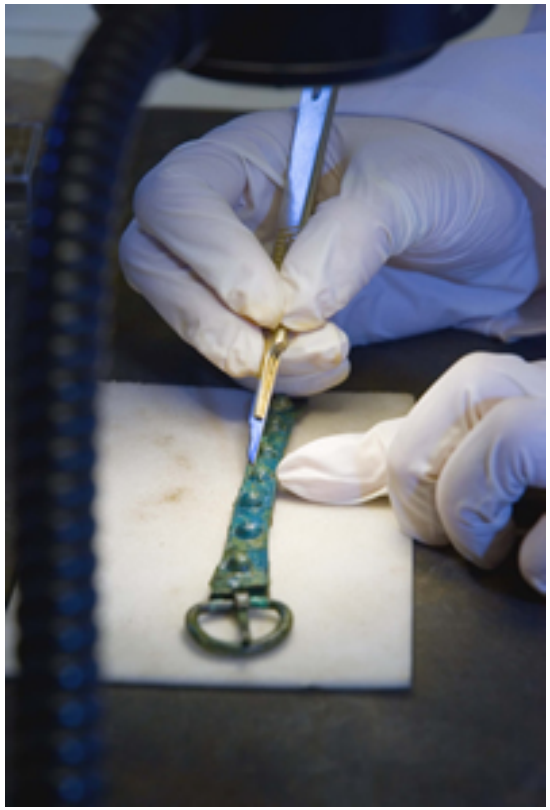
- **Conservation Treatments**
- **Silica gel**
- **Fluid preserved specimens**
- **Pesticides**

National Museums Scotland

Hazardous materials used in conservation

- **Potassium cyanide - used to clean gold and silver objects leaving a white residue that if wetted produces toxic hydrogen cyanide**

- **Benzotriazole (BTA) - used as a corrosion inhibitor to treat copper alloy artifacts – thought to be carcinogenic**



National Museums Scotland

Silica Gel

- **Used to keep low RH, particularly in archaeological metalwork**
- **Blue Cobalt is present in small concentrations (0.5 to 1.0% by weight). Banned by EU – possible carcinogen, and respiratory irritant**
- **Now replaced by non-toxic orange/clear Sorbead Orange® desiccant**

National Museums Scotland

Fluid Preservation of specimens

- **Usually alcohol (IMS) or formaldehyde**
- **Hazard from breathing fumes and fire risk**

National Museums Scotland

Pesticides

- ethylene oxide
- arsenic
- dichlorvos (Vapona)
- Camphor
- Strychnine
- mercuric chloride
- Naphthalene
- paradichlorobenzene (PDB),
- dichloro-diphenyl-trichloroethane (DDT),
- Methyl bromide
- cyanide.

National Museums Scotland

Pesticides – mercury, arsenic and other pesticides on natural history and ethnographic objects

National Museums Scotland

Degrading materials

- **Cellulose nitrates, cellulose acetates, polyvinyl chlorides, polyurethanes – from photographs, plastics and negatives**

- **Moulds / microorganisms on objects**

National Museums Scotland

Unusual hazards

- **Modern art! Bodily fluids, sharp needles, toxic pigments**
- **Old unopened cans may be contaminated with botulism.**
- **Bacteria inside may cause the cans to swell and explode harming staff, exhibits, and other objects in the collection.**

National Museums Scotland

Hazards in Natural Sciences collections

National Museums Scotland

Hazards in Geological Collections

National Museums Scotland

Hazards in Geological Collections

- **The NMS has approximately 60,000 – 70,000 mineral specimens stored at two sites.**
- **There are also around 180,000 fossil specimens.**
- **Hazards are particularly associated with the mineral collections.**

National Museums Scotland

Hazards in Geological Collections

National Museums Scotland

Hazards in Geological Collections

Radiation

- **There are around 240 mineral species that contain U and/or Th.**
- **This represents a percentage of about 5%**
- **Other specimens may contain a radioactive mineral as an unknown secondary or minor constituent.**
- **Many uranium and thorium minerals are brightly coloured.**

National Museums Scotland

Hazards in Geological Collections

National Museums Scotland

Dose and Effect

Background radiation (UK)	**2.3mSv/year**
Average radiation worker	**1.5mSv/year**
Annual Dose Limit	**20mSv/year**
Typical chest x-ray	**0.02mSv**
Effects	
Chromosomal damage	**>0.1Sv**
Radiation sickness	**>1Sv**
Possible death	**>3Sv**
Certain death	**>10Sv**

The doses we receive, if any, are of the order of 0.01 – 0.02mSv. This equates roughly to a chest x-ray every three months. Indeed we are likely to take in more natural radiation than from geological specimens.

