

The Health and Safety Considerations of Working with Natural Science Collections

Points to be Discussed

- Can Natural Science collections pose a risk to health and safety?
 - if so what types of hazards can they pose?
- How can you identify if a specimen is hazardous?
- What health and safety precautions should you take?
- What health and safety legislation should you be aware of?
Where can you go for advice and support?

GEOLOGY COLLECTIONS

Inherently Hazardous

- Radioactive
- Containing asbestos
- Comprised of toxic chemicals
- Exude toxic dusts
- Can be extremely heavy and sharp

Radioactive Geology

- The emission of ionising radiation or particles caused by the spontaneous disintegration of atomic nuclei.
- All natural materials are to some extent radioactive, and almost all rocks will contain crystals of U and Th-rich mineral phases
- Emits Alpha, beta and gamma radiation
- Radon gas – ionising radiation



Radioactive Geology

- Routes of exposure
 - Ingestion of particulates and dusts
 - Inhalation of radiating gas (radon)
 - Radiation of soft body tissues through touch and close contact
- Damages vital compounds and cellular information often resulting in cancers

Most common 'primary' minerals

- Uraninite
 - often labelled as pitchblende
- Thorianite
- Thorite .
 - may be labelled orangite
- Most geological collections will house these types of specimens but must still comply with the Ionising Radiations Regulations 1999 (IRR99)

Asbestos in Geology

Asbestos can be found in its mineral form in geological collections.

It can be friable and fibrous.

A single fibre can cause serious harm if inhaled causing e.g. mesothelioma (cancer of the pleural membrane in the lungs)

The use, movement and disposal of asbestiform specimens is controlled by the Asbestos Prohibitions Regulations 1992. Further information can be obtained from the HSE

Asbestos in Geology

- Six different types of asbestos
- Divided into two main groups:
- Serpentine (White Asbestos) and
- Amphibole asbestos (blue and brown)



Asbestiform Minerals

- Serpentine –
 - layered structure and curly fibres.
 - Chrysotile asbestos is the only type in this category
 - most often used in building materials (white asbestos)



Asbestiform Minerals

- **Amphibole** –
- a long chain-like structure of fibres that are sharp and straight and easy to inhale
- *Anthophyllite*,
- *Actinolite*
- *Tremolite*
- *Amosite*, - found in building products Brown asbestos
- *Crocidolite* - found in building products Blue asbestos

} Not currently classified



Current BMAG Storage



Toxic Chemicals in Geology

- Specimens can contain high concentrations of toxic elements ie mercury, arsenic boron, copper and lead.
- Any loose, associated material can be a hazard as can breathing in the vapours and handling the specimens without gloves.

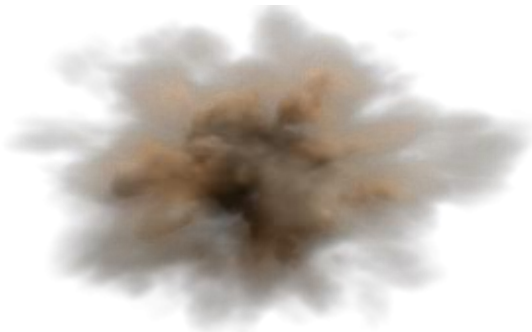


Toxic Chemicals in Geology

- Routes of exposure
 - Inhalation of vapours
 - Inhalation and ingestion of dusts
 - Absorption through the skin

Hazardous Dusts

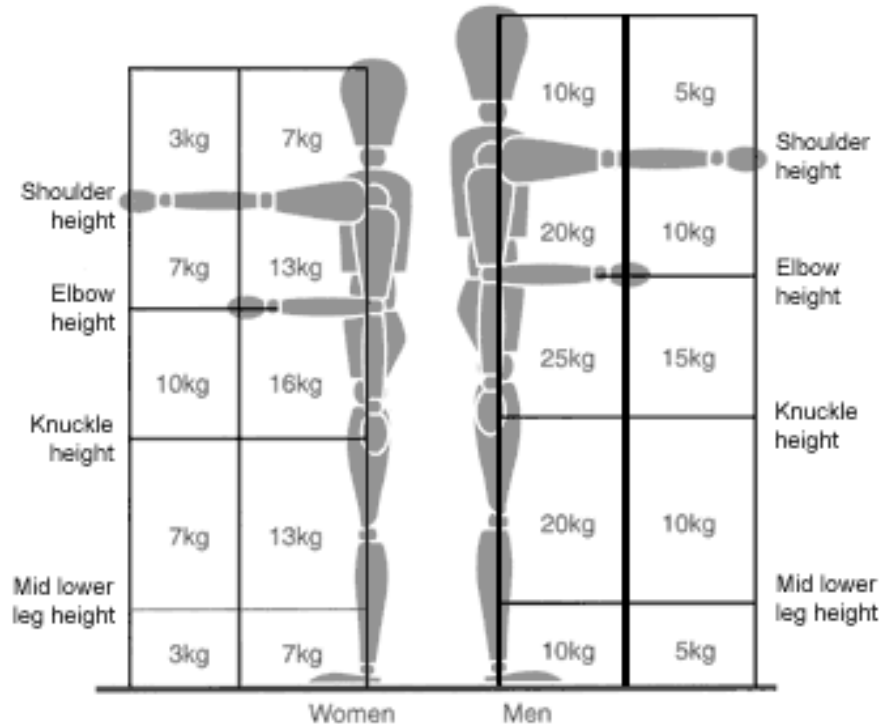
- Geological dusts can contain toxic elements, radioactive particulates or asbestos particles
- Containing the dust or friable particles is essential e.g. asbestiform minerals
- Dust and dirt from a store can pick up contamination so ensure that collection areas are kept clean and dust free



Dust image courtesy of Drum magazine

Extremely Heavy Material

- Take care when moving specimens.
- Ensure clear passageways, clear work areas.
- Ensure housing is suitable
- Use signage
- Manual handling training is advised.



