



MUSEUMS & GALLERIES
COMMISSION

Standards **2.**
in the
Museum
Care of Biological
Collections.
1992

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Standards in the Museum Care of
Biological Collections 1992

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Foreword

by the Earl of Cranbrook

Nature conservation is one of many science-based applications of biological knowledge. Members and staff of the nature conservancy councils and the Joint Nature Conservation Committee depend on reliable identifications to underpin their statutory responsibilities to designate sites of special interest, to categorise rare or endangered species in need of protection, and to set the standards and criteria for monitoring them. Museum collections provide indispensable support for these functions, and frequently act as the national reference point for taxonomic comparisons.

In round figures, excluding Palaeontological material, some 49 million biological specimens are held in the national museums of the United Kingdom, in Belfast, Cardiff, Edinburgh, Liverpool and London (including Kew), and over 20 million reside in the museums of our universities and local authorities.¹ With other material held in independent or private museums, the grand total must exceed 70 million specimens. These collections constitute a resource of worldwide importance.

Museum specimens serve many purposes, including the verification of identifications, opportunities for research, and authentication of the opinions of specialists. They provide a database of geographical distribution containing information on occurrence and seasonal movements. Dated examples can be important: to demonstrate present and past ranges; to illustrate aspects of cyclic biology, such as periodic breeding or moult; to provide baseline information about the spread of industrial pollutants. The variation shown by specimens from different regions illustrates the processes of natural selection. Geographical spread defines the patterns of variability and the range limits of species. Properly curated museum specimens are therefore essential for the conduct of many fields of Systematics and biological research. Critical among the variety of specimens are the 'types' - those to which scientific names are permanently linked by the original description. These form the basis of biological nomenclature and are essential in ultimately establishing the correct usage of names. The regulatory bodies of taxonomic nomenclature have laid down special rules for the care and safe-keeping of type specimens. A sound taxonomic foundation is essential to all subsequent biological studies.

The process of curation itself is subject to review and research. Technical innovation in recent years has taken advantage of novel ways to investigate biological variety and has provided additional means to define species and to distinguish between them. Processes such as cryopreservation place new demands on museum facilities. The management of living collections, including bacterial or algal cultures, has added a range of extra tasks to the curatorial role.

The collections now held in the United Kingdom are particularly important because of their international scope and, in some cases, their antiquity. Thanks to the early lead given by private collectors of natural curiosities (such as Tradescant, or Sloane), and a long tradition of specimen hunting among British explorers and travellers, pioneer settlers, military and colonial officers, our collections give worldwide coverage. Due to the care of past curators, we can (for example) still handle specimens actually from Linnaeus's personal cabinets, as well as others collected and prepared by later giants in the history of biology, Raffles, Darwin and Wallace among them.

Ownership of these collections in trust carries an obligation to maintain them in good state and to make them accessible to enquirers and research workers at home and abroad. The responsibilities are wide; priorities must be carefully directed and resources properly allocated. I therefore give an especial welcome to the initiative of the Museums & Galleries Commission in publishing this booklet on standards for the museum care of biological collections. The text offers an authoritative formulation of professional best practice. It is designed to benefit museum staff, local authorities, governing bodies and professional advisers of museums, and to provide guidance for grant-giving bodies seeking authentication. I am sure that it will be widely used for all these purposes. I hope it may also provide a lead to the rising generation of biologists who wish to study, and to safeguard, the world's rich natural biodiversity.

Earl of Cranbrook DSc DL
Chairman of English Nature
(the Nature Conservancy Council for England)
15 December 1991

Footnote

¹House of Lords, Select Committee on Science and Technology, Session 1991-2, First Report, Systematic Biology Research (HL Paper 22-I) p. 17. See also the results of the Museums Association's survey of 1987.

Introduction

This booklet is one of a series being published by the Museums & Galleries Commission setting out standards in various aspects of museum work. The first four in the series will cover the museum care of archaeological, biological, geological and industrial collections.

The purpose of this booklet is to set down standards for the museum care of biological collections, and to provide guidance on the interpretation of these standards. It has been difficult to write, because museums vary so greatly, and so do biological collections, and because so many activities go to make up "care". There is, however, a growing consensus within the museum profession on how such care should be exercised. The Museums & Galleries Commission therefore drew together a group of practising museum biologists, conservators and other experts, and this publication owes everything to their discussions and conclusions.

These standards represent a consensus of current professional opinion of best practice and as such, the Museums & Galleries Commission believes that every museum should be aspiring to reach them. "Aspiring" is the key word. We take the pragmatic view that not all museums will be able to achieve all of them in the short-term. Some standards, on the other hand, will soon be met by all museums. The standards for documentation for example, are essentially those that all Museums & Galleries Commission registered museums are already committed to reaching.

These standards will certainly change, as techniques change and expert opinion changes. The Museums & Galleries Commission intends to publish up-dated editions of this booklet every few years.

How do we envisage the booklet being used?

- A museum curator is asked by management to draw up a schedule of performance objectives and indicators for the care of biological collections. The national standards in this booklet will be a benchmark for the museum's own objectives and performance indicators.
- An auditor (internal or external) may wish to review how a local authority is looking after its collections. This booklet will give defined national standards against which achievement may be measured.
- A curator is trying to persuade a museum governing body to make more resources available for care of collections. This booklet will help make the case.
- A local museum run by volunteers is reviewing its acquisition policy, and is looking for professional guidance on the implications of acquiring various classes of material. This booklet will help in drawing up a sensible policy reflecting the constraints posed by the museum's resources.

- An architect is asked to design new premises for biological research collections. This booklet sets out the standards of security, environmental control, etc that should be attained.
- A grant-giving body needs reassurance that a museum applying for grant will use it responsibly. These standards enable it to judge whether the museum is likely to do so.

Because so much goes into looking after collections, the booklet is quite long. An alternative approach would have been to separate the different aspects - security, curation, pest control and so on - into different booklets. Eventually we decided to include all aspects in one booklet, so that it could more easily be used in the ways imagined above. No harm will be done by the consequent overlap in the different booklets in the series.

Each aspect of caring for collections is divided into three sections:

- The standards themselves. These are the standards at which every Museums & Galleries Commission registered museum should be aiming. Larger and specialist museums may already be meeting even higher standards.
- Guidelines and notes, explaining and enlarging on the standards.
- Sources of advice and help: generally one or two basic publications and a first-stop address.

We have tried, in each section, to achieve a balance between the statement of principles and detailed guidelines.

The Museums & Galleries Commission is grateful to the Department of National Heritage for funding its standards development programme, and to the members of the "expert group" and others who gave their help, who are listed below.

Users of the booklet are warmly invited to comment on its usefulness, and to make suggestions for improvements - or even for a new approach - for a second edition.

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Part One: Managing Collections

1

Standards for collecting

- 1.1 The museum's governing body must draw up and publish a detailed acquisition policy, which must be formally reviewed at least every five years.
- 1.2 The museum must ensure that it secures legal title to specimens it acquires.
- 1.3 Every specimen must be acquired in accordance with the code set out in the Museums & Galleries Commission's *Guidelines for a Registration Scheme for Museums in the United Kingdom*, with national laws and international conventions protecting wildlife and with any local licences and bylaws.
- 1.4 Anyone collecting on behalf of the museum must adhere to the same legal and ethical constraints. The museum should ensure that both statutory and amateur groups from which it receives material are aware of and abide by its policies.

Guidelines and notes

- 1.5 Every acquisition by the museum should be carefully considered for its ecological and ethical implications.
- 1.6 The *Wildlife and Countryside Act*, 1981 subjects the acquisition of many biological specimens to very tight controls.
- 1.7 The museum's acquisition policy should explain why the museum collects particular groups, or collects in particular areas. It should describe the historical collections held by the museum, and explain how the current biological acquisition policy fits into the museum's overall policy.
- 1.8 Every effort must be made to harmonise the collecting policy with those of other museums collecting locally or in the same fields.
- 1.9 Save in emergency, museums must collect only specimens they have the facilities and expertise to care for. Unless it has appropriately qualified and experienced staff, no museum should normally hold type or other scientifically critical specimens, but should transfer them to a registered museum with the appropriate facilities and specialist staff and a proven commitment to collection care.
- 1.10 All those undertaking research involving collecting should include in their research design deposition arrangements agreed with a museum, or other recognised research institute, unless it is part of their policy to hold collections of their own. Research Councils and others supporting research should ensure that proposals include such provisions.
- 1.11 The museum should be sensitive to the issues involved in the curation of human remains. The Museums Association *Code of Conduct for Museum Professionals*, 1991, should be followed. The Museum Ethnographers Group's *Recommendations on Professional Guidelines concerning the Storage, Display, Interpretation and Return of Human Remains in Ethnographical Collections in United Kingdom Museums*, May 1991, also provides guidance.
- 1.12 Every museum intending to carry out fieldwork in the biological sciences should prepare a fieldwork policy. This document should answer the following questions:
 - for what reason is fieldwork to be carried out?

- what resources - staff, time, equipment and money - will the fieldwork need?
- what resources - particularly staff time and specialist expertise - will be required to process the data and specimens collected?
- what outside expertise, if any, will be required?
- what resources - particularly space and curatorial time - will be required permanently to house and make available this material?
- is the planned fieldwork justifiable and affordable?
- if field work is to take place in another country, have arrangements been made to share specimens and data with an institution in the host country?

1.13 Experience suggests that processing the data and specimens from fieldwork takes at least as long as the collecting; to that must be added the time required to identify specimens.

1.14 As far as possible, museums should follow in their collecting and fieldwork the various codes of conduct drawn up by specialist groups. These include:

Botanical Society of the British Isles, *Code of Conduct for the Conservation of Wild Plants*, 1989, BSBI, London.

Joint Committee for the Conservation of British Insects, 'A code for insect collecting', *Entomologists' Gazette*, 1972, Volume 23, pp 135-137.

Royal Society for the Protection of Birds, *Bird Photography and the Law*, 1991, RSPB, Beds.

Museums collecting living plants for conservation or display should follow the:

International Union for the Conservation of Nature and Natural Resources - The World Conservation Unit, (Botanic Gardens Conservation Secretariat), *Botanic Gardens Conservation Strategy*, 1989, Richmond.

1.15 Museums should abide by the *Code of Practice on Archives for Museums in the United Kingdom*, 1990, agreed by the Association of Independent Museums, Museums Association and Society of Archivists. Copies are available from the Museums & Galleries Commission. Save for documentation relating to their collections and biological records, museums should normally ensure that archives are deposited in professionally-staffed archive offices.

Sources of advice and help

- Advice on drafting a collecting policy can be given by the Biology Curators Group. The Royal Geographical Society can advise on foreign collecting regulations and The Natural History Museum on aspects of fieldwork.

