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Care and Conservation of Natural History Collections

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Foreword

The world's natural history collections are of astonishing richness and significance. They are the single most important source of primary information on the diversity of life on earth, both today and in our past. But these collections do not simply exist as an inert monument to the activity of collectors: they are dynamic resources, to be used actively to meet the needs of today. They are massive repositories of information whose value is being increasingly recognized today, not only in scientific research but in areas such as environmental conservation, medicine, agriculture and education. If used to their full potential natural history collections can contribute much to the welfare and quality of life of people today.

All of this means that there is a pressing need to ensure that natural history collections are cared for to the highest possible standards, and that the information resident in those collections is made as accessible as possible to users world wide. Without proper care, the collections will deteriorate; without accessibility they will be ignored. The responsibility for caring for natural history collections, and for making the information they contain available to users, lies with collections managers and

curators. This book is written with the primary aim of helping them to fulfill this vital role. The book provides practical information on a wide variety of techniques and procedures including the conservation and documentation of whole organisms from a wide range of different taxonomic groups. It also deals with special topics such as the care of collections of genetic material: the protection of collections from pests, and many other issues that are central to the successful care and conservation of collections.

Many institutions that hold natural history collections lack sufficient funds to allow them to follow best practice in every aspect of their collections. This book should help curators and collections managers as they set about the difficult task of deciding on which aspects of care and conservation should be accorded the highest priority. I hope very much that the book will prove a valuable source of reference for all who have the responsibility of caring for and conserving natural history collections.

Neil Chalmers
Director of The Natural History Museum,
London

Series editors' preface

The conservation of artefacts and buildings has a long history, but the positive emergence of conservation as a profession can be said to date from the foundation of the International Institute for the Conservation of Museum Objects (IIC) in 1950 (the last two words of the title being later changed to Historic and Artistic Works) and the appearance soon after in 1952 of its journal *Studies in Conservation*. The role of the conservator as distinct from those of the restorer and the scientist had been emerging during the 1930s with a focal point in the Fogg Art Museum, Harvard University, which published the precursor to *Studies in Conservation*, *Technical Studies in the Field of the Fine Arts* (1932-42).

UNESCO, through its Cultural Heritage Division and its publications, had always taken a positive role in conservation and the foundation, under its auspices, of the International Centre for the Study of the Preservation and the Restoration of Cultural Property (ICCROM), in Rome, was a further advance. The Centre was established in 1959 with the aims of advising internationally on conservation problems, co-ordinating conservation activities and establishing standards of training courses.

A significant confirmation of professional progress was the transformation at New York in 1966 of the two committees of the International Council of Museums (ICOM), one curatorial on the Care of Paintings (founded in 1949) and the other mainly scientific (founded in the mid-1950s), into the ICOM Committee for Conservation.

Following the Second International Congress of Architects in Venice in 1964 when the Venice Charter was promulgated, the

International Council of Monuments and Sites (ICOMOS) was set up in 1965 to deal with archaeological, architectural and town planning questions, to schedule monuments and sites and to monitor relevant legislation. From the early 1960s onwards, international congresses (and the literature emerging from them) held by ITC, ICOM, ICOMOS and ICCROM not only advanced the subject in its various technical specializations but also emphasized the cohesion of conservators and their subject as an interdisciplinary profession.

The use of the term *Conservation* in the title of this series refers to the whole subject of the care and treatment of valuable artefacts, both movable and immovable, but within the discipline conservation has a meaning which is distinct from that of restoration. *Conservation* used in this specialized sense has two aspects: first, the control of the environment to minimize the decay of artefacts and materials; and, second, their treatment to arrest decay and to stabilize them where possible against further deterioration. Restoration is the continuation of the latter process, when conservation treatment is thought to be insufficient, to the extent of reinstating an object, without falsification, to a condition in which it can be exhibited.

In the field of conservation conflicts of values on aesthetic, historical, or technical grounds are often inevitable. Rival attitudes and methods inevitably arise in a subject which is still developing and at the core of these differences there is often a deficiency of technical knowledge. That is one of the principal *raison d'être* of this series. In most of these matters ethical principles are the subject of much

discussion, and generalizations cannot easily cover (say) buildings, furniture, easel paintings and waterlogged wooden objects.