National Museums Scotland

Hazards in Geological Collections

National Museums Scotland

Hazards in Geological Collections

Legislative Bodies (Radiation)

- **International Commission on Radiological protection (ICRP)**
- **Euratom (European Atomic Energy Community)**
- **Health and Safety Executive/Commission**
- **Parliament**

National Museums Scotland

Hazards in Geological Collections

Legislation (UK)

- **Health and Safety at Work Act (1974)**
- **Ionising Radiation Regulations (1999)**
- **The Radioactive Substances Act (1993)**

National Museums Scotland

Hazards in Geological Collections

Top Left: Radioactive Specimen Store at the NMCC. Top Right: Internal door which demarcates the controlled area. Bottom Left: Inside the with the radioactive mineral cabinet on the right and the Store for S&T objects on the left. Note vent and signage

National Museums Scotland

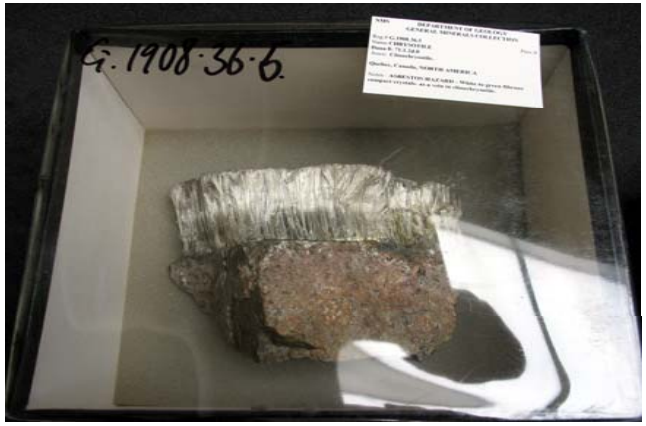
Hazards in Geological Collections

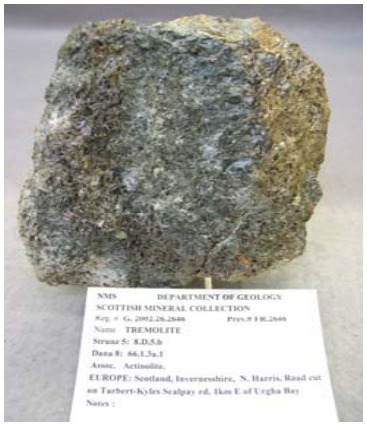
Asbestos

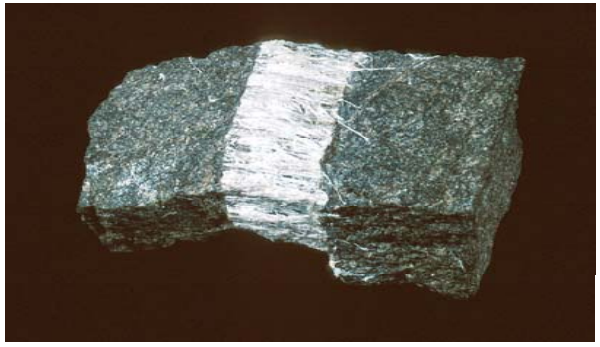
- **Asbestos used to cover a variety of mineral species.**
- **White asbestos is the name given to chrysotile (kaolinite-serpentine group. Most common found.**
- **Brown asbestos refers to certain Group 1 amphiboles. Found in fire retardant insulation and roof tiles.**
- **Blue asbestos to certain amphiboles of Group 2.**

National Museums Scotland

Hazards in Geological Collections







Top L: Chrysotile, Top R: Anthophyllite, Bottom L: Tremolite, Bottom R: asbestos

National Museums Scotland

Hazards in Geological Collections

Legislation

- **The Control of Asbestos Regulations 2006**
- **Asbestos (Prohibition) Laws 1999**
- **Asbestos (Licensing) Laws 2003**
- **Control of Asbestos at Work Regulations 2002**