2

Standards for the disposal of specimens

- 2.1 The museum's governing body must draw up and publish a disposal policy, which must be formally reviewed at least every five years.
- 2.2 All museums must accept that there is a strong presumption against disposal of specimens in the permanent collection. No specimen may be disposed of other than in accordance with the code set out in the Museums & Galleries Commission's *Guidelines for a Registration Scheme for Museums in the United Kingdom*.
- 2.3 A full assessment must be made of any material considered for disposal.
- 2.4 Accessioned specimens may be destroyed only if deteriorated beyond recovery or infested to an extent that endangers the rest of the collection, and after a qualified biology curator or conservator has confirmed that the specimens cannot be treated. The decision must be approved by the museum's governing body and full records must be kept.
- 2.5 Specimens comprising animal tissue must be disposed of in accordance with the *Collection and Disposal of Waste Regulations, 1988*.

Guidelines and notes

- 2.6 Disposal is the permanent removal of objects from the museum's collections by any means (sale, destruction, exchange, or gift). 'Permanent loan' is not a recognised or permissible disposal transaction, as 'loan' implies that material will eventually be returned to the collection, yet 'permanent' implies that it will not.
- 2.7 All material considered for disposal should be assessed in terms of its scientific, historical and cultural importance as well as the legal and ethical issues as they relate to that material. This should be undertaken by a professionally qualified biological curator, but may also involve a specialist in the material concerned.
- 2.8 Even if they are unlabelled, unidentified or damaged, biological specimens may have potential uses. The museum's collections management plan should include reference to any non-accessioned material which it is agreed to retain, and should establish appropriate levels of documentation and care. Museums may decide to retain unaccessioned material for other uses, such as:
 1. Displays.
 2. Loans for educational or cultural purposes, for which scientifically well-provenanced material may be inappropriate. A schoolteacher or advertising agency, for example, may require just "a starfish".
 3. Source material for destructive or intrusive examination, eg a headless, legless bird mount can still yield feathers for electron microscopy or biochemical analysis. The test may not even have been developed yet, so these specimens can be regarded as "scientific knowledge-in-waiting".Museums should consider the possibility that other information will become available later that will permit the specimen to be re-incorporated into the permanent collection.
- 2.9 However, there are collections which contain material so damaged or so low grade that its continued curation is difficult to justify. In such cases the approved procedure for disposal should be scrupulously followed after specialist advice has been taken.

Sources of advice and help

- A museum wishing to transfer collections to another museum better able to care for them can obtain advice from the Biology Curators Group, the Area Museum Council or the Collections Research Unit.

Useful references include:

- Norris, A., 'Vanishing herds - large mammals in museum collections', *Biology Curators Group Newsletter*, 1988, Volume 4, Number 8, pp 148-149.
- Wheatcroft, P., 'Merely rubbish: disposal of natural history collections', *Museums Journal*, 1987, Volume 87, Number 3, pp 133-134.

3

Standards for curation and conservation

- 3.1 The museum's collections management plan should include a programme of care based upon the research, exhibition and conservation priorities of the biological collections.
- 3.2 All biological specimens must be inspected by a trained and experienced museum biologist on a rolling programme.
- 3.3 There must be a written procedure governing the moving of specimens within the museum, and permanent moves must always be recorded. No specimen may be removed from the museum without consultation with the museum biologist referred to above.
- 3.4 Appropriate training must be undertaken by those responsible for the day-to-day care of the collections.

Guidelines and notes

- 3.5 A museum with an active collecting policy, with substantial natural history collections (perhaps 40,000 individual specimens) or with scientifically important collections should have a biology curator with a specialist expertise in at least one of the classes of material predominant in the collections. Smaller museums without a biologist on the staff should either deposit their biological collections in a museum which has, or should contract regular visits by an appropriate museum biologist (curator, conservator or taxidermist) from elsewhere. Museums without regular access to the advice of a museum biologist should adopt an extremely cautious approach to the acquisition of biological collections.
- 3.6 Such staff can help draw up a programme of regular inspection. The biology curator can advise on identification, check the documentation of the collections, ensure that they make their proper contribution to science, check their condition and advise on conservation requirements and environmental conditions. The museum's budgets should make appropriate provision for the cost of such visits.
- 3.7 Unstable material should be checked annually or even more frequently. Many collections should be checked every four months for pest attack. Expert attention must be given to drawing up such a programme based on the curatorial and academic priorities of the collection. Appropriate action should be taken to maintain the collections in a stable condition. The museum's budget should make appropriate provisions for the costs of remedial and preventive conservation.
- 3.8 All specimens temporarily transferred to new locations, whether for the purposes of conservation or exhibition, should receive the same or better conditions of care than those housed in the store. These conditions as they apply to environment, handling, packing, transport and security, are outlined elsewhere in this document.
- 3.9 Any conservation-related treatment should be the subject of full discussion between the responsible biological curator, other specialist and conservators before the work is started, taking into account the use to which the specimen will be put (eg research, display) after conservation.
- 3.10 Conservators should keep a systematic and consistent record of all their observations on a specimen, as well as details of all conservation treatment including, where appropriate, all scientific data.

- 3.11 The House of Lords Select Committee on Science and Technology has stressed the importance of the link between curation and research (see 7.4).
- 3.12 Whether or not to merge historic collections is controversial. It should be done only after discussion with specialists in the groups concerned, if possible with the knowledge of the collectors concerned, and after reference to any legal requirements incorporated in the terms of the original donation. It may be necessary to refer to the successors of the original donor for their permission. Full documentation should be kept.

Sources of advice and help

- General curatorial advice, and advice on securing regular professional help, can be obtained from Area Museum Councils, which can also provide information on training available, as can the Museum Training Institute.
- Horie, C. V. (ed), *Care and conservation of natural history collections*, (forthcoming), Butterworth-Heinemann, Oxford.
- Lee, W. L., Bell, B. M. and Sutton, J. F. (eds), *Guidelines for acquisition and management of biological collections*, Association of Systematics Collections, Lawrence (Kansas).
- Stansfield, G., 'Conservation and Storage: Zoology Collections' in Thompson, John M. A. et al (eds), *Manual of Curatorship*, 1992 (2nd edition), Butterworth-Heinemann/ Museums Association, Oxford.
- Stansfield, G., Mathias, J. and Reid, G., *Manual of Natural History Curatorship*, 1992, HMSO, London.
- The following references are relevant to particular groups:
 - Mammals
 - Genoways, H. H., Jones, C. and Rossolimo, O. L., *Mammal collection management*, 1987, Texas Tech University Press, Lubbock (Texas).
 - Birds
 - Cato, P. S., *Guidelines for managing bird collections*, 1986, Texas Tech University Press, Lubbock (Texas).
 - Amphibia and reptiles
 - Simmons, J. E., 'Herpetological collections and collection management,' *Herpetological Circular 16*, 1987, Society for the Study of Amphibians and Reptiles.
 - Insects
 - Walker, A. K. and Crosby, T. K., *The preparation and curation of insects*, 1988 (2nd edition), Science Information Publishing Centre, Wellington (New Zealand).
 - Botanical collections
 - Forman, L. and Bridson, D., *The herbarium handbook*, 1989, Royal Botanic Gardens, Kew, London.
 - Perry, Roy and Thomas, Barry A., 'Herbarium Practice' in Thompson, John M. A. et al (eds), *Manual of Curatorship*, 1992 (2nd edition), Butterworth-Heinemann/ Museums Association, Oxford.

4

Standards for access

- 4.1 Every museum must make publicly known the existence of its biology research collections.
- 4.2 Any *bona fide* enquirer must under normal circumstances be allowed to inspect specimens and archives from the collections.
- 4.3 An enquiry about the presence of a particular category of specimen must normally be answered within fifteen working days.
- 4.4 An enquirer must be able to secure an appointment to see specimens within 30 working days of applying to the museum.
- 4.5 An enquirer having an appointment must be able to consult all available documentation relating to the collections on arrival, subject only to any restrictions based upon confidentiality, either at the request of the collector or donor, or because of rarity or site secrecy.
- 4.6 The enquirer, having made an appointment to see a collection, must then be able to see any specimen within it, if it is on the premises, within 30 minutes.
- 4.7 A suitable study-area should be available with good light, power point, equipment to read any records kept on disk, fiche etc, low-powered binocular microscope, clear table space, access to washbasins (with bactericidal soap) and WC, and free of food, drink and tobacco-smoke.
- 4.8 Enquirers with disabilities must have, as far as possible, as ready access as any other enquirer.

Guidelines and notes

- 4.9 An enquirer should be regarded as *bona fide* unless there is reason to believe that he or she is contravening or intends to contravene the law or relevant codes of ethics. See 10.3 for standards of invigilation.
- 4.10 The study area should as far as possible, have the same environmental conditions as those in which the collections are normally kept. A working library should be available for the use of researchers; a useful booklist is:

The Systematics Association, *Keywords to the flora and fauna of Great Britain and Northern Europe*.
- 4.11 The museum will need to balance the good aim of encouraging access to its collections with the requirements of conservation and of security (see especially 10.3.2). Enquirers who need to handle specimens should be advised on how to do so safely; some specimens may be too fragile to handle at all (see Section 13).

Sources of advice and help

- Museums & Galleries Commission/ *United Kingdom*, (and accompanying Museums Association, *Guidelines on Resource Directory*), 1992, Museums & Galleries Commission, London.
- *Disability for Museums and Galleries in the*

5

Standards governing the loan of specimens

- 5.1 Subject to the guidelines below, material in museum biological collections should be available for loan. Specimens loaned should be appropriate to the purpose of the loan; scientifically important material should not be loaned for trivial purposes. An institution may decline or modify loan requests that make unrealistic demands on the use of the collections, or where the loan could lead to harm or loss.
- 5.2 Every museum must have a written loans policy and standard conditions; these conditions may vary for different subject areas to reflect accepted conventions applying to loaned specimens.
- 5.3 Loan agreements should be signed and retained by museum and borrower.
- 5.4 All biological material is valuable and irreplaceable, so loans must be packed carefully and securely. Suitable quality containers, packing materials and means of transport must be provided.