A rigid, universally agreed principle is that all treatment should be adequately documented. There is also general agreement that structural and decorative falsification should be avoided. In addition there are three other principles which, unless there are overriding objections, it is generally agreed should be followed.

The first is the principle of the reversibility of processes, which states that a treatment should normally be such that the artefact can, if desired, be returned to its pre-treatment condition even after a long lapse of time. This principle is impossible to apply in some cases, for example where the survival of an artefact may depend upon an irreversible process. The second, intrinsic to the whole subject, is that as far as possible decayed parts of an artefact should be conserved and not replaced. The third is that the consequences of the ageing of the original materials (for example 'patina') should not normally be disguised or removed. This includes a secondary proviso that later accretions should not be retained under the false guise of natural patina.

The authors of the volumes in this series give their views on these matters, where relevant, with reference to the types of material within their scope. They take into account the differences in approach to artefacts of essentially artistic significance and to those in which the interest is primarily historical, archaeological or scientific.

The volumes are unified by a systematic and balanced presentation of theoretical and

practical material with, where necessary, an objective comparison of different methods and approaches. A balance has also been maintained between the fine (and decorative) arts, archaeology and architecture in those cases where the respective branches of the subject have common ground, for example in the treatment of stone and glass and in the control of the museum environment. Since the publication of the first volume it has been decided to include within the series related monographs and technical studies. To reflect this enlargement of its scope the series has been renamed the Butterworth—Heinemann Series in Conservation and Museology.

Though necessarily different in details of organization and treatment (to fit the particular requirements of the subject) each volume has the same general standard, which is that of such training courses as those of the University of London Institute of Archaeology, the Victoria and Albert Museum, the Conservation Center, New York University, the Institute of Advanced Architectural Studies, York, and ICCROM.

The authors have been chosen from among the acknowledged experts in each field, but as a result of the wide areas of knowledge and technique covered even by the specialized volumes in this series, in many instances multi-authorship has been necessary.

With the existence of IIC, ICOM, ICOMOS and ICCROM, the principles and practice of conservation have become as internationalized as the problems. The collaboration of Consultant Editors will help to ensure that the practices discussed in this series will be applicable throughout the world.

Preface

Literature covering the care and conservation of museum objects in the fields of art and antiquities is plentiful but very few authors deal with natural history specimens in detail. This book aims to fill that gap by gathering together, from a wide range of sources, practical information on techniques and procedures useful to curators and all those responsible for the care of natural history collections. Palaeontological collections are not dealt with here since their care and conservation procedures differ and there is a rich literature pertaining to the subject (see Collins, 1995; Brunton *et al.*, 1985).

This is a multi-author work and each chapter has a character of its own, which is partly governed by the different problems faced by different types of collections. Therefore some repetition is inevitable but, as far as possible, where matters common to all collections are concerned, they are dealt with in separate chapters or appendices. For convenience we have used the term 'researcher' referring to the person studying the collection whilst the term 'curator' is applied to those caring for the collection, although we recognize that this interpretation does not necessarily fit all situations. The place holding the collections we refer to as an 'institution', which includes museums, universities, agricultural stations and hospitals etc. It is also recognized that some important small collections are held in private residences and it is hoped that the

advice offered will be of use to anyone caring for a collection, no matter how small.

While 'care' is a well defined term, 'conservation' and, to a lesser extent, 'preservation', are open to interpretation. *The Oxford English Dictionary* (Simpson and Weiner, 1989) defines conservation as: 'To keep in safety, or from harm, decay, or loss; now, usually, to preserve in its existing state from destruction or change.' Within the general museum community, conservation may encompass preservation and restoration of specimens but, as Stansfield (1992) points out, the conservation of biological collections differs in a number of respects from the conservation of objects of art and antiquity. Stansfield defines the term conservation to describe treatment after preservation while the process of preparing natural history specimens for the museum is preservation. While Reid (1994) also interprets conservation as supplementary actions to keep specimens from damage or decay in the long term, he defines preservation as any process that rapidly prevents or inhibits decay or deterioration. We consider that preservation methods may have a profound effect on the subsequent care and conservation of specimens, and therefore they are taken into account in this book wherever it is considered appropriate.