National Museums Scotland

Hazards in Geological Collections

Effects of Asbestos Inhalation

- **Asbestosis**
- **Lung Cancer**
- **Mesothelioma**

Caveat Curator

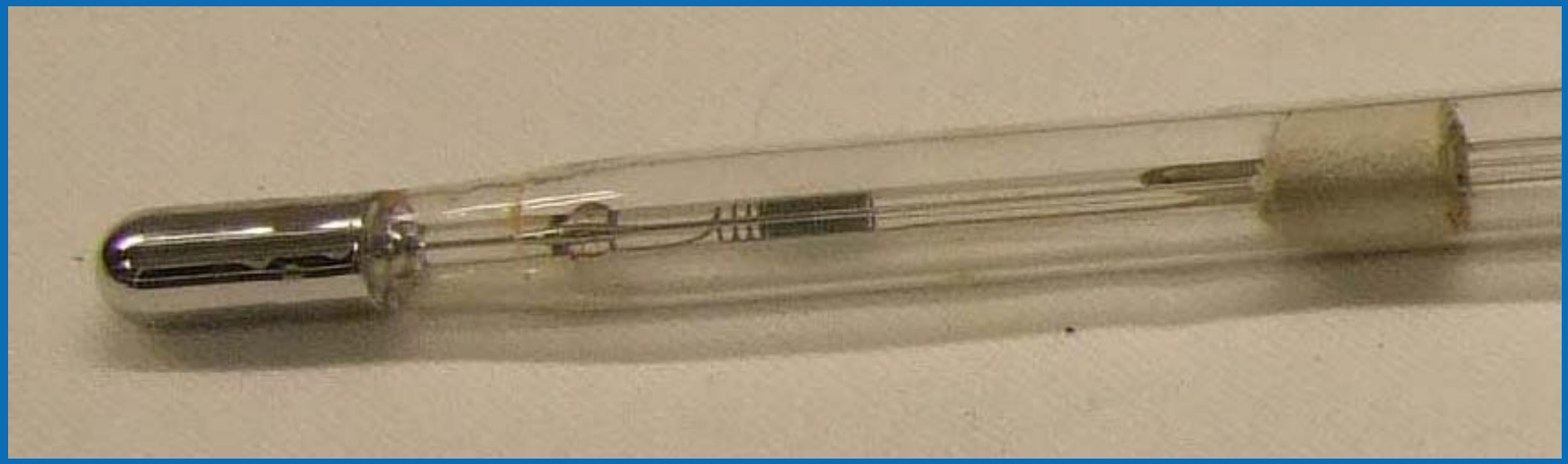
Tacye Phillipson
National Museums Scotland

National Museums Scotland

In the medical collection

National Museums Scotland

Hazard/Risk & not just one.