Guidelines and notes

- 5.5 There is a tradition of loans between scientists which has contributed greatly to the progress of natural science. However, such loans inevitably put specimens at extra risk. The loaning of type material is becoming more controlled among institutions. For well known groups, such as birds and mammals, the types at larger institutions are virtually never loaned. Similar strategies are being considered in some other disciplines (eg invertebrates) because of the damage type specimens are receiving. Responsible museums will therefore approach the drafting of a loans policy with great care, and will ensure that the policy is rigorously observed.
- 5.6 Museums which make many loans should keep a register of approved borrowers, both institutions and individuals, who may be required to provide references. When loaning to employees or affiliates of an institution, specify that the responsibility rests jointly with the individual and the institution.
- 5.7 Specimens should be packed in leak-proof, airtight containers. Remember that material sent by air will be exposed to low temperatures and pressures during the flight, and that all material entering Australia will be fumigated.
- 5.8 Type, cited and figured material:
- should be loaned to private addresses only in exceptional circumstances;
 - should not be lent for more than six months;
 - wherever possible should be transported by hand, and if not possible should be sent by Registered Post within the UK, Insured Letter or Insured Small Packet or Parcelforce International Standards to countries outside Europe¹;
 - should be restricted to six primary types within a single loan (and then preferably divided into more than one parcel).

5.9 Material that is not type, cited or figured:

- may be lent for longer periods, but the recommended initial period is one year, renewable on written request;
- should not normally be sent where it represents more than half of an institution's holding of a given species or of a collection from a major geographical region;
- should normally only be sent to recognised institutions unless special arrangements are made²;
- should ideally be sent abroad by Insured Letter or Insured Parcel¹;
- when sent abroad, should be addressed to a named individual care of an institution.

5.10 The written agreement between the lender and borrower should normally require the borrower:

- to arrange insurance as required;
- to acknowledge receipt of the loan within one week;
- to abide by the loan conditions, and in particular not dissect, section, clean, stain or in any way alter, treat or sample specimens or their mounts, preservatives or containers without prior written permission;
- to accept that all specimens and preparations made from them remain the property of the loaning museum;
- to confirm or re-determine specimens whenever possible. New information should be entered on fresh labels, signed and dated; original labels should never be removed, obscured or defaced;
- not to transfer the specimens to a third party, or remove the specimens to a different institution, without prior written permission;
- to request any extension of the loan period at least one month before the end of the current loan, and to agree to return the loan at any time it is requested by the lending museum;
- to return loans by the same, or a better, agreed method as that by which the loan was received. A return address slip should always be included inside the package. The borrower should send a letter advising the lender that the material is being returned.
- if the results of the study of the borrowed material are to be published:
 - to obtain any catalogue/accession number from the lending museum and not to assign their own number or letters;
 - to credit the lending museum in a specified way;
 - to provide the lending museum with a specified quantity of the resulting publication;
 - to accept that permission to reproduce any photograph of the specimen must be sought from the lending museum unless waived in writing.

See over for sources of advice and help and footnotes

Sources of advice and help

Useful references include:

- Hounsome, M. V., 'Research: natural science collections', in Thompson, John M. A. et al (eds), *Manual of Curatorship*, 1992 (2nd edition), Butterworth-Heinemann/Museums Association, Oxford.
- Merritt, E., 'Trust or Verify: conditions on outgoing loans', *Collection Forum*, 1992.

Footnotes

¹ The Post Office states that abroad Insured Letter, Insured Small Packet (both up to 2kg) or Parcelforce International Standard services confer greater security than Registration. Parcelforce International Standard Service provides automatic insurance to all countries except Nigeria, Romania and the Philippines. Nigeria accepts insurance on letters and small packets, so Romania and the Philippines are at present the only countries to which it is recommended that type, figured or otherwise important material should not be sent by post. Consult the Parcelforce Guide and the Royal Mail International Service Guide for details of countries and also for details of the necessary Customs declarations.

² There is a risk that a private address borrower may die or move house, making it difficult or impossible to recover the loan. Therefore such loans should only be made after a suitable person (eg a solicitor or someone employed at a *local* biological institution) has agreed in writing to accept responsibility for the return of the loan.

6

Standards for documentation*

- 6.1 Entry records must be maintained for all specimens deposited in the museum, whether as enquiries, loans or potential acquisitions.
- 6.2 Bound registers must be maintained with records about all accessions, each including an accession or inventory number and sufficient information for collection management purposes. Long term loans must be similarly recorded either in the same or a parallel register. Fully automated accession systems must be backed up by a bound hard-copy record on archival-quality paper.
- 6.3 Each accession and (where appropriate) each individual specimen must be marked or labelled with a unique accession or inventory number. Such marking must not damage the specimen or obscure features of taxonomic importance. Any previous marking must be preserved or recorded, and all old labels must be preserved. The documentation system must ensure that the links between individual specimens and all associated data are maintained.
- 6.4 A catalogue must normally be maintained, bringing together all the primary information about each item or group in the collection.
- 6.5 Appropriate indexes, or equivalent information retrieval facilities, must be maintained, including taxonomic name, collector, locality, donor, and location in storage or display.
- 6.6 Back-up copies of key records, including entry records, accession records, catalogue records and current exit records must be made regularly and kept in a separate building.
- 6.7 All original records relating to collections, including field notebooks, must be preserved.
- 6.8 The documentation system must record every movement of a specimen both inside, and in and out of the museum.
- 6.9 Every new acquisition must be accessioned as soon as possible and at least within one year, and the museum must adopt a formal policy incorporating a timetable designed to address any backlog of documentation.
- 6.10 Documentation must meet the requirements of the *Wildlife and Countryside Act*, 1981, the *Misuse of Drugs Act*, 1971, and the *Data Protection Act*, 1984.

Guidelines and notes

For biological collections the data that should be recorded is of four types:

- inherent in the specimen, eg taxonomic identity, sex, dimensions, preparation method, etc. If not recorded, even inherent information can be lost, eg a prosobranch shell with its operculum attached indicates that the specimen was live collected; if the operculum is allowed to become separated this important knowledge is lost;
- global to all the specimens in a collection, eg acquisition details, including details of collector, field notebooks, etc. Every specimen must remain linked to such global information through its accession number;

- associated with the specimen, eg field collection information (labels, notebooks, etc). The type of container or label (handwriting, shape, size, etc) - or even the colour and texture of the cotton wool used can sometimes be important in researching the past history of specimens. If it is necessary to separate the specimen from its original container, all marks, labels or numbers must be transferred or transcribed (preferably by lifting/cutting off or by photocopying) and retained with the specimen. Where all the containers of a large collection are similar, examples could be retained in a reference collection of original containers, and a cross-reference kept with the specimen. Colour photographs of collections as they arrive are also recommended;
- post-accession information, eg research events (re-identification, selection as neotype, etc), publication, or the history of conservation of the specimen.

Sources of advice and help

- An invaluable introduction to museum documentation is: *Facts and artefacts: how to document a museum collection*, Museum Documentation Association, Cambridge, 1991.
- The Museum Documentation Association determines standards for museum documentation, publishes appropriate guidance, record cards and computer programs, and offers general advice on all aspects of documentation.
- Data standards are expanded and explained in the *MDA Data Standard*, 1991, Museum Documentation Association, Cambridge. A leaflet introducing the standard is available free from the Museum Documentation Association.
- Advice can be obtained in the first instance from the Area Museum Councils or direct from:

Museum Documentation Association
 347 Cherry Hinton Road
 Cambridge CB14DH
 (Tel 0223 242848)
 (Fax 0223 213575)

- Museums in Scotland may also obtain advice from the Scottish Museums Documentation Unit of the National Museums of Scotland.

- Other useful references include:

Garret, K. L., 'Documentation guidelines for preparation and conservation of biological specimens', *Collection Forum*, 1989, Volume 5, Number 2, pp 47-51,

Roberts, A. (ed), 'Discipline developments: natural history and geology' in *Terminology for museums*, 1990, Museum Documentation Association, Cambridge.

Davis, P., 'Documentation of collections' in Stansfield, G., Mathias, J. and Reid, G., *Manual of Natural History Curatorship*, (forthcoming), HMSO, London.

Footnotes

*'Documentation' in this booklet means all the recorded information a museum holds about its collections, and also the gathering, storing, manipulation and retrieving of that information.

7

Standards for museum biological research

- 7.1 The museum governing body must formally approve a policy for biological research, which should be regularly reviewed.

Guidelines and notes

- 7.2 Research is fundamental to the function and purpose of a museum, though its form will vary greatly between museums of different sizes and types. The first responsibility of the biological curator is to understand the collections, their identification, history and condition. Some museums will be able to go on to carry out wider scientific research based on those collections, eg in taxonomy or ecology.

- 7.3 The museum's research policy should preferably be written as part of the museum's development plan and/or collections management policy. It should be realistic and relevant to the museum's collections, its staff and resources and to its public role.

- 7.4 The House of Lords Select Committee on Science and Technology has stressed the link between research and curation:

"There can be no doubt that, ideally, collections should ultimately fall under the care of a staff member who is given the opportunity to take an active research interest in the field and who will know to whom to turn for expertise beyond his own immediate ken. Unless a collection is exposed to research activity - preferably on an in-house basis - its utility will diminish because designation and arrangement of the material will not reflect the latest research.

We agree with those witnesses who maintained that visits from researchers from other institutions or overseas are no substitute for regular in-house research. At second best, there may be scope for appointing honorary curators from other institutions within the United Kingdom who are able to give regular and sustained attention. And regular visitors from overseas might be willing to undertake similar responsibilities. Suitable financial arrangements could be made in respect of work done.

Accordingly we recommend that no important collection be left without regular, though not necessarily continual, attention from a researcher or scientific officer who is contracted so to do.

However it is inevitable that much routine care will fall on technicians and their skills must be maintained at the requisite levels by in-house training and/or other means. They should be perceived by all concerned as part of a research team which is advancing systematic knowledge as a product of their collective activity. Technicians should be encouraged to keep abreast of, and indeed themselves develop, modern curatorial skills".

- 7.5 The museum's research policy should include reference, where appropriate, to the circumstances under which destructive or damaging research on accessioned specimens may take place, including whether a curator has delegated responsibility for such decisions. Non-destructive procedures should be used wherever possible.

- 7.6 The museum research policy should be drafted in discussion with neighbouring and related museums and with appropriate local and national academic societies and specialist groups; help can be given by staff at the relevant national museums and by the Biology Curators Group.

Sources of advice and help

- A valuable introduction to biological research in museums is:

Hounsome, M. V., 'Research: natural science collections' in Thompson, John M. A. et al (eds), *Manual of Curatorship*, 1992 (2nd edition), Butterworth-Heinemann/Museums Association, Oxford.

- House of Lords Select Committee on Science and Technology, Session 1991-2, First Report, *Systematic Biology Research* (HL Paper 22), 2 vols, 1992, HMSO, London, is essential reading.

- Miller, E. H. (ed), *Museum collections: their roles and future in biological research*, 1985, British Columbia Provincial Museum.