Duckworth *et al.* (1993) restrict the term conservation to 'the application of science to the examination and treatment of museum

objects and to the study of the environments in which they are placed' but this is more generally referred to as conservation science. In a significant conference on the interface between science and conservation held at the British Museum in 1997 (Bradley, 1997) it became quite evident to one of the editors (Carter) that, in some museums, conservation scientists, conservators and curators operate in quite separate fields and that communication between them is often inadequate.

For the purposes of this book we define conservation as *'The employment of best practice to prevent or arrest the long-term physical deterioration of natural history specimens and associated artefacts and documents to preserve their scientific and cultural worth'*. This interpretation emphasizes preventive rather than remedial conservation and it is intentional to do so. While remedial conservation is a fast developing and important science, it is very costly both in materials and personnel. Preventive conservation makes good economic sense — it is protecting an invaluable and often irreplaceable resource and investment. Remedial conservation, whilst important, is usually an admission of past failures. The fine dividing line between care and preventive conservation is acknowledged but the term 'care' is included in the title because it emphasizes the necessity for an overall culture of caring for collections at all levels, from housekeeping staff and office administrators to curators, conservators and research workers.

We hold the view that, for a natural history collection to remain of value, it not only requires care and conservation but also a continuing (if sometimes necessarily intermittent) scientific and technical input, otherwise it will become, at best, an antiquarian curiosity. Although within this book little attention is paid to the scientific questions of systematics and identification, we view collections as 'living' entities and not as plant and animal cemeteries. The uses for which a collection are intended must be taken fully into account when considering aspects of care and conser

vation; for example, a teaching collection is likely to be submitted to a high level of handling by inexperienced students while specimens in a research collection are more likely to be subjected to interventive examination techniques such as dissection and molecular analysis. At the first World Congress on the Preservation and Conservation of Natural History Collections in Madrid, Hoffmann (1993) highlighted the double paradox that the use of collections produces degradation and unused collections are 'useless' and suggested that, in many ways, the collections manager acts as a mediator between these two extremes. We suggest that the term mediator is insufficiently proactive and collections managers and curators should actively seek to improve care and access simultaneously. Hayton (1996) suggested that 'A vigorous museum must face outwards in order to address the needs of users and stakeholders....The purpose of conservation is to facilitate beneficial uses of collections. An unconserved or neglected collection represents a wasted asset and a failure of curatorial imagination to find a use for it.'

Access to collections at all levels is becoming increasingly important and museums ignore this at their peril. Governments and other funding bodies are unlikely to look favourably on institutions that keep their collections to themselves. While the use of computer technology may allow universal access to 'virtual collections' on the Internet and on CD-ROMs (Durie, 1997), this is likely to increase rather than reduce the demand for access to actual specimens. In considering the various aspects of care and conservation it is always important to take into account the intended use for the material, whether it be scientific research, education, teaching, display or historical and cultural record. Much material will be used for some or all of these purposes and all collections constitute potentially valuable scientific and cultural resources. Therefore, for most collections of scientific and historical value, the aim is long-term preservation. Educational material almost inevitably

has a limited life, particularly that used for demonstration purposes. Display material often includes specimens of great scientific and cultural value and this can be placed at considerable risk — a sad recent case of destruction of such material being Lister's Conch, which was broken into hundreds of fragments by a falling display sign (Riley, 1996).