National Museums Scotland

Nitrate film

Mercury

National Museums Scotland

(formerly) luminous paint

National Museums Scotland

Military (and other) compasses

National Museums Scotland

Spitfire

National Museums Scotland

Twin Pioneer

National Museums Scotland

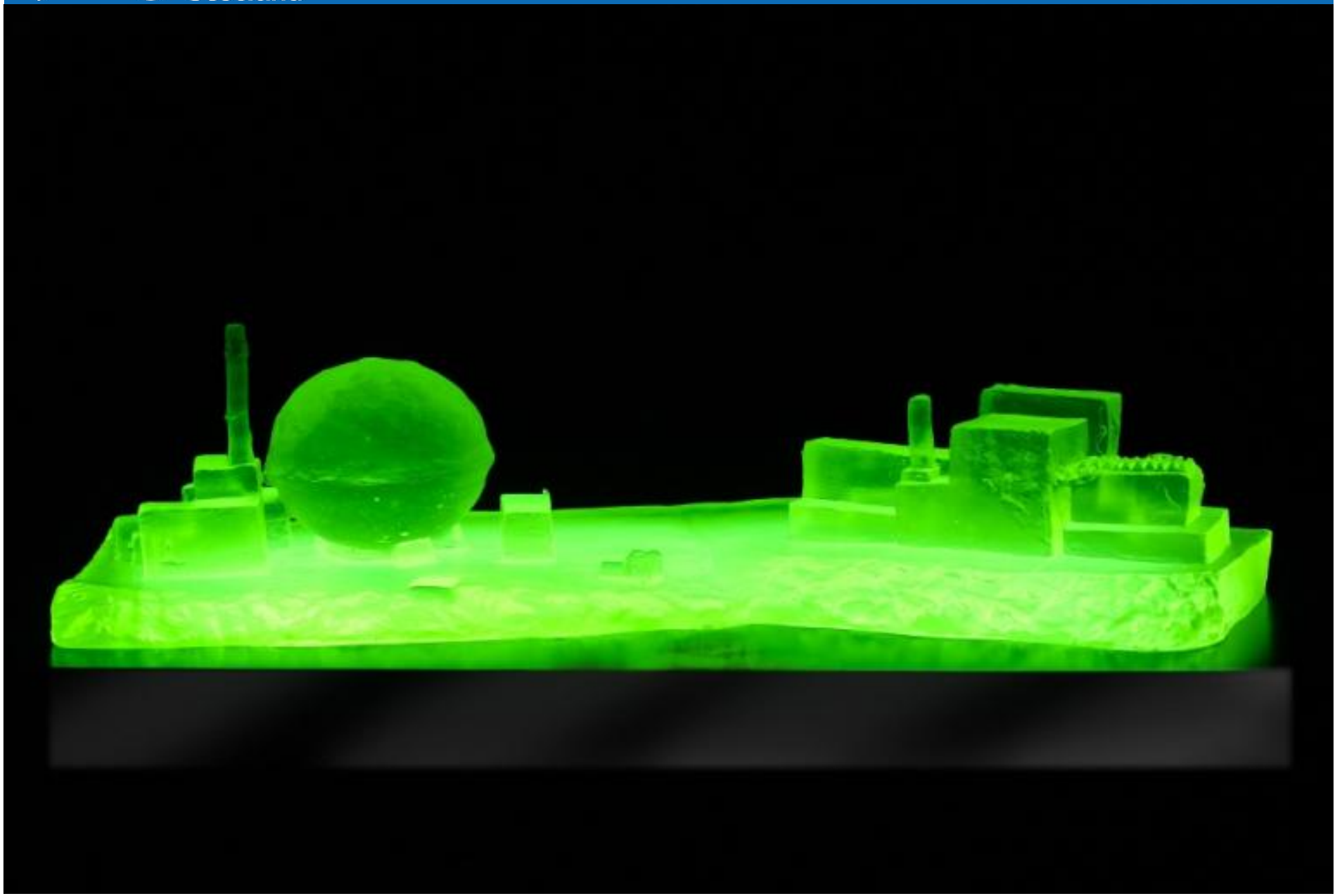
Sir William Ramsay’s lab bench

National Museums Scotland

Predating radiation's discovery

National Museums Scotland

Dounreay: Uranium Glass



National Museums Scotland

National Museums Scotland

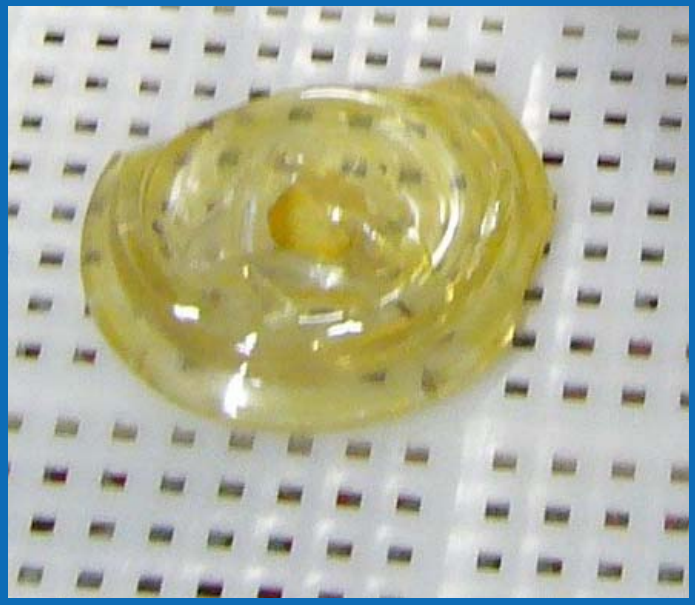
Oh dear…

National Museums Scotland

‘Keep in well stoppered bottles’