8

Standards for the care of living collections

- 8.1 Museums caring for live animals and plants must provide adequate facilities, funds and trained staff to provide continuous care, seven days a week for normal maintenance and twenty-four hours a day cover in the event of emergencies.
- 8.2 The provisions of the *Zoo Licensing Act*, 1981 must be observed.
- 8.3 The provisions of the *Health and Safety at Work Act*, 1974 applying to zoos must be observed.
- 8.4 *The Secretary of State's Standards of Modern Zoo Practice* must be observed.

Guidelines and notes

- 8.5 Live animals and plants used in museum displays, or for research purposes, represent a major curatorial commitment and there is a moral, ethical and legal responsibility to manage such collections to the highest standards. Animals and plants cannot await human convenience, and may die if given inappropriate or insufficient attention. Carefully conceived routine maintenance programmes and sound long-term planning for development are crucial.
- 8.6 Live animal displays in museums (eg aquaria, vivaria, formicaria, beehives, city farms) are subject to the provisions of the *Zoo Licensing Act*, 1981. All public displays (however small) must, following an inspection by the Department of the Environment, either be licensed through the local authority or have gained a special exemption from licensing. Other legislation, codes of conduct and ancillary documentation concerning the welfare and conservation of wild and domesticated animals in captivity also apply to a zoo's public and private functions.
- 8.7 The health and safety of visitors and staff in zoos is subject to the broad provisions of the *Health and Safety at Work Act*, 1974 - the enforcement responsibility for which was, in respect of zoos, transferred to local authorities in 1984.
- 8.8 When introducing living displays of plants to a gallery environment, care should be taken to use only sterile growing materials; spray regularly against insect pests using biological methods of control wherever practicable; provide adequate ventilation, and monitor the effect of watering and transpiration on humidity levels in the surrounding air spaces; and maintain suitable facilities for acclimatising newly acquired plants to the light levels and temperatures prevailing within the gallery.
- 8.9 Safety standards in electrical installations need close attention, especially in aquarium display areas. Splash or condensation proof fittings and residual current circuit breaking devices (RCCDs) should be incorporated. Strict safety and security procedures must be adopted for animals which are scheduled under the *Dangerous Wild Animals Act*, 1976, or which might otherwise be reasonably regarded as 'hazardous'. In the case of venomous animals, the current antivenom must be held by (or be immediately available to) the museum and formal accident and emergency procedures should be established with a local hospital.
- 8.10 In staffing, a relief shift system is essential, together with emergency arrangements in relation to animal escapes and to the breakdown of mechanical or electrical services operating the life support systems (eg heating, cooling, lighting, aeration, water purification).

- 8.11 Development work - establishing new displays or improving back-up facilities - must be allowed for in the staffing and revenue budgets and should never supersede essential routine livestock husbandry or maintenance of life support systems.
- 8.12 Environmental and pest control is important in living display areas. However, environmental conditions appropriate to livestock (eg hot, humid and brightly lit) will often be damaging to other museum collections; and standard museum methods of pest eradication could contaminate livestock areas. To minimise such problems, there is a need to separate living from non-living displays and to operate systems for environmental and pest control.
- 8.13 Documentation, through detailed animal and plant stock records, is necessary for licensing and general management purposes and for propagation or breeding programmes. Livestock records should be in a standardised format and easily retrievable (eg through a card file index or computerised system) and should be maintained for at least six years following the death, loss or disposal of stock from the collection. Species records should contain accurate data on taxonomic identity, origin/provenance, dates of entry to and exit from the collection, reproductive generation, clinical treatments and post mortem details. Annual statistical summaries of species records should be compiled for the 1st of January.
- 8.14 There should be a formal written Acquisitions Policy for Livestock. In obtaining specimens, care must be taken not to breach the *Wildlife and Countryside Act, 1981*, or other relevant nature conservation codes or conventions, eg *Convention on International Trade in Endangered Species (CITES)*.

8

Sources of advice and help

- Advice on proper zoo management is given in *The Secretary of State's Standards of Modern Zoo Practice* (supplied by the Department of the Environment and updated at intervals). This covers general welfare, health, hygiene, the provision of sufficient space, veterinary requirements, post-mortem procedures, transit arrangements, specifications for safety and security and necessary facilities for visitors.
- The *Health and Safety at Work Act* in relation to zoos is interpreted through a Health and Safety Commission Document, 1985: *Zoos - Safety Health and Welfare Standards for Employers and Persons at Work*. In concert with the Secretary of State's Standards (above), this document deals with topics such as: enclosures for dangerous animals, access provision, training, systems of work, escapes of animals, instruction, training and supervision of staff, veterinary procedures, the disposal of clinical waste and aspects of basic health welfare and sanitation.
- *The Control of Pesticides Regulations, 1986*, must be observed when applying pesticides to plants accessible to the public. Staff should obtain the necessary certificates of competence in the use of spraying equipment, including hand-held applicators. A suitable Control of Substances Hazardous to Health (COSHH) Regulations assessment must be made.
- Advice and help can be obtained from
 - Biology Curators Group (BCG)
 - Wildlife Division,
Department of the Environment,
Tollgate House,
Houlton Street,
Bristol, BS2 9DJ
 - National Federation of Zoological Gardens of Great Britain and Ireland,
Zoological Gardens,
Regent's Park,
London, NW1 4RY
- Useful references are:
 - Reid, G. M., 'Zoo Licensing Act 1981 - implications for museums with live animal displays', *BCG Newsletter*, 1984, Volume 3, Number 10, pp 576-585.
 - Reid, G. M., 'Law, ancillary documentation and live animal displays in museums - the lower vertebrates', *BCG Newsletter*, 1988, Volume 4, Number 10, pp 170-176.

Reid, G. M., 'Live animals and plants in the museum' in Stansfield, G., Mathias, J. and Reid, G. (eds), *Manual of Natural History Curatorship*, (forthcoming), HMSO, London.

- On health and safety aspects:

Richards, P., 'Health and Safety', in Stansfield, G., Mathias, J. and Reid, G. (eds), (forthcoming), *op cit*.

9

Standards for biological recording

- 9.1 The museum's governing body should formally approve a policy for biological recording, covering:
- the level of service to be provided;
 - access, charging, copyright and use of data;
 - resources: staff (including training), premises and finance.
- 9.2 Museums should liaise closely with other statutory and voluntary organisations - international, national and regional - concerned with the collection and use of biological data.
- 9.3 The collecting of biological records should be guided by the same legal and ethical considerations as the collecting of specimens (see Section 1).
- 9.4 Biological records should be subject as far as possible to the same level of protection as other museum records (see Section 16).
- 9.5 All museums should make information from their collections and fieldwork available to the local Environmental Records Centre and to national and regional recording schemes.
- 9.6 A museum wishing to establish an Environmental Records Centre should ensure that adequate staffing, premises and funding are and will remain available.

Guidelines and notes

- 9.7 All museums with biological collections *ipso facto* hold biological records. It is important that they recognise this fact and make adequate arrangements to maintain their biological records and to make them available.
- 9.8 The Co-ordinating Commission for Biological Recording and the National Federation for Biological Recording are developing guidelines and standards. All museums should seek to co-operate with them and to meet the standards they determine.
- 9.9 Environmental Records Centres are a means of formalising the recording of biological data, often together with geological and sometimes also archaeological and historical data. They maintain species, habitat and site information, and liaise with the numerous national and regional species recording schemes and provide data to a wide variety of users, including planning authorities, researchers, schools, environmental agencies, developers, amateur naturalists and museums. Environmental Records Centres constitute major regional databases, and are a crucial part of the national system of environmental recording. Much of the United Kingdom is now covered by such centres which are linked by the Co-ordinating Commission for Biological Recording.

Sources of advice and help

- Advice on biological recording can be obtained from:

National Federation for Biological Recording
c/o Monks Wood Experimental Station
Institute of Terrestrial Ecology
Monks Wood
Abbots Ripton
Huntingdon PE17 2LS

Biological Recording in Scotland Campaign
c/o Scottish Wildlife Trust
Cramond House
Kirk Cramond
Edinburgh EH4 6NS

Co-ordinating Commission for Biological Recording
c/o Monks Wood Experimental Station
Institute of Terrestrial Ecology
Monks Wood
Abbots Ripton
Huntingdon PE17 2LS

- An essential introduction is:

Ely, W., 'Biological Recording', in Stansfield, G., Reed, G. and Mathias, J. (eds) *Manual of Natural History Curatorship*, (forthcoming), HMSO, London.

- Further valuable background will be found in:

Berry, R. J. (ed), *Biological Survey: Need & Network. Report of a Working Party Set Up by the Linnean Society*, 1988, PNL Press, London.

Stansfield, G. and Harding, P. T. (eds), *National Perspectives in Biological Recording in the UK*, National Federation for Biological Recording, 1990.

Part Two: Protecting
Collections

10 Standards for protection against theft

10.1 Standards for physical protection

- 10.1.1 The STRUCTURE of the building or area in which collections are kept must be capable of withstanding a determined attack by an intending thief or vandal.
- 10.1.2 WINDOWS must be physically defended so that an intruder is deterred from trying to get in or is delayed long enough to allow a supporting intruder alarm to trigger a response before the intruder can enter, steal and escape.
- 10.1.3 DOORS must be physically defended to the same standard as windows.
- 10.1.4 SHOWCASES must not be regarded as the primary protection against theft of display material when the building is unoccupied. Their construction must provide a level of security appropriate to the risk.
- 10.1.5 STORES housing collections must be kept locked; specimen cabinets themselves should be locked.

Guidelines and notes

- 10.1.6 Further advice on these standards and guidelines can be obtained from the Museums & Galleries Commission's Museums Security Adviser.
- 10.1.7 The structure of the building should be in at least 9" (230mm) cement mortar/clay brickwork or material of the equivalent penetration resistance.
- 10.1.8 The number of windows should be reduced to the essential minimum. Windows no longer required should be bricked up using clay bricks or equivalent and cement mortar fully keyed into the existing walling, or by other methods agreed with the Museums Security Adviser. Windows in use should be protected by means agreed with the Museums Security Adviser.
- 10.1.9 Doors to the outside should be reduced to the minimum, leaving only those required for entry or as Emergency Exits. Unused doors must be bricked up as with windows, or blocked by other methods agreed with the Museums Security Adviser. Remaining doors should be of at least 2" (50mm) thick solid construction and fitted with security standard mortice deadlocks. If doors of lesser quality are to be retained, they should be protected by internal roller shutters or folding metal gates. Emergency exit doors should be fitted with modern quick release door furniture which must be capable of being deadlocked when the building is unoccupied.
- 10.1.10 Pitched ROOFS of slate or tile should be fitted over close-boarded timber. Where roofs are to be constructed of other materials advice should be sought from the Museums Security Adviser. Unauthorised access to the roof should be limited by physical barriers, such as fencing, anti-climb paint or anti-vandal barriers.
- 10.1.11 The risk to specimens will vary enormously, depending on the value of the specimen, type of visitor, neighbourhood, etc. The risk should be assessed with the Museums Security Adviser and Crime Prevention officer and appropriate showcases, etc provided. Birds eggs are a high risk item. Natural history collections may attract hostility from those who wrongly associate them with offenses against animal rights.