In 1991, Miller, in a survey of entomological collections in the United States, highlighted the fact that many collections were still kept in storage conditions that were unsatisfactory and 'According to current knowledge of

conservation needs, recuration or rehousing of many specimens is required to make up for *sins of the past*. Although this book encourages the use of best practice in conservation procedures, it is only too evident that, worldwide, many museums lack the funds to use the best methods and materials for all of their collections. It is hoped that this book will enable collection managers, curators and conservators to reach decisions over priorities for care and conservation activities. Whilst not wishing to encourage the use of nonarchival/conservation grade materials for the preparation and storage of specimens, it must

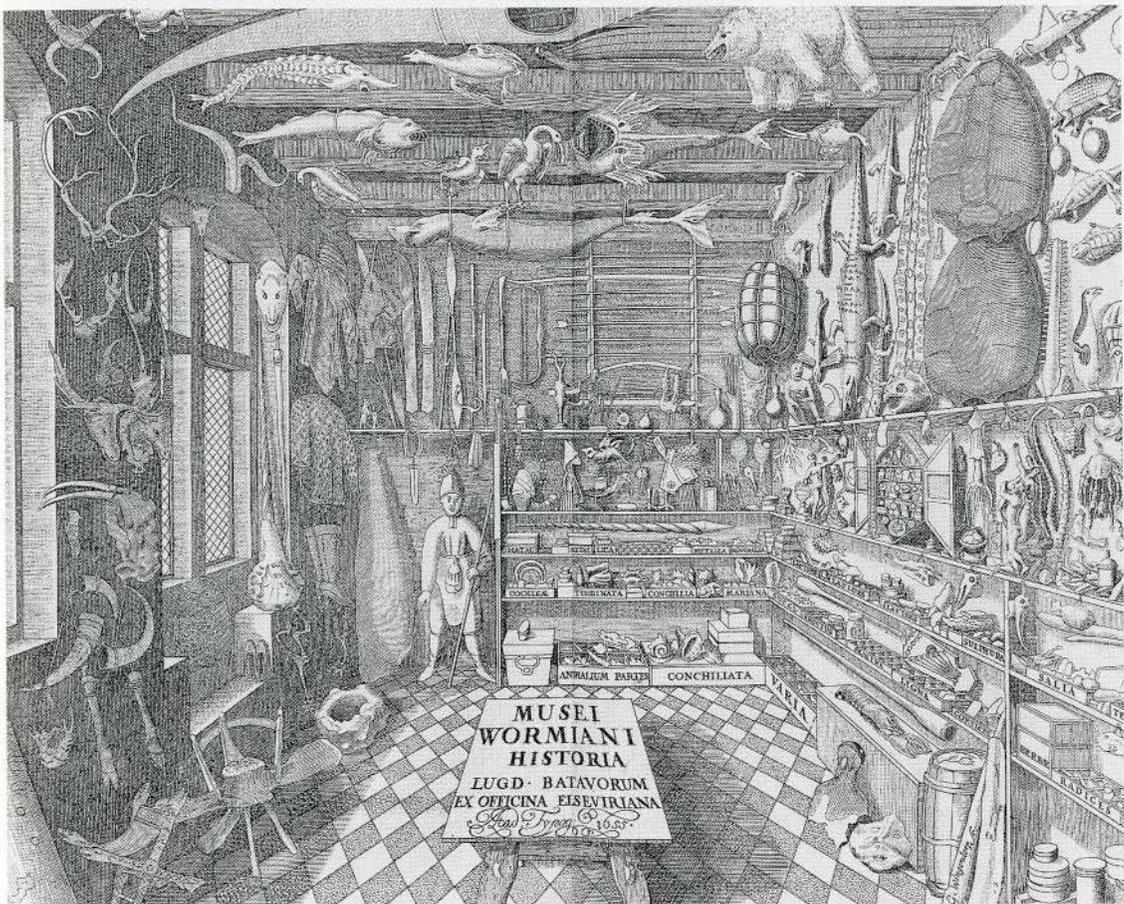


Figure i An early illustration of a 'cabinet of curie cities' from the Danish medical professor, Olaus Worm (1588-1654), who founded a private collection of natural objects to use as demonstration material for the benefit of students in natural philosophy. His folio volume *Museum Wormianum* (1655) secured his name as one of the founders of European museums (Scheperle, 1985).

he acknowledged that in some cases the most suitable materials will not be available. The only viable option may be to use available materials that most closely serve the purpose. Where the cost and accessibility of archival materials is prohibitive, we suggest that their use may be confined to materials that come into direct contact with specimens, for example labels and storage trays. In some cases, maintenance of optimum achievable environmental conditions within the collections building, coupled with extra vigilance for specimen deterioration, may offer the best way forward. It is recognized that, while the majority of large collections are at present housed in countries with temperate climates, there is an ever-increasing growth of collections in the

tropics and subtropics. These have received little attention in the past with respect to collections conservation, which is unfortunate, since the problems they face are much greater than those in temperate climates. A special effort has been made in this book to address problems that are specific to these collections.