National Museums Scotland

175 grams Ferric chloride, anhydrous in 1903…

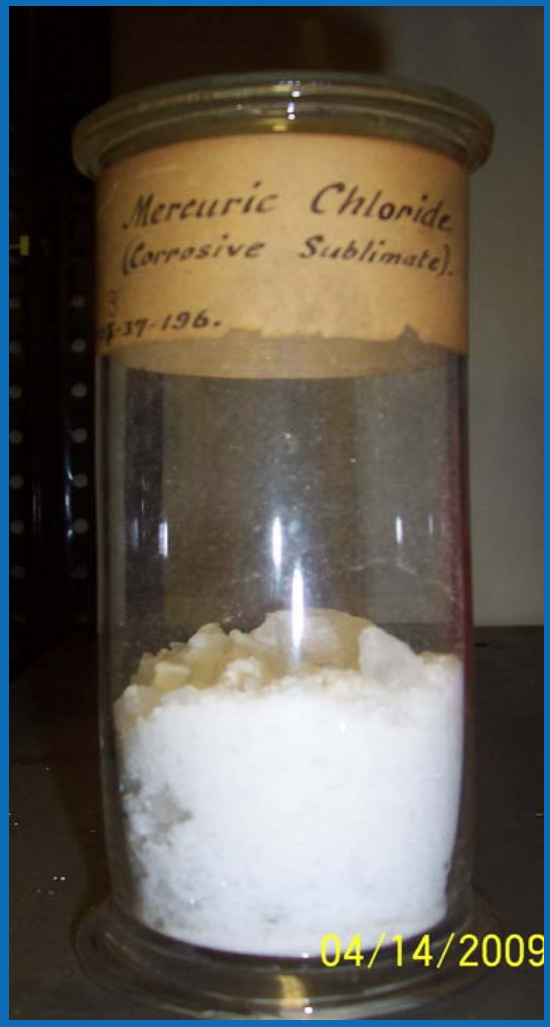


National Museums Scotland

The Latin abbreviation quiz

National Museums Scotland

More labels



National Museums Scotland

Carbon tetrachloride fire grenades

National Museums Scotland

Asbestos: useful stuff

National Museums Scotland

Training

National Museums Scotland

Mutual non-aggression pact

National Museums Scotland

Non agression 2

National Museums Scotland

Oil saturated

National Museums Scotland

Selfac fire extinguisher

Museum of Fire

http://www.lothian.fire-uk.org/museum/MrMac_articles_1940s.htm

Hazards in ethnography and social history collections

Chantal Knowles, Principal Curator - Oceania, Americas and Africa

The collector in the field may pack up and ship specimens and artefacts that would not be opened for over a year, an essential tool to prevent pest infestation was arsenic.

Ship to shore:
From the field cargo would take a matter of weeks to arrive at the nearest port.

Shipped from one port to another the return journey to the UK could take months.

National Museums Scotland

Cleaning and pest control of the past are rarely documented. Therefore the assumption must be that some chemicals have been used.

National Museums Scotland

Golden Rule:

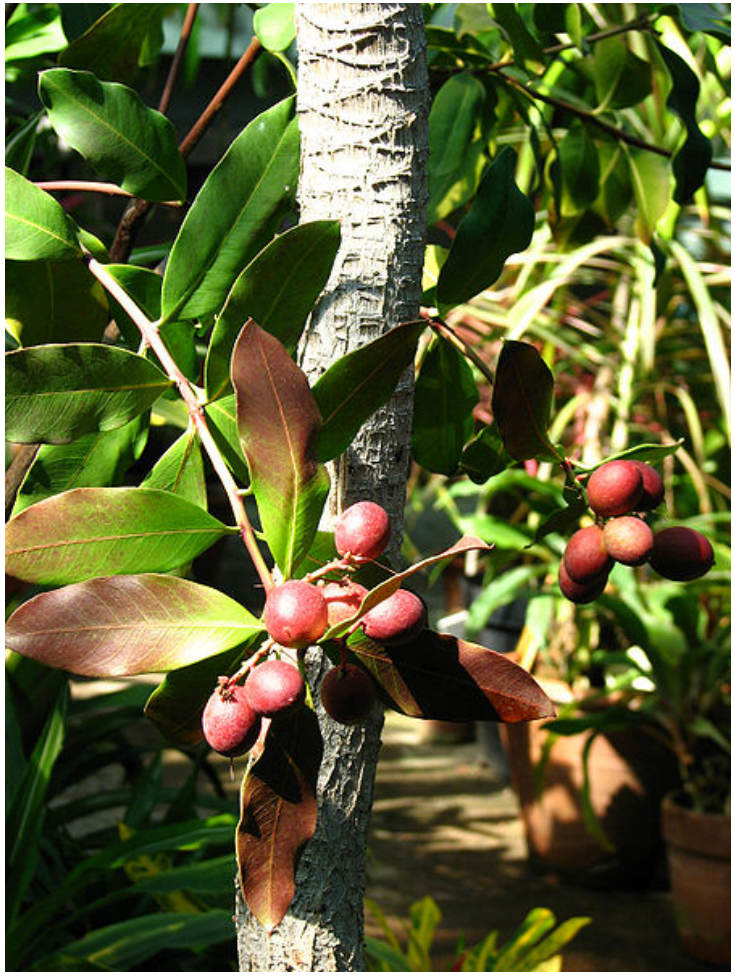
Anything collected before 1900 should be considered contaminated and anything collected before 1960 handled with caution.