10.2 Standards for perimeter alarms

- 10.2.1 All openings in the building fabric, such as doors, windows and rooflights, must be fitted with intruder detectors. An intruder detection alarm system which qualifies for a NACOSS certificate and is to BS 4737: *Intruder Alarm Systems in Buildings* specification should be fitted by a reputable company.

Guidelines and notes

- 10.2.2 The system should be as simple as possible to avoid an unacceptable false alarm rate and should depend upon suitable sensors fitted to doors and other openings. Movement or body heat detectors, being prone to false alarms, should be used only where absolutely necessary and in limited numbers.
- 10.2.3 The signalling of an alarm condition should be by means of a monitored line to an alarm company's central station or where appropriate, an internal controller. This will give an alarm if the line is cut.

10.3 Standards for invigilation

- 10.3.1 The level of invigilation of the displays must be appropriate to the risk.
- 10.3.2 The bona fides of all researchers, volunteers and others handling specimens and data must be checked, and they must be adequately supervised.
- 10.3.3 Nobody must be allowed into museum stores unless accompanied by an authorised member of staff.

Guidelines and notes

- 10.3.4 The risk to items on display should be assessed and an appropriate level of invigilation be provided. This level must never be reduced; if sufficient invigilators are not available the gallery, or even the whole museum should be closed. Special care should be taken at unusual times, eg exhibition installation or evening events.
- 10.3.5 Researchers have, unfortunately, been responsible for serious thefts from museums. Even the most senior scholars should understand the need for tactful, but strict, invigilation.
- 10.3.6 The Museums Association's *Guidelines on Security when Using Outside Contractors*, published annually in the Museums Yearbook, (Museums Association, London), should be observed.

10.4 Standards for key security

- 10.4.1 A strict policy regarding the possession of keys must be devised and enforced.

Guidelines and notes

- 10.4.2 There should never be more keys than is strictly necessary and the number of people in possession of keys should be kept to the barest minimum. All keys, both to doors and cabinets, should remain within the building in a secure key cabinet or safe, and should be identified by a coding system. Only door keys held by keyholders and keys to safes should be allowed to leave the buildings. An issue system against signature should be used as a security measure.

Sources of advice and help

- The following publications form a useful introduction to museum security:

a leaflet published by the Museums & Galleries Commission *Museum and Gallery Security*, 1989, Museums & Galleries Commission, London.

Hoare, Nell, *Security for Museums*, 1990, Committee of Area Museum Councils.

Burke, R. and Adloye, S., *Basic Museum Security*, 1991 (2nd edition), International Council of Museums, Paris.

Kluwer Handbooks, *Handbook of Security*, Updated periodically, Croner Publications Ltd. Kingston on Thames.

Dovey, Bryan, 'Security' in Thompson, John M. A. et al (eds), *Manual of Curatorship*, 1992 (2nd edition), Butterworth-Heinemann/Museums Association, Oxford.

Museums Association's *Guidelines on Security When Using Outside Contractors*, published annually in *Museums Yearbook*, Museums Association, London.

- Advice is readily available from the Museums & Galleries Commission's Museums Security Adviser (Tel 071 233 4200) and from the Area Museum Councils.

11

Standards for protection against fire

- 11.1 The museum building must be designed or adapted to minimise the risk of fire and to prevent its spread.
- 11.2 Areas housing collections must be rigorously insulated to a high standard (not less than half an hour protection, but preferably one hour) from fire spread from areas of risk, eg workshops, laboratories, kitchens, boilers, chemical stores. The risk must be reduced as much as possible, eg by using an external chemical store. If chemicals are stored within the building, it must be in accordance with the advice of the local authority's Fire Officer. A suitable Control of Substances Hazardous to Health (COSHH) Regulations assessment must be made.
- 11.3 Specimens preserved in spirit must be kept in a separate spirit store. This must be insulated to the same standard as areas housing collections, (see 11.2).
- 11.4 All electrical wiring and equipment (including portable equipment) must be installed in accordance with the appropriate British Standard, the Institute of Electrical Engineers' Regulations and the Electricity at Work Regulations, and must be regularly maintained and checked as required by those regulations. All mechanical equipment must also be installed in accordance with the appropriate British Standard and statutory instructions and must be regularly maintained.
- 11.5 The Fire Officer's advice must be sought on the selection of all materials used in displays and storage areas. Normally all such materials should be fire-retardant.
- 11.6 The Fire Officer must be invited - quite apart from any statutory responsibilities - to inspect the premises at least once a year, and must be made aware of the particular requirements of museums. The Fire Officer's recommendations must be reported to the museum's Board of Management. The approval of the Fire Officer must be sought when any building alterations are to be carried out.
- 11.7 All contracts for building work on the premises must be on a 'Permit to Work' basis and must include a "hot-work clause" to cover the safety regulations contained in Section 31(4) of the Factories Act 1969.
- 11.8 All parts of the building must be covered by an automatic fire-detection and alarm system, installed and maintained in accordance with BS 5839: *Fire Detection and Alarm Systems in Buildings*.
- 11.9 The premises must be equipped with fire-fighting equipment as recommended by the Fire Officer and complying with BS 5423: *Portable Fire Extinguishers*, and BS 5306: *Fire Extinguishing Installations and Equipment on Premises*.
- 11.10 Fireproof cabinets must be provided to house the primary records and museum documentation.
- 11.11 All staff and volunteers must regularly attend training in fire prevention and response. The level and standard of this training must be at least consistent with *Part 1 (18) Fire Precautions Act 1971*.

Guidelines and notes

- 11.12 A survey is needed to decide the type, number and location of fire-detection sensors appropriate to the building. Indeed, a wider ranging survey can be undertaken to identify specific risks, and precautions required, to provide a fire precautions manual containing checklists and disaster plans (see Section 18) and to set out a reporting procedure. Both specialist companies and many major security firms can give such advice.
- 11.13 Fluid-preserved specimens can present a considerable fire hazard because of the flammability of ethanol, the major component of spirit preservatives. Evaporation of the ethanol from containers can lead to explosive concentrations in store rooms, cabinets and workrooms. These should be well ventilated by spark-proof fans and lighted with sealed-beam luminaries with spark-proof switches. Provision must be made for accidental spillage in both stores and workrooms.
- 11.14 High quality cork-lined wooden entomology cabinets give good fire protection.
- 11.15 Smoking should be confined to designated parts of the premises which do not contain collections.

Sources of advice and help

- Information about UK fire authorities and companies offering prevention and detection services is contained in the *Security & Fire Prevention Yearbook*, available from:

Paramount Publishing
17-21 Shenley Road
Borehamwood
Herts

- Other useful information such as safety data sheets can be obtained from:

Fire Protection Association
140 Aldersgate
London EC1

and

Fire Prevention Information
Aldermay House
Queen Street
London EC4N 1TJ

- Many museums are in historic buildings, whose adaptation to meet fire prevention and security requirements often causes problems. *Fire safety in historic buildings*, 1990, published by the Fire Protection Association is a useful source of advice. Area Museum Councils can also give advice - directly or through consultants - on possible solutions.

- Useful information on the interpretation of the *Fire Precautions Act, 1971* can be found in: *Code of practice for fire precautions in factories, offices, shops and railway premises not required to have a fire certificate*, HMSO 1989, and in *Fire Precautions Act 1971, precautions in existing places of work that require a fire certificate*, HMSO.

- Helpful advice is contained in:

East Midlands Museums Service, *The Museums and Records Office Emergency Manual*, 1991, East Midlands Museums Service, Nottingham.

12

Standards for protection against flood

- 12.1 As far as possible, no pipework or tanks should be permitted in new buildings in areas where collections are kept; every effort must be made to exclude them from such areas in old buildings.
- 12.2 No specimen which CAN be raised, should be placed lower than six inches (150mm) above the floor.

Guidelines and notes

- 12.3 "If a flood can occur, one day it will"; this assumption should guide all arrangements in the museum. Floods often come from above the museum.
- 12.4 Compliance with relevant building regulations and recommendations, especially in old buildings, may make complete exclusion of pipework difficult. Every effort should be made, in discussion with the appropriate technical consultant, to find a satisfactory compromise solution. In areas where specimens can be raised off the floor, one solution may be to run the pipework at ground level rather than ceiling level. Automatic cut-off valves should be installed, and leak detectors are desirable.
- 12.5 All pipework and stop-cocks should be labelled in accordance with BS 1710: *Identification of pipelines and services*, should be noted on the building plan in the museum's Disaster Plan, and should be very frequently inspected during frosts.
- 12.6 Flood plain level should be taken into account when planning new facilities.
- 12.7 Adequate drainage to cope with flooding should be provided; drains should have non-return traps.
- 12.8 The danger of water-damage as a result of fire should be considered in the museum's Disaster Plan (see Section 18) and should be regularly discussed with the Fire Brigade.
- 12.9 As extra protection from water leaking from above, the tops of shelves and showcases should, where possible, be protected with polythene sheeting. Waterproof boxes, cabinets, etc should be used wherever possible.
- 12.10 All staff and volunteers should receive regular training in flood prevention and response.
- 12.11 Section 18 gives standards for disaster planning.

Sources of advice and help

The Fire Brigade will provide advice on the prevention of flooding.

13 Standards for protection against physical damage

- 13.1 All specimens must be provided with physical support appropriate to their vulnerability.
- 13.2 Suitable equipment and adequate space must be available for the safe moving of specimens.
- 13.3 The appropriate method of handling each specimen must be determined and used.
- 13.4 Fragile specimens must not be exposed to sudden shocks or excessive vibration.
- 13.5 Specimens must never be handled unnecessarily.
- 13.6 Specimens preserved in fluid must be kept topped-up with the appropriate fluid.