While natural history specimens have been collected for various reasons since records began, organized collections in the form of 'cabinets of curiosities' (Figs i and ii), first became established in Europe in the sixteenth and seventeenth centuries (Impey and MacGregor, 1985). By the end of the seventeenth century, it is evident that techniques for preservation of specimens were becoming well established (Wilkinson, 1966). Around this



Figure ii The ideal conception of a natural history cabinet of the early eighteenth century from Levin Vincent's *Elenchus Tabularum* (1719). Note the pig's bladder sealed jars along the left wall.

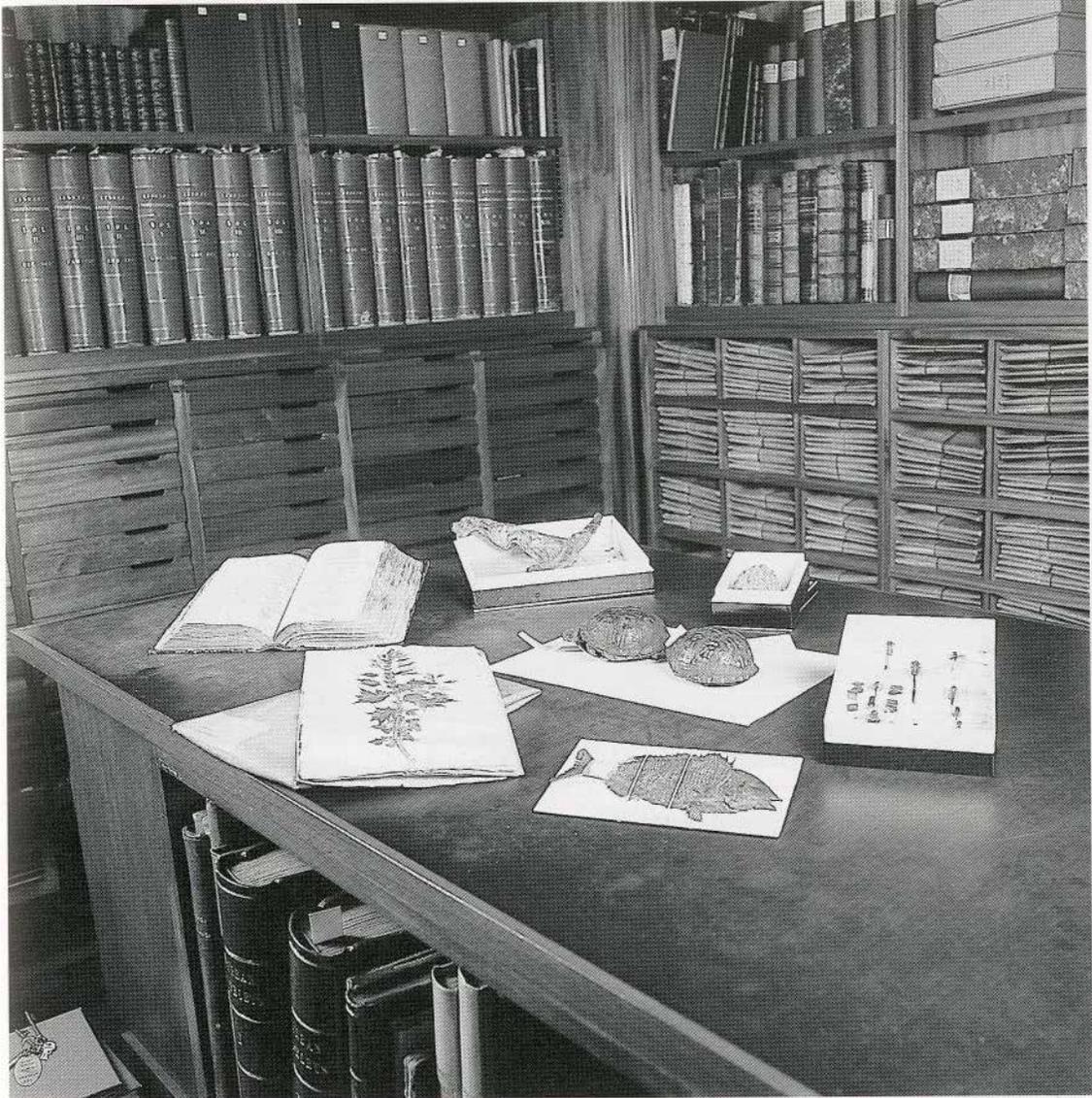


Figure iv A selection of specimens from the Linnaean Collection. showing a range of preservation methods. Part of the insect collection stored in drawers is visible behind one of Linnaeus's books open on the bench. His book collection is stored on the shelves above and the herbarium collection is arranged in flat folders to the right of the insect collection.

time, James Petiver (c 1700), a fellow of the Royal Society, produced an engraved folio sheet entitled 'Brief Directions for the Easie Making, and Preserving Collections of all Natural Curiosities' (frontispiece) which provides advice on preparing a wide range of natural history specimens. Petiver's collection

eventually became part of Sir Hans Sloane's famous museum set up at the beginning of the eighteenth century, which in turn formed the nucleus of the British Museum and subsequently The Natural History Museum in London. Although some of Sloane's original natural history material was destroyed (Fitton