Botanical Collections

Inherent Hazards

- Castor oil seeds
- Hemlock
- Curare
- Precatory Seeds

- Scheduled drugs
- Psilocin, opiates



Image © RBG, KEW

Physical Hazards

- Spines - Palm specimens
- Stings - Nettles
- Thorns - Roses, Brambles
- Chemical burns - Giant hogweed
- Allergens- spores (bracken) pollen



Biocides

- Pesticide/Fungicide
- Mercuric chloride
- Lead arsenate
- Naphthalene
- Para-dichlorobenzene
- Mystox
- Barium fluorosilicate
- DDT



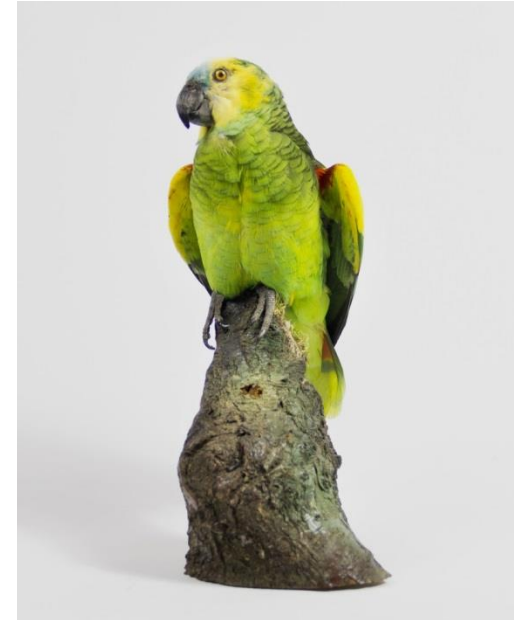
Contaminated Botany

- Routes of exposure
 - Inhalation of vapours
 - Inhalation and ingestion of dusts
 - Absorption through the skin
 - Through cuts and abrasions

Zoology Hazards

Inherent and Additional

- Biocide residues
 - Heavy items, bones and skulls
 - Fluid preserved specimens
 - Pathogens from storing animal tissue
 - Pigeon fancier's lung
 - Psittacosis from feathers of parrot family
 - Cuts, and tears from spines and claws
 - Poisonous specimens or venom (ethnographical collections)
-
- [Parrot image ©www.ayreandco.com](http://www.ayreandco.com)



How can you identify if a specimen is hazardous?

- Fibrous geological specimens may contain asbestos fibres
- Grey stains on herbarium sheets usually mercuric sulphide
- White powder on old taxidermy specimens probably As
- Radioactive material can be quite non-descript, black or brown in colour, rarely forming good crystal structure, very hard to recognise by eye. Can emit heat too.

How can you identify if a specimen is hazardous?

- Don't assume it is safe
- Most hazards are not visible
- Assess the specimen for any data re: name, hazardous information or signage
 - E.g. specimen contains thorium
- Requires specialist knowledge and experience



What health and safety precautions should you take?

- **Identify the Hazard**
- Identify which specimens are hazardous and signpost, seek expert help if necessary
- Ensure all hazards are logged and registered appropriately
- Check your institutions current policies and legislation

What health and safety precautions should you take?

- **Assess the Risk**
- Determine the level of risk the specimens pose
- Seek expert help eg HSE
- Establish who may be at risk
- Restrict access if necessary
- Provide a risk assessment
- Provide a COSHH assessment, if needed
- Take measurements: geiger counter, dosimeters

What health and safety precautions should you take?

- **Control the Risk**
- Apply best practice – PPE, good housekeeping
- Use appropriate storage
- e.g. Radiation cabinets, ground glass jars, double bagging
- Ensure suitable ventilation systems are in place
- Develop rules and procedures to minimise that exposure and ensure legal compliance

What health and safety legislation should you know?

- Asbestiform minerals - The Asbestos (Prohibitions) (Amendment) Regulations 1999,
- Toxic chemicals – COSHH/EH40
- Radioactive - Ionising Radiation Regulations 1999 (IRR99). Under guidance of certificated radiation protection adviser (RPA) local rules need to be developed at your institution.
- Carcass material keeping and disposal-Environmental agency and DEFRA
- Carriage of dangerous goods ADR 2015 United Nations Economic Commission for Europe (UNECE)



Where can you go for advice and support?

- Past/current colleagues and curators
- The SWANS
- SWANS Introduction to working with Natural Science Collections booklet (pdf)
- Contact other organisations including:-
 - Mineralogy Resource database , Smithsonian Museum-Oh no Ethnobotany; MinDat, NatSCA, GCG, SW Fed Website, DEFRA
 - HSE, HSL, Home Office, Environment Agency
 - SPNHC Society for the preservation of Natural History Collections

Quick Quiz

What is the potential hazard?



What is the potential hazard?



What is the potential hazard?



What is the potential hazard?



What is the potential hazard?



What has been covered today

- Can Natural Science collections pose a risk to health and safety?
 - if so what types of hazards can they pose?
- How can you identify if a specimen is hazardous?
- What health and safety precautions should you take?
- What health and safety legislation should you be aware of?
Where can you go for advice and support?

**It's a big subject,
don't panic, ask questions
Thank you!**

Dr Victoria Purewal ACR
Senior Natural Science Curator (Acting)
Bristol Museum and Art Gallery