Guidelines and notes

- 13.7 Some natural history specimens are amongst the most fragile of all museum objects. Specimens may be damaged by being dropped or knocked or collapsing under their own weight (eg an old mounted specimen collapsing). A frequent cause of damage is the rubbing of specimens against one another in cabinets. Hence the need both for proper packing and for staff and volunteers to be trained in the handling and support of different types of specimen.
- 13.8 In storage and on display, specimens should be properly supported and suitable trolleys, lifting equipment and packing materials must be used for moving them. Specimens should not be stored at heights where access becomes difficult or dangerous.
- 13.9 The museum should define what is "necessary" and "unnecessary" handling for each specimen according to its scientific value and fragility. Some specimens, for example, will be offered to visiting parties to handle; those that may be used in this way should be identified.
- 13.10 Roller racking should be used with caution for fragile specimens, and showcases should be solidly constructed.
- 13.11 Static electricity is a danger to Lepidoptera and other delicate specimens. It can be generated, for example, by plastic drawers. A similar problem may be caused where a vacuum effect is created by tight seals to drawers or cabinets.
- 13.12 The purchase of ethanol for preserving specimens requires a licence from HM Customs and Excise.

Sources of advice and help

- Advice on techniques and equipment for moving, packing and housing specimens can be obtained through the Area Museum Councils and the Biology Curators Group.
Horie, C. V. (ed), *Care and conservation of natural history collections*, (forthcoming), Butterworth-Heinemann, Oxford.
- Advice can be found in
Cato, P. S., 'Characteristics of a collection of fluid-preserved mammals and implications for collections management'. *Collection Forum*, 1990, Volume 6, Number 2, pp 53-64.
Thompson, John M. A. et al (eds), *Manual of Curatorship*, 1992 (2nd edition), Butterworth-Heinemann/Museums Association, Oxford.

14 Standards for protection against damage due to poor construction or maintenance of buildings and of their furnishings and fittings

- 14.1 Buildings used for the display, storage or examination of specimens must be regularly inspected to ensure that they continue to provide adequate physical protection against the elements, and are generally fit for the purpose.
- 14.2 Maintenance of the fabric of the building must be given a high priority and funds budgeted for it. A badly maintained building will put a collection at risk from environmental damage.
- 14.3 Expert technical advice must be taken when planning modifications to the building or the introduction of measures to control the environment.
- 14.4 All collections and storage areas must be kept clean and tidy, and a regime for regular cleaning instituted.
- 14.5 Before environmental control equipment (eg humidity control, heating or air-conditioning plant) is installed, the environment of the area to be controlled must be monitored. A suitably qualified and experienced person must assess the condition of the building using the resulting data. Ideally, the monitoring should be for a period covering all four seasons and be related to the external climatic conditions during the period.
- 14.6 A programme for the regular maintenance of all environmental monitoring and control equipment must be established. Maintenance should be linked to use and not to the time since the last service. These costs should be built in to the budget.
- 14.7 All harmful biologically active agents must be eliminated from the collections, storage areas, buildings and plant.
- 14.8 A programme for regular monitoring of collections, buildings and plant for pests, etc must be instituted.
- 14.9 All incoming specimens, together with their associated packaging materials, must be inspected for the presence of biologically active agents before being introduced to the main storage or display areas.
- 14.10 Specimens must not come into contact, or into close association, with materials that emit harmful substances (gases, fumes or other forms of pollutant).
- 14.11 All materials used for the storage, display or transport of specimens must be tested by a recognised method before being used in the construction, fitting out or dressing of a display case or storage module.
- 14.12 All areas where specimens are stored or displayed must be kept in darkness when not in use by staff or visitors.
- 14.13 All maintenance, monitoring, cleaning, pest control or related work must be undertaken, or supervised, by fully trained and experienced personnel.
- 14.14 Any use of pesticides must be in accordance with the Health and Safety Commission Approved *Code of Practice for the Safe Use of Non-Agricultural Pesticides*.

Guidelines and notes

- 14.15 New building work, redecoration and routine cleaning can introduce contaminants such as dust, solvent fumes or large quantities of moisture which are potentially harmful to specimens. Action should be taken to remove dust and excess moisture before collections are re-housed following building work.
- 14.16 Recommended levels of relative humidity and temperature within a building can be more easily attained if it has been well maintained and is well insulated. The structure should be watertight, with all possible sources of damp (failed or non-existent damp courses, leaking pipes, water tanks, faulty guttering, missing roof-tiles, etc) identified and remedied. Basements and attics should be avoided as they are difficult to control environmentally.
- 14.17 Measures should be taken to stabilise the environment within a building or room. Insulation is one way of doing this, but professional technical advice needs to be taken. All apertures should be draught-proofed and blacking out windows or introducing double-glazing may help to reduce temperature fluctuations. However, the cause of temperature instability should first be identified, otherwise these measures can make the situation worse.
- 14.18 Where new building work, such as concreting and plastering, introduces moisture into a building, a period of time for drying out is required. The length of time will depend on the moisture content of the materials used and the thickness with which they have been applied. Surface drying can be speeded up using appropriately sized industrial dehumidifiers before the introduction of specimens into the space.
- 14.19 Dust causes damage directly and indirectly. It can cause surface damage, eg scratches; it encourages mould and corrosion by attracting damp, and it can act as a catalyst for other chemical reactions, such as fading.
- 14.20 Dust can originate from both internal and external sources; good housekeeping and simple preventive measures can be used to reduce levels to a minimum. Windows should be close fitting and kept shut, and concrete floors covered or sealed. All specimens should be in suitable containers or protected by dust sheets (avoiding use of all materials that build up static charge and so attract dust), and there should be large loop-piled doormats at the doors. The use of vacuum-cleaners with ultra-fine filters is recommended; these should conform to BS 5412: Section 2.2, Supplement 1, *Specification for type H industrial vacuum cleaners for dusts hazardous to health*.
- 14.21 Biologically active agents include rats, mice, birds, insects, fungi, algae, bacteria, etc.
- 14.22 The storage and use of pesticides is controlled under the *Control of Pesticides Regulations*, 1986. Emphasis should be on 'good housekeeping', but where this fails to prevent or control infestation, local treatment of affected items using approved pesticides should be undertaken. Remedial treatments to eliminate any biological pest should be minimal, in order to reduce potential risk of damage to specimens, to the environment and to staff and visitors. Non-toxic methods of pest control, such as freezing and the replacement of oxygen with other gases, are becoming more widely used.
- 14.23 Incoming specimens should ideally be kept in quarantine for at least three months and should be regularly inspected for pest or fungal activity. If infestation is found, reference should be made to a qualified conservator.
- 14.24 Many inorganic and organic materials are affected by gases, organic vapours and other compounds given off by substances in contact or close proximity to them. Specimens may thus be vulnerable to damage. Sources of these potentially harmful substances include: manufactured boards, natural fibres such as wool-felt and silk, fire retardant coatings, cleaning compounds, recently applied paint and adhesives, and some hardwoods, such as oak.

- 14.25 Both cleaning materials and materials for use in the display and storage of specimens should be tested for any possible harmful effects.
- 14.26 Concentrations of reactive gases like sulphur dioxide, ozone and nitrogen oxide can rise to high levels in city air, as can levels of smoke and building dust. These gases cause fading and degradation of organic materials, while the particles cause irremovable staining and soiling. These pollutants can be reduced in the museum by sealing windows, doors and ventilation points, and more efficiently by air-conditioning which incorporates air-scrubbers. Well sealed storage containers contribute significantly to protection from external pollutants. Photocopiers are a source of ozone.
- 14.27 Building and finishing materials give off both particles (eg sawdust and concrete dust) and vapours (eg ammonia and water) especially during and soon after application. Specimens should be protected from these effects; a new or newly decorated building should as far as possible not be used to house specimens until tests show that emissions have ceased. This may take some months.
- 14.28 Natural history specimens degrade slowly and may give off substances harmful to other specimens. In addition, some preservatives, such as DDT powder and formaldehyde solutions, present on specimens, may affect neighbouring specimens. (Approved products no longer contain DDT.)
- 14.29 As a result of a Control of Substances Hazardous to Health (COSHH) Regulations assessment, those specimens identified as giving off harmful vapours may need to be sealed in a containment cabinet (or require some other form of engineering control), and may require museum staff to wear personal protective equipment (including respiratory protection) when handling them.
- 14.30 All microscope slides should be wiped clean of immersion oil which can damage the mounting medium used in slide collections.

Sources of advice and help

- Advice can be given by:
 - Area Museum Councils
 - Biology Curators Group
 - The Conservation Unit of the Museums & Galleries Commission
- Advice on pesticides is available from all regional offices of the Health and Safety Executive and from:
 - Registration Section
 - Health and Safety Executive
 - Magdalen House
 - Stanley Precinct
 - Bootle
 - Merseyside L20 3QZ
- Several organisations, including some commercial conservation firms offer a testing service for the suitability of materials for use in exhibition or storage of museum specimens. These include:
 - Area Museum Council for the South West
 - North of England Museums Service
 - Wiltshire Museum Service
 - British Museum Conservation Department
- An up-to-date introduction to the whole field is:
 - Cassar, May, *Environmental Management: Guidelines for Museums and Galleries*, in preparation, Museums & Galleries Commission, London.
- The following publications are useful:
 - Chartered Institution of Building Services Engineers, *Lighting guide: museums and galleries*, (revised edition forthcoming), Chartered Institution of Building Services Engineers.
 - Health and Safety Executive, *Health and Safety Commission Approved Code of Practice for the Safe Use of Non-Agricultural Pesticides*, 1991, Health and Safety Executive.
 - HMSO, *Pesticides*, a list of permitted pesticides published annually on behalf of

the Health and Safety Executive and the Ministry of Agriculture, Fisheries and Food.

HMSO, *Control of substances hazardous to health in fumigation operations*, Control of Substances Hazardous to Health Approved Code of Practice, 1988, Health and Safety Commission.

Horie, C. V. and Murphy, G. (eds), *Conservation of natural history specimens: vertebrates*, 1988, The Manchester Museum.

Horie, C. V. (ed), *Conservation of natural history specimens: spirit collections*, 1989, The Manchester Museum.

Pinniger, D., *Insect Pests in Museums*, 1990 (2nd edition), Archetype Publications, Denbigh.

Stansfield, G., 'Conservation and Storage: Zoology Collections', in Thompson, John M. A. et al (eds), *Manual of Curatorship*, 1992 (2nd edition), Butterworth-Heinemann/Museums Association, Oxford.

• See also:

Storey, K. O., *Approaches to pest management in museums*, 1985, Smithsonian Institute, Washington DC.

Zychermen, C. A. and Schrock, J. R., *A guide to museum pest control*, 1988, Association of Systematics Collections.

• Valuable guidance on the use of freezing is given in:

Foreman, L. and Bridson, D., *The herbarium handbook*, 1990, Royal Botanic Gardens, Kew.