collections, funded in part by both Swedish and American financial aid — a fine example of international co-operation in the preservation of a supremely important natural history collection. Great care is taken to ensure that the collections are safe from fire and flood, and specialist curators have been appointed to care for specific parts of the collections. The long-term care and conservation of these collections has not only impressed us but has influenced us in both procedural and practical recommendations for this book. We must thank the Linnean Society for access to its collections and the help and advice of its secretary, John Marsden, the librarian, Gina Douglas, and the honorary curator of the insects, Mike Fitton. We must also thank the Linnean Society for its support in obtaining a NERC Taxonomic Publications Grant to offset the cost of colour plates.

Although each chapter of this book includes its own list of acknowledgements, the following persons and organizations deserve special mention. *Bishop Museum, Hawaii*: Scott Miller; *Butterworth-Heinemann*: Marie Milmore, Neil Warnock-Smith, Zoe Youd; *Insect Preservation Association, Utsunomiya*: Keiji Morishima, Yuji Shiraishi; *Landcare Auckland*: Trevor Crosby; *Liverpool Museum, National Museums and Galleries on Merseyside*: Donna Hughes; *The Manchester Museum*: Velson Horie; *Museum für Naturkunde, Berlin*: Hannelore Hoch, Dr Angermann, Mr Fiebig, Dr Neuhaus, Dr Paepke, Dr Uhlig; *National Museum and Gallery of Wales, Cardiff*: Julian Carter, Gayle Evans, Mike Wilson; *National Science Museum, Tokyo*: Mamoru Owada; *National Museums of Kenya, Nairobi*: Mike Clifton; *Royal Botanic Gardens, Kew*: Diane Bridson, Kate Edmondson, Dave Frodin; *Royal College of Surgeons Museum, London (Hunterian Museum)*: Elizabeth Allen, Martyn Cooke, Jane Pickering; *Thermo Lignum UK Limited*: Mark Nicholson; *University of Glasgow Zoology Museum (Hunterian Collections)*: Maggie Riley.