Fur and fabric in particular can harbour high amounts of pesticides.

National Museums Scotland

Abrus precatorias

National Museums Scotland



Curare made from the bark of *Strychnos toxifera*

South American dart poison

A blood poison, has no effect if ingested.

Curare is an arrow poison that comes from the plant *Strychnos toxifera*. Indigenous people in South America have used it on their blowgun darts and arrows for centuries. The poison kills the prey by stopping their respiratory muscles from working, asphyxiating the animal. The name curare comes from the word "wurari", which the Macusi people in Guyana used to refer to the substance. What's more, curare doesn't just just have applications as a poison for arrows but has also been used in medical treatments – as a muscle relaxant in anaesthesia. Used for hunting, not warfare as too expensive.
Death would take 1-2 minutes for birds, small mammals 10 minutes, large mammals (tapir) 20 minutes. Death is caused by asphysxia, because skeletal muscles become relaxed and then paralysed.

National Museums Scotland

Arrows poisoned with strychnos nux vomica

Applying the poison from a larvae. A stick is used as the poison is highly toxic although it can take hours or even days for an animal to die. Therefore it must be tracked.

National Museums Scotland

Good practice in handling museum objects made from organic materials

- Assume that hazardous pesticides are present unless testing has been undertaken.
- Wear nitrile gloves while handling artefacts.
- When removing gloves, do not touch the exterior surface of the gloves.
- Always discard gloves and wash hands with soap and water after handling an object, and especially before eating, drinking or smoking.
- Wear a lab coat to keep dust off clothing and remove it when you leave the storage area or are no longer handling contaminated material.
- Keep lab coats clean to avoid transferring dust and dirt.
- If possible, work with artefacts in a well ventilated area. For example examine objects in a conservation lab with proper ventilation or fume hoods.
- Ensure work surfaces are well cleaned after they have been in contact with artefacts.
- Keep tetanus up-to-date

National Museums Scotland

Next steps to consider:

• Providing staff training and risk assessments.

• Guidelines for public access to collections by researchers or at visitor events.

• Repatriation and visits from source communities: any visitors to ethnographic material need to be made aware of potential dangers. A disclaimer will be needed if agreement is made to return material to a community where the object/s may be put back into use, cremated, or have unrestricted access.

• Conservation and cleaning: This needs to be undertaken by trained staff in controlled environments as staff are the most susceptible to the dangers given their potential long term exposure to hazards.

Members of the Blood tribe receive a headdress from the Marischal Museum, Aberdeen

Images courtesy of Marischal Museum.

