Local Rules for the Storage, Handling and Display of Radioactive Geological Specimens in the Hunterian Museum Collections

(Febrary 2008 revision)

These guidelines have been drawn up in consultation with the University of Glasgow Radiation Protection Service, following original discussion and assessments made in December 2000, and most recently reviewed in February 2008.

- Dr. JW Faithfull, the Curator of Mineralogy and Petrology, is the nominated Departmental Radiation Protection Supervisor (DRPS).

- Specimens designated significantly radioactive are stored in sealed radon-proof containers in the "near plant room" of museum store on Floor 1 at Thurso St.

- A list of currently designated "significantly radioactive" specimens, together with their storage locations, is attached.

A. Introduction

1. The geological collections of the Hunterian Museum, like almost all sizeable geological collections anywhere, include specimens with significant natural concentrations of uranium and thorium. All natural materials are to some extent radioactive, and almost all rocks will contain crystals of U and Th-rich mineral phases.

***2*.** Quantitative measurement of radioactive hazard is complex due to variations in detector response across different types and energies of radiation, and variations in the biological activity of different types of radiation depending on modes of exposure. As a working definition, we class hand-specimens to be "significantly radioactive" if they give a maximum surface dose rate of greater than 7.5μSvh^{-1}, corresponding to the *"adequate shielding level"* specified by UK legislation. We class a specimen as "weakly radioactive" when it gives a maximum surface dose rate of > 1μSvh^{-1}, which is the limit for public exposure.

> ***NB*** *For the Hunterian 1" Geiger counter tube, 10 counts per second approximates to a dose rate of 2.5$\mu Svh^{-1.}$ 30 counts per second thus corresponds to the 7.5μSvh^{-1}. For public or student handling, no specimens with over 4 counts per second (approx. 1μSvh^{-1}) should be used.*

3. The total volume of material which is significantly radioactive is very small: probably only a couple of litres. Weakly radioactive specimens might have a total volume of a few more litres. Given that our collections number several hundred thousand specimens, and occupy many hundreds of cubic metres of storage, radioactive specimens are not a major component.

4. In addition, there are a few very weak radioactive sources associated with the Scientific Instrument collections. However examination of these has not revealed anything which requires special treatment.

New acquisitions of both scientific instruments and geological specimens are routinely checked for radioactivity.

B. Storage

All our geological collections, are kept in locked, restricted-access stores.

1. 13 Thurso St.

The museum store occupies most of Floor 1, and part of Floor 4 of this building. Most of the mineral collections (and hence radioactive specimens) are stored on Floor 1.

In most cases, specimens are kept in locked cabinets or cupboards within these areas. There is no direct public access to any of these areas, except under curatorial supervision.

Significantly radioactive specimens are isolated and stored in sealed containers to prevent radon escape into storage areas. These containers are kept in the "near plant room" (despite the name, it contains no plant) within our locked store. They are marked with radiation stickers, as well as warnings that they must not be opened indoors. The room itself is marked as a Supervised Radiation Area, and is not used as a regular work area by any staff.

2. Balmore

We also run a remote store on Balmore Industrial Estate where our rock collections, and lower-value reserve material is kept, as well as material currently being assessed for formal inclusion into our collections.

Specimens are mostly housed in a large locked mobile-storage rack. There is no public access to the store. There is very little significantly radioactive material at Balmore. The store is a fairly drafty building, and this, together with the tiny quantities of significantly radioactive material mean that there is no significant threat from radon accumulation.

C. Documentation

1. We have an on-going programme of documentation of our collections, but as there are several hundred thousand geological specimens, preparing detailed and accurate computer records for all of them is a very long term project. The majority of our significantly radioactive specimens have already been fully catalogued.

2. They may be flagged in two ways:

> **a)** by having the "radioactive" keyword attached to their computer record on our INCA database.
> **b)** by being stored in one of the RAD: locations if they have a significant count-rate.

3. Note that the radioactive keyword is applied to any specimens flagged as containing U or Th mineral species (even if they are not actually very radioactive, due to small quantities), as well as significantly radioactive specimens of whatever nature.

D. Usage and handling

1. Significantly or weakly radioactive specimens will not be used for public or student handling. Such activities should only involve specimens giving less than $1\mu Svh^{-1}$ maximum surface dose rate (approximately 4 counts per second on the Museum Geiger counter).

2. Weakly radioactive specimens, giving maximum surface dose rates of 1-$7.5\mu Svh^{-1}$, may be used for display or supervised demonstration activities by museum staff, or other appropriate persons, providing that there is no risk of fragmentation or dust generation, and that public or student users will not be directly handling them, or be exposed to potential dose rates of more than $1\mu Svh^{-1}$.

3. Significantly radioactive specimens will not be used for public display, or other activities unless isolated within a radon-proof transparent container giving a surface dose rate of less than $7.5\mu Svh^{-1}$, and a maximum potential exposure to public users (e.g. on the outside of the enclosing display case) of less than $1\mu Svh^{-1}$.

4. Curatorial staff (normally only the Curator of Mineralogy/Petrology) will sometimes have to handle significantly radioactive specimens. Where this is necessary, the sealed RAD storage containers will be opened out of doors, or in a fume cupboard, and specimens handled using disposable rubber/vinyl gloves. A finger dosimeter will be requested in advance, and worn during such work. Emission of radon from specimens during short periods of examination or handling in large open spaces is not considered a significant problem.

5. If other museum staff (eg curatorial assistants, or education staff) need to handle material, even briefly, giving a surface dose rate of > 7.5µSvh^{-1}, they should be registered as radiation workers with the University RPS, and follow the handling procedures outlined in section 4 above.

6. Similar procedures will be used under the supervision of the DRPS, if and when researchers require access to significantly radioactive specimens.

7. Note that for specimens of low, or zero radioactivity, as with other potentially toxic or dangerous minerals, all users are warned not to eat, drink, smoke, bite nails or apply make up during any handling work, or before washing their hands afterwards.

8. We will not use rock-saws or other dust-generating treatments on any significantly radioactive specimens unless University of Glasgow Radiation Protection Service have assessed and approved any proposed procedures on particular specimens Such approval must always be sought in advance of any work being carried out.

9. As well as mineral specimens labelled as containing U and Th species, significant radioactivity is occasionally found in specimens whose main interest arises from the presence of other geological features (e.g. other minerals, fossils). Such specimens can pose a problem because the radioactivity cannot be inferred from what is written in the museum catalogues or labels. Where older collections are being worked on, we routinely monitor for unexepected radioactivity.

10. This is in practice rare, as most of our collections have been examined with a Geiger counter to detect such specimens. Newly-acquired materials are always assessed in this way.

11. An up-to-date list of significantly radioactive items stored in radon-proof cabinets is attached.

John Faithfull 25.02.2008