• The Health and Safety Commission and the Health & Safety Executive publish a great deal of information which is of interest to museum managers. Many publications are available free of charge. Contact HSE Publications Point, St Hugh's House, Stanley Precinct, Bootle, Merseyside L20 3LZ (Tel 051 951 4000). A full list of current Health and Safety Commission/Health & Safety Executive publications, *Publications in Series*, is published twice yearly.

15 Standards for protection against damage through poor internal environmental conditions (relative humidity, temperature and light)

- 15.1 Specimens must be kept at the relative humidity and temperature levels set out in Table A.
- 15.2 For organic materials, an equilibrium between the moisture content of the specimen and its environment must be maintained.
- 15.3 Sudden or extreme fluctuations in relative humidity and temperature must be avoided.
- 15.4 Temperature, relative humidity and light must be monitored in all storage and display areas, and the records assessed regularly with reference to the condition needs of the collection(s). At least every six months a conservator, or other suitably qualified and experienced person, must collate and assess the records. A report must be presented to senior management and any recommendations acted on.
- 15.5 Before environmental control equipment (eg portable humidifiers or dehumidifiers) is acquired or installed, the environment of the area to be controlled must be monitored and the resulting records collated and assessed by a conservator or other suitably qualified and experienced person.
- 15.6 All sensitive materials must be protected from excessive exposure to sources of natural and electric light.
- 15.7 Levels of visible light and ultraviolet radiation on display must be kept at, or below, the values set out in Table B.
- 15.8 The period of exposure to light must be kept to a minimum as damage by light is cumulative.
- 15.9 Specimens must be isolated from sources of direct heat, including the heat-producing components of lighting installations.
- 15.10 A programme for the regular maintenance of all environmental monitoring and control equipment is essential. Maintenance should be linked to use and not to the time since the last service. These costs should be built in to the museum's budget.
- 15.11 All maintenance, monitoring, cleaning work, etc must be undertaken, or supervised, by fully trained and experienced personnel.

Guidelines and notes

- 15.12 Little research has so far been done on the appropriate humidity levels in which to keep different types of biological specimens. The recommendations in Table A should be used with caution so that continuity of conditions with which the specimens have reached an equilibrium is maintained.
- 15.13 In order to achieve the most appropriate environmental conditions for all materials in the most cost effective way, stored collections should, as far as possible, be organised so that similar materials are kept together.
- 15.14 As temperature falls, relative humidity rises; as temperature rises, RH falls. This is true if no moisture comes in from outside or is generated from within the building, and there is no artificial control of the climate within the space.

- 15.15 The higher the temperature, the faster chemical and biological change occurs. For this reason, the temperature should be kept as low as is practicable in unoccupied areas, though this should not be such as to cause the relative humidity to rise above the recommended levels. It should be noted that legislation governs the minimum temperature for areas in which staff work.
- 15.16 Condensation can occur on the surface of a cold specimen when it is exposed to warm air. This is because a volume of warm air is capable of holding more moisture than the same volume of air at a lower temperature. The sudden drop in temperature around cold specimens will cause moisture to condense out of the cooled air onto the surface. Care should be taken when moving specimens from one area to another.
- 15.17 Sudden or extreme fluctuations in relative humidity, particularly if repeated, can cause dry organic materials to absorb or lose moisture and may result in cracking.
- 15.18 Controlling humidity by installing dehumidifiers and/or humidifiers in bulk storage areas can be more efficient and cost-effective than installing heating plant. This is because as long as relative humidity is held at the required levels, the temperatures can be allowed to fall.
- 15.19 Where it is not possible to provide all the appropriate conditions in individual rooms or zones, microclimates should be created; for example, in sealed showcases or polythene boxes within a general area maintained at the required relative humidity.
- 15.20 Measuring and recording the environment by regular spot-checks using a whirling hygrometer or electronic thermohygrometer is the minimum acceptable level of monitoring. Ideally, monitoring should be by continuous recording thermohygrographs (7/30 day charts) or by remote environmental sensors connected to a recording system. Conditions outside the building should also be monitored. A schedule of regular cleaning and calibration of all monitoring equipment should be instituted. Staff responsible for this work should be suitably trained.
- 15.21 Microclimates should also be monitored. A relative humidity indicator strip should be positioned so that it can be checked without opening the case or container.
- 15.22 All organic materials are light sensitive to some degree. Little research has yet been done to establish critical levels for different types of organic material. The most noticeable result of over-exposure to light is fading or discolouration, but structural damage can occur in the long term. Freeze-dried botanical specimens are particularly susceptible to fading. Over-exposure of microslides to light can cause staining media (especially blues and greens) to bleach out, and mountants to discolour. The standards can be attained by keeping all stores and display areas dark when not in use. Curtains, blinds or screens provide an effective way of reducing light levels cheaply.
- 15.23 Many apparently stable coloured materials undergo a rapid initial change of colour when exposed to light, although it may then take far higher doses of light exposure to cause further change. It is therefore important to ensure that all specimens being studied are exposed for the minimum duration. They should be covered when not being examined, and during breaks for lunch, etc.
- 15.24 Ultraviolet light levels can be effectively reduced by the application of protective film or varnish applied to windows and/or lamps. These films and varnishes have a limited life and require regular renewal. They should be checked with a hand-held UV meter or by checking their transmittance with a spectrophotometer before application, and at regular intervals to ensure that they are still effective. Lamps are now available from a limited number of suppliers which emit only 10-20 $\mu\text{w/lumen}$.

15.25 Both duration and level of illumination are important when assessing the possible damage caused by light; both should be kept to a minimum. Measuring exposure in lux-hours using an integrating light-meter provides a more accurate record of total exposure.

Total exposure (lux hours) = time (hours) x illuminance (lux)

15.26 Both natural and electric light sources produce heat which can damage specimens. Sharp or repeated fluctuations of temperature are particularly damaging and are to be avoided.

15.27 Specimens should be positioned away from sources of heat, and provision made to dissipate excess heat by ventilation, eg display cases with integral light boxes should provide for heat ventilation from above the light box. New forms of lighting are available, notably low-voltage lighting which creates less heat than older installations, and fibre optic lighting which produces no heat. Care must be taken in positioning transformers which also produce heat.

Sources of advice and help

- Advice can be given by:

Area Museum Councils
Biology Curators Group
The Conservation Unit of the Museums & Galleries Commission

- An up-to-date introduction to the whole field is:

Cassar, May, *Environmental Management: Guidelines for Museums and Galleries*, in preparation, Museums & Galleries Commission, London.

- The following publications are useful:

Chartered Institution of Building Services Engineers, *Lighting guide: museums and galleries*, (revised edition forthcoming), Chartered Institution of Building Services Engineers.

Stansfield, G., 'Conservation and Storage: Zoology Collections', in Thompson, John M. A. et al (eds), *Manual of Curatorship*, 1992 (2nd edition), Butterworth-Heinemann/Museums Association, Oxford.

Thomson, G., *The Museum Environment*, 1986 (2nd edition), Butterworths, London.

Scottish Museums Council, *Caring for Museum Collections*, a Video and Information Pack, 1990, Edinburgh.

Stansfield, G., Mathias, J. and Reid, G., *Manual of Natural History Curatorship*, (forthcoming), HMSO, London.

16 Standards for the protection of primary records

16.1 All museum records must be kept to the standards set out in Table C, (see also Section 9).

Guidelines and notes

16.2 As far as possible primary records should be duplicated so that the originals are handled as little as possible. The originals should be stored in a different building to the duplicates.

16.3 *Standard recommendations for storage and exhibition of archival documents.* The museum should aim to maintain all records to the standard set out in *BS 5454: British*

Sources of advice and help

- Informal advice is available from the Biology Curators Group, from the Area Museum Councils and from County Record Offices.

- Valuable guidance is contained in:

The Royal Commission on Historical Manuscripts *A Standard for Record Repositories*, 1990.

17 Standards for protecting people from specimens

- 17.1 The requirements of the *Control of Substances Hazardous to Health Regulations*, 1988, must be complied with in the storage and handling of specimens and the use of hazardous substances in their preparation and preservation.
- 17.2 The requirements of the fire, building and health and safety regulations must be complied with.
- 17.3 The *Misuse of Drugs Act*, 1971 and the *Misuse of Drugs Regulations*, 1985 (as amended) must be complied with.
- 17.4 Washing facilities must be provided and must be used by all staff handling specimens.

Guidelines and notes

- 17.5 Every museum will of course observe fire and health and safety regulations, but biological collections have their own particular hazards, to which attention is drawn here.
- 17.6 A small number of organisms contain toxins that will be present in fresh specimens and which may survive in preserved specimens. Examples are fern spores and snake venom. Exposure to these should be considered in the assessment required by Control of Substances Hazardous to Health (COSHH) Regulations.
- 17.7 Recently-dead specimens may offer particular hazards. Parasites, for example, can transfer to the handler and can transfer disease.
- 17.8 Hazardous materials have been used in the past for preparing and preserving specimens. These include arsenic oxides (skins and fluid-preserved specimens), mercuric chloride (botanical specimens), alcohol, glutaraldehyde and formaldehyde (liquid-preserved specimens), DDT and other pesticides (ubiquitous in dry specimens). Exposure to these should be considered in the assessment required by Control of Substances Hazardous to Health (COSHH) Regulations, and care should be taken in handling these specimens.
- 17.9 Before a specimen is handled, especially by inexperienced personnel, the potential hazards should be listed and their absence confirmed by the employer. Where there remains significant doubt about the presence of a hazardous material, or where it has been confirmed, the risks to those involved should be identified (by the employer), and appropriate precautions must be taken.
- 17.10 Adequate ventilation should be provided wherever specimens are store or handled; all staff should follow the correct procedures and use protective equipment, such as gloves and masks. Staff who handle specimens should receive regular tetanus injections.
- 17.11 Specimens preserved in alcohol can present a considerable fire hazard: see 11.13.
- 17.12 Museum staff and volunteers must be adequately informed and trained concerning those substances hazardous to health to which they may be exposed.

Sources of advice and help

- General advice on hazards can be obtained from the local office of the Health and Safety Executive. Advice on the particular hazards of biological collections can be obtained from the Biology Curators Group.
- *Control of substances hazardous to health regulations*, 1988 (2nd edition), Health and Safety Executive.
- Waller, R. and McAllister, D. E., 'A spot test for distinguishing formalin from alcohol solutions', in Waddington, J. and Rudkin, D. M. (eds), *Proceedings of the 1985 workshop on care and maintenance of natural history collections*, 1986, pp93-99, Royal Ontario Museum.
- Much helpful advice is contained in: Howie, F. (ed), *Safety in museums and galleries*, 1987, Butterworths, London.