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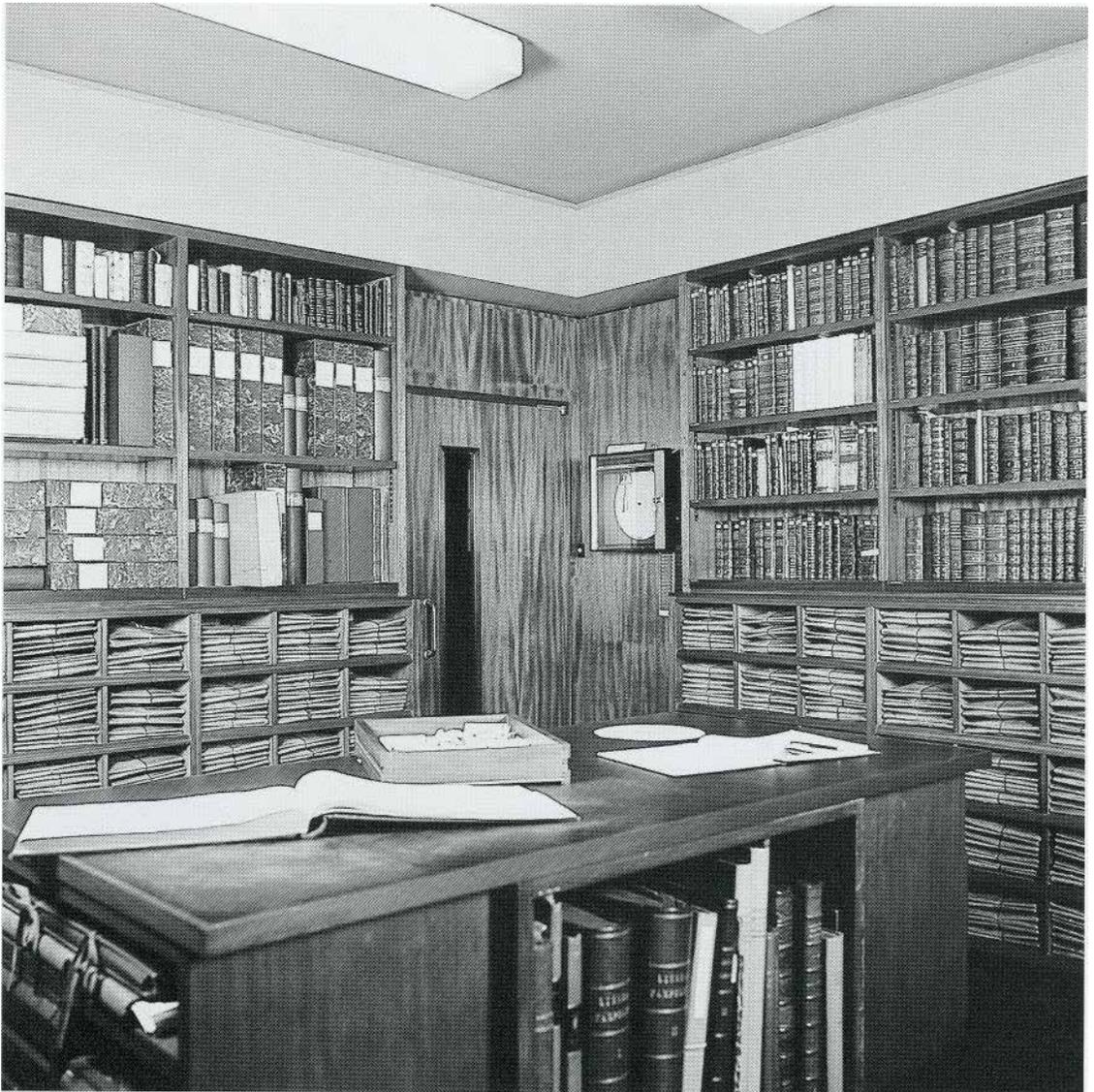


Figure v The Linnaean Collection strong-room which provides safe housing for both the library and collections of Linnaeus. It shows the strong-room door with a temperature and humidity monitor on the right. On the bench in front is one of the registers, the visitors book, an environmental disc and a drawer of corals from the Linnaean Collection.

and Gilbert, 1994), a substantial collection of his specimens, together with extensive notebooks, still remain, proving that natural history collections can survive for at least 300 years.