National Museums Scotland

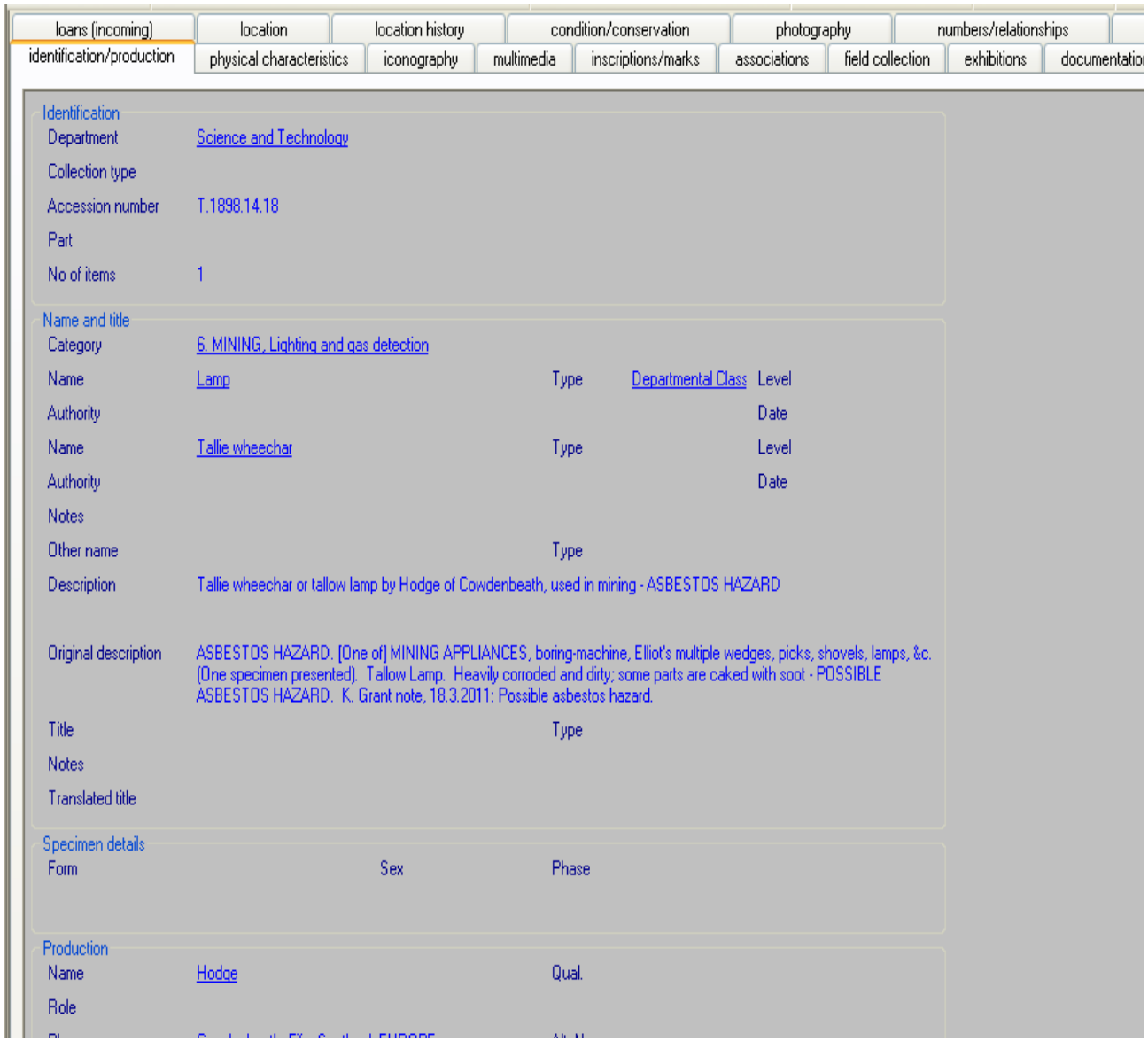
Health and Safety

National Museums Scotland

Inventory Hazardous Materials

- **Record items that are hazardous**
- **Check all new items that come into the collections – do you want to collect a potentially hazardous item?**
- **Visually inspect collection for signs of change – odours, degradation, corrosion etc.**

National Museums Scotland



loans (incoming) | location | location history | condition/conservation | photography | numbers/relationships

identification/production | physical characteristics | iconography | multimedia | inscriptions/marks | associations | field collection | exhibitions | documentatio

Identification

Department	Science and Technology
Collection type	
Accession number	T.1898.14.18
Part	
No of items	1

Name and title

Category	6. MINING, Lighting and gas detection			
Name	Lamp	Type	Departmental Class	Level
Authority				Date
Name	Tallie wheechar	Type		Level
Authority				Date
Notes				
Other name		Type		
Description	Tallie wheechar or tallow lamp by Hodge of Cowdenbeath, used in mining - ASBESTOS HAZARD			
Original description	ASBESTOS HAZARD. [One of] MINING APPLIANCES, boring-machine, Elliot's multiple wedges, picks, shovels, lamps, &c. (One specimen presented). Tallow Lamp. Heavily corroded and dirty; some parts are caked with soot - POSSIBLE ASBESTOS HAZARD. K. Grant note, 18.3.2011: Possible asbestos hazard.			
Title		Type		
Notes				
Translated title				