18 Standards for disaster planning

- 18.1 The museum must draw up a disaster plan for the protection and rescue of the collections in the event of fire, flood or other catastrophe.
- 18.2 The plan must identify the scientifically most important specimens - notably any type specimens - and provide for their priority rescue.
- 18.3 All museum staff and volunteers must receive regular training in how to respond to disasters.

Guidelines and notes

- 18.4 The disaster plan is a written document which sets out procedures to be followed in an emergency. Its general contents will be known to all staff through prior discussion and through regular training sessions and emergency exercises; its details will provide an aide memoir, list of resources and telephone numbers for those finding themselves in control. Liaison with the public emergency services over its contents is essential; once written, it requires continued revision to ensure that it remains relevant.
- 18.5 The plan will include:
- responsibilities of personnel, method of raising alarm and communication to others;
 - emergency telephone numbers, including home numbers of staff;
 - confidential plan of building showing services, hazardous stores, etc. A separate copy of this should be available to the fire brigade on arrival;
 - priorities in mitigating damage to the collection, notably the precedence of type specimens;
 - sources of relevant expertise, including conservators and nearby museums, archives, etc as agreed beforehand;
 - list and locations of material and equipment, (every museum should have a 'disaster box' containing maps, buckets, cloths, overalls, etc);
 - list of suppliers and services (eg freeze-drying);
 - security measures for collection if premises damaged, including pre-arranged emergency storage accommodation;
 - first aid measures for damaged collections, by type of specimen, drawn up in consultation with conservators.
- 18.6 A complete record of the collection and its disposition within the store or display should be available some distance from the collection itself, and a duplicate should be held in another building.
- 18.7 Type specimens and other important specimens such as extinct, endangered, cited and historical material should be clearly identified; and kept where they are safest or can most easily be rescued.

Sources of advice and help

- East Midlands Museums Service, *The Museums and Records Office Emergency Manual*, 1991, East Midlands Museums Service, Nottingham.
- Anderson, Hazel and McIntyre, John, *Planning manual for disaster control in Scottish libraries and record offices*, 1985, National Library of Scotland, Edinburgh.
- Jenkins, I. A., *Disaster planning and preparedness: an outline disaster control plan*, 1987, British Library, London.
- Fire Protection Association, *Fire safety in historic buildings*, 1990, Fire Protection Association, London.
- Cackett, Susan, 'Disaster planning' in Thompson, John M. A. et al (eds), *Manual of Curatorship*, 1992 (2nd edition), Butterworth-Heinemann/Museums Association, Oxford.
- Advice can be obtained from the Area Museum Councils. In addition, The Conservation Unit of the Museums & Galleries Commission (Tel 071 233 3683, Fax 071 233 3686) maintains a Register of private conservators throughout England, Wales and N Ireland and a list of suppliers of materials. In Scotland this information is held by Historic Scotland's Conservation Bureau.
- The National Preservation Office video *If disaster strikes* is useful for training. Contact your Area Museum Council for hire or purchase of this video and to organise disaster contingency planning seminars.

A

Relative humidity and temperature for display and storage of biological specimens

Specimens	Ambient Temperature	Ambient Relative Humidity	Indications of Active Decay
Zoological:			
Fluid-preserved	18°C ⁽¹⁾⁽²⁾	50% ⁽³⁾⁽⁴⁾	Discolouration and disintegration, loss of shape
Pinned Entomology	18°C ⁽²⁾	50%	Discolouration and disintegration, fungal attack, verdigris on copper/copper alloy based pins at high RH
Taxidermy	18°C ⁽²⁾	55% ⁽⁵⁾	Discolouration and disintegration, fungal attack ⁽⁶⁾ and rusting of armatures at high RH; splitting and cracking at low RH
Freeze-dried	18°C ⁽²⁾	50%	Discolouration and disintegration, fungal attack ⁽⁶⁾ at high RH, splitting and cracking at low RH
Air-dried	18°C ⁽²⁾	50%	Discolouration and disintegration, fungal attack ⁽⁶⁾ at high RH, splitting and cracking at low RH
Microslides	18°C ⁽²⁾	60% ⁽⁷⁾	Fungus can form in mounting media (especially if water soluble) at high RH; cracking and discolouration at low RH
Botanical:			
Fluid-preserved	18°C ⁽¹⁾⁽²⁾	50% ⁽³⁾⁽⁴⁾	Discolouration and disintegration, loss of form
Freeze-dried	18°C ⁽²⁾	50%	Discolouration and disintegration, fungal attack at high RH; splitting and cracking at low RH
Herbaria	18°C ⁽²⁾	50% ⁽⁸⁾	Discolouration and disintegration, fungal attack at high RH, disintegration at low RH
Microslides	18°C ⁽²⁾	60% ⁽⁷⁾	Fungus can form in mounting media (especially if water soluble) at high RH; cracking and discolouration

Notes

There is a great deal of debate about acceptable levels, further research may reappraise the values given in this table.

The single figures recommended in the above table should serve as guide to the optimum level required. How close a museum gets to these figures depends on the conditions with which the collection has reached an equilibrium, the accuracy of the equipment being used

and the regularity with which the equipment is calibrated. Every possible effort should be made to reduce fluctuations in RH to a minimum.

Palaeontological and mineral specimens are covered in Standards in the Museum Care of Geological Collections (forthcoming).

⁽¹⁾ Above this temperature evaporation of industrial methylated spirit will occur, and formalin will emit hazardous fumes. Containers of fluid-preserved specimens should be regularly monitored and topped up as required. Containers should be sealed where possible to reduce evaporation to a minimum.

⁽²⁾ This temperature meets thermal comfort requirements for people. It should not be exceeded and whenever possible, temperature should be kept below this level (down to a minimum of 10°C). The lower the temperature, the slower is the rate of deterioration of materials.

⁽³⁾ Exterior labels may start to disintegrate at an RH higher than 60%, or may desiccate and flake off at an RH less than 30%.

⁽⁴⁾ The higher the RH the more dilute fluids become for a given loss in overall volume in the container, consequently, the lower the RH the better (down to a minimum of 35%).

⁽⁵⁾ While a maximum of 55% RH is recommended, this may produce conditions in which certain insects, eg *Tinea* (case-bearing clothes moth), can flourish.

⁽⁶⁾ To prevent mould or fungal growth, ventilation rates should, where practicable, not be less than 0.75 cubic metres per second.

⁽⁷⁾ The optimal conditions required for storage of microslides employing water soluble mountants are specific to the formulation of the mountant. Specialist advice should be sought.

⁽⁸⁾ Above 55% RH, acid hydrolysis and insect pest activity are probably the greatest threat to herbaria.

B

Maximum levels of illuminance and ultraviolet radiation for biological materials

Materials ⁽¹⁾	Max. Illuminance	Max.UV Radiation
Botanical specimens and paper (all items, eg prints, watercolours, drawings, manuscripts, photographs)	50 lux ⁽²⁾	75µW/lumen
Most coloured specimens, (insects, feathers, fur)	50 lux	75µW/lumen
Dyes and Inks on any support materials	200 lux	75µW/lumen
Undyed organic materials: leather, horn, bone, wood, materials with structural colouration, eg iridescence	200 lux	75µW/lumen
Fluid-preserved specimens	200 lux	75µW/lumen
Conservation, scientific examination, photography	2500 lux ⁽³⁾	75µW/lumen

Definitions Lux (or lumens per square metre) is the unit of measurement of illuminance. 10 lux is equal to the light falling on one square foot of surface from 1 candle at a distance of one foot.

Lux-hours: For the general lighting situation in the museum, the concept of lux-hours is useful. Lux-hours is a measure of exposure (illuminance X time). To reduce damage by light, both illuminance and time of exposure need to be reduced. Each museum should attempt to define the maximum number of lux-hours per annum it deems acceptable.

Microwatts of UV per lumen of visible light (µW/lumen) is a measure of ultraviolet radiation. Since this is a measure of the proportion of UV in visible light, it can be measured irrespective of distance from the source. The maximum acceptable level of UV radiation is set at 75µW/lumens because it is the proportion of UV emitted by a tungsten lamp, the most commonly available light source which produces a low level of UV radiation.

Notes ⁽¹⁾ Composite objects should be kept at the illuminance recommended for their most sensitive parts.

⁽²⁾ Many phanerogam herbarium specimens are highly light sensitive. Where possible levels should be kept below 50 lux.

⁽³⁾ All light is damaging. Exposure time at this level must be kept to a minimum. Heat-emitting light sources can have a drying effect and light can cause darkening, bleaching or yellowing of some surface treatments.

C

Relative humidity and temperature for storage of biological records⁽¹⁾

Materials	Ambient Temperature	Ambient Relative Humidity	Microclimates ⁽²⁾ (Where needed)
Historical Records:			
Documents on paper	13° - 18°C ⁽³⁾	55 - 65% ⁽³⁾	Not applicable
B&W prints	15° - 20°C ⁽⁴⁾	30 - 50% ⁽⁴⁾	Prevention of condensation on cooled material important
B&W negatives:			
Cellulose ester base	<20°C ⁽⁵⁾	15 - 40% ⁽⁵⁾	
Polyethylene terephthalate base	<20°C ⁽⁵⁾	30-40% ⁽⁵⁾	
Glass negatives (silver image photographic plates)	15° - 25°C ⁽⁷⁾ (preferably below 20°C)	20 - 50% ⁽⁷⁾ (preferably below 40%)	
Modern Records:			
Magnetic recording media	18° - 22°C ⁽⁶⁾	35 - 45% ⁽⁶⁾	
Optical or laser discs	18° - 22°C ⁽⁶⁾	35 - 45% ⁽⁶⁾	
Microform/Film (master & copies):			
Cellulose ester base	<20°C ⁽⁵⁾	15 - 40% ⁽⁵⁾	Prevention of condensation on cooled materials important
Polyethylene terephthalate base	<20°C ⁽⁵⁾	30 - 40% ⁽⁵⁾	
Colour slides/negatives	2°C or below ^{(4) (2)}	25 - 30% ^{(4) (2)}	Higher than necessary RH accelerates deterioration
Colour prints	2°C or below ^{(4) (2)}	30 - 50% ^{(4) (2)}	

Notes

⁽¹⁾ There is great debate about acceptable levels. In general the nearer the minimum figure quoted the better.

⁽²⁾ Take advice on microclimates. Refrigeration of these materials should include RH buffering with conditioned silica gel. Allow materials to acclimatise to room temperature before use, and provide moisture sorbents, eg bagged silica gel, to counteract any possible condensation.

⁽³⁾ BS 5454

⁽⁴⁾ ISO 6051

⁽⁵⁾ ISO 5466

⁽⁶⁾ BS 4783

⁽⁷⁾ BS 5687