Linnaeus' important collections of plants and animals made in the eighteenth century have

survived in amazingly good condition. The Linnean Society of London holds the bulk of the collections which were purchased in 1829 (Figs iv, Plates 1 and 2), (Stearn and Bridson, 1978). In 1970 a special air-conditioned strongroom (Fig. v) was constructed in the basement of the Society's rooms to house the

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Plate 1 Dried preserved fish specimen from the Linnaean Collection. The discoloured paper at the top indicates that a previous envelope has not entirely covered the paper. The specimen is now completely protected from dust in a conservation grade envelope (Photo: The Natural History Museum).

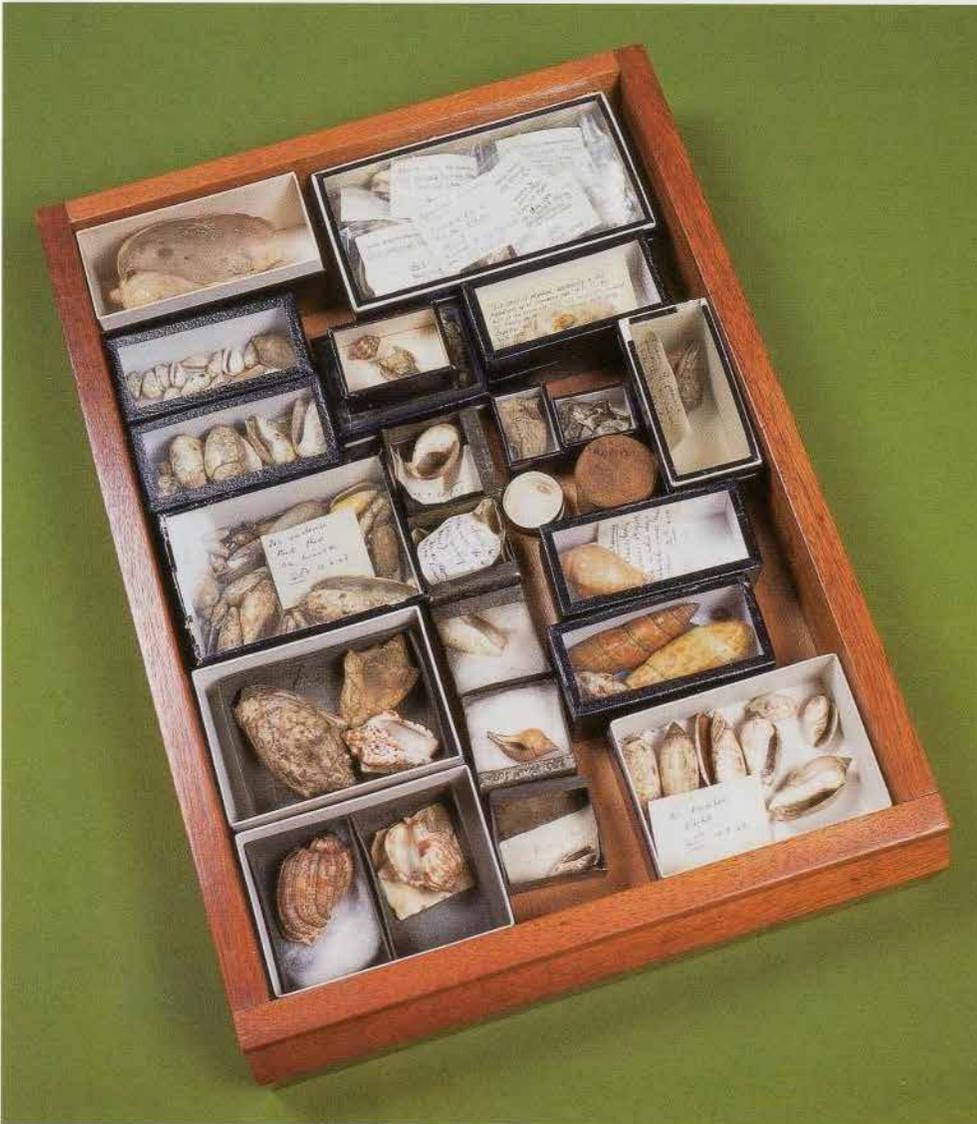


Plate 2 A drawer of molluscan shells from the Linnaean Collection, some of which are still stored in their original metal boxes (Photo: The Natural History Museum).