Specimen details

Form	Sex	Phase

Production

Name	Hodge	Qual.
Role		

National Museums Scotland

Risk Assessments

- **Consider Areas of higher risk – large collections of material, when collections are to be moved, when collections are to be handled for a long period**
- **Risk Assessments for a storage area or for a procedure**
- **Consider legislation**

Form 1 NMS – GENERAL RISK ASSESSMENT FORM

Hazard: Something that has the potential to cause harm; Risk: The likelihood of such harm occurring plus the consequences

Date: Department: Location: Assessed by:

DESCRIPTION OF WORK ACTIVITY	HAZARDS INVOLVED	EXISTING CONTROL MEASURES IN PLACE	PERSONS AT RISK	RISK RATING			FURTHER CONTROL MEASURES REQUIRED/ACTION REQUIRED/COMMENTS
				HIGH (H)	MED (M)	LOW (L)	

Key to risk: **High** = Unacceptable, not adequately controlled, action required; **Medium** = Acceptable risk, further action may be taken to further reduce the risk; **Low** = Minimal risk, adequate controls in place

National Museums Scotland

Good Housekeeping

- **Keep storage and work areas clean and free of dust and debris that can harbour harmful materials.**

- **Work surfaces should be thoroughly cleaned regularly to ensure that hazardous particulates are not put in the air.**

- **When vacuuming is necessary, use a HEPA vacuum and wear a respirator with a HEPA cartridge as vacuum exhaust can circulate hazardous particulates. Change filters often.**

National Museums Scotland

Storage and Labelling

- **Use a storage method appropriate for the type of hazard, including hazardous storage cabinets found in many industrial supply catalogues.**

- **Ensure that others are aware of the nature of harmful materials. This may mean labelling the room, cupboard, and individual object.**

- **Label hazardous collection materials on the catalogue card and digital database.**

National Museums Scotland

harmful/irritant

toxic

flammable

corrosive

radioactive

explosive

oxidizing/supports fire

National Museums Scotland

Handling

- **Follow legislation and guidelines for specific materials such as Asbestos and Radiation**
- **Minimise handling of potentially hazardous objects.**
- **Follow proper handling guidelines such as wearing the proper tvpe of gloves, wear lab coats, and other types of protective clothing as appropriate.**
- **Provide written handling procedures to researchers and visitors handling collections.**
- **Post standard operating procedures for handling contaminated objects in storage and work spaces.**

National Museums Scotland

Personal Protective Equipment (PPE).

- **There is no universal type of PPE that can protect from all types of hazards associated with collections. They are not acceptable substitutes for good preventive methodology and should be relied upon for short term projects or emergencies only.**

MAKE SURE YOU HAVE IN STOCK

- **Masks,**
- **gloves,**
- **safety glasses,**
- **labcoats,**
- **respirators,**

National Museums Scotland

- Provide a tour of areas containing potentially hazardous collection materials to local fire personnel so they will be familiar with the types of hazards they might encounter in the course of fighting a fire.

- Limit access to new accessions until testing has been completed or appropriate handling precautions can be implemented.

- Restrict locations where contaminated objects may be used, for example exhibitions, if the hazard cannot be controlled.

National Museums Scotland

Practice Good Personal Hygiene.

- **Wash Hands before and after touching objects, even when using gloves**
- **Wash lab coats and other protective clothing frequently.**
- **Do not wear home, clothing that has been contaminated, as hazardous materials can be passed along to your family.**
- **Do not smoke, eat, drink, apply lipstick or balm, or contact lenses near toxic materials as the toxic materials are more easily introduced through the mouth and mucous membranes.**
- **Keep your tetanus shot up-to-date.**
- **Be aware of personal habits (licking fingers to turn pages, putting thread in your mouth, chewing on pencils or fingernails, etc.) that can facilitate the transmission of toxic materials.**

National Museums Scotland

Dispose of Hazardous Materials Properly

- **Dumping toxic or potentially toxic items in the bin or down the sink is not acceptable.**

- **Research the proper disposal method and seek out your hazardous waste disposal coordinator.**

National Museums Scotland

For more advice and training course email
partnerships@nms.ac.uk

or visit our directory of expertise at
www.nms.ac.uk/advice