Natural Sciences
Conservation Group

# Newsletter

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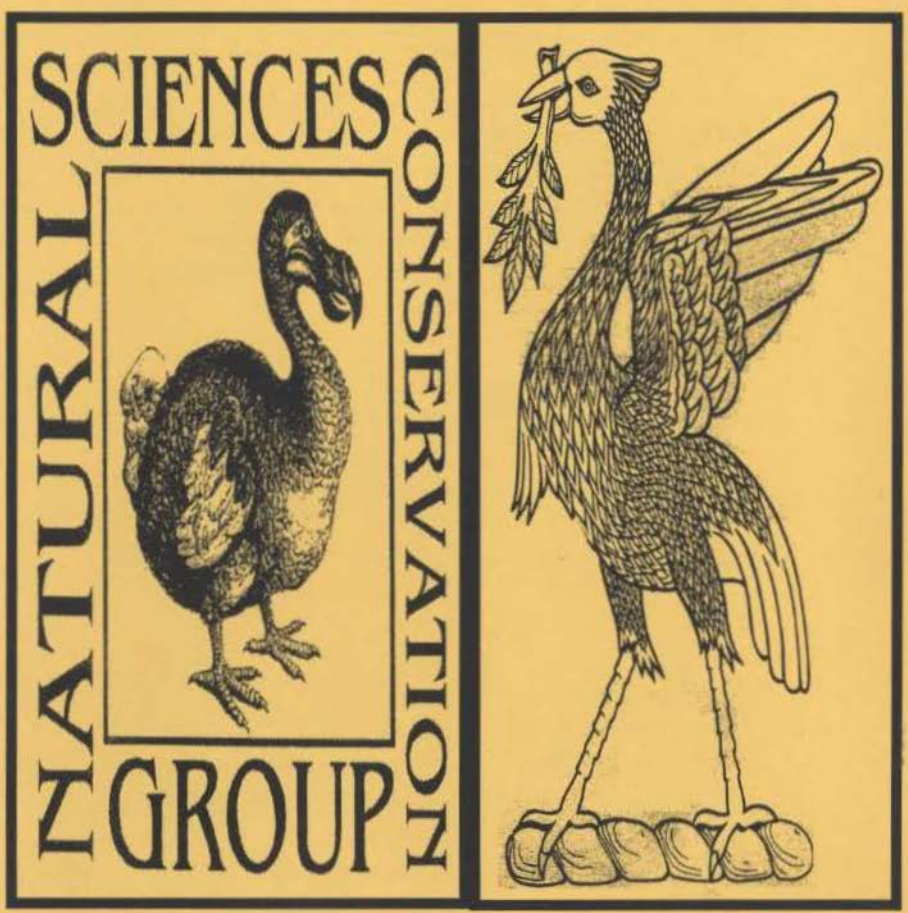


*AGM 1998 - Liverpool*

# Editorial

Welcome to issue 9 of our newsletter.

The first thing you may notice about this issue is the fact that there is no pull-out; another in our series on the Ten Agents of Decay. We are now up to number 5 in this series and were to cover (jointly) topics dealing with 'Temperature' and 'Relative Humidity'. I'm afraid there was a poor response to the appeal for articles. I have to remind you all that the success of this newsletter depends upon the support and contribution of its membership. It was not desirable to 'skip' an issue and I hope we are able to present many an interesting piece for our next issue, January 1999, (with your help!).

The AGM in Liverpool this May was a great success. The theme of 'Storage' ran through all the papers presented, most describing the planning, application for funding for, and the installation of new storage facilities. Delegates were able to discuss and learn from other colleagues' experiences. Most of the papers presented on the day are printed in this issue.

Please continue to let us know what's going on out there; what projects you're involved with, reviews of any course you have recently attended.

Many thanks to all those who have contributed to this issue.

*Donna Hughes*

Any articles for inclusion in the newsletter should be sent to Donna at:
The Botany Department, Liverpool Museum, William Brown St, Liverpool, L3 8EN. e.mail: donna@nmgmnhc.demon.co.uk
If on disc or by attached email file: in Word 6 or 7 format. Please also include hardcopy.

Articles for next newsletter needed by **04.12.98**

## View from the Chair

The summer is nearly over and it's back to work unfortunately. The weather was bad but at least the rain kept the relative humidity high.

By this time I expect you will all have received a special Communication from myself and Simon Moore, concerning "Accreditation". I hope my summary of the accreditation system was accurate and understandable. As I write this I have received only one query from a member of the Group, which means either that you all fully understand the implications or haven't returned from your holidays yet.

I attended the UKIC AGM in London on the 29 July where the proposed accreditation system was discussed, voted upon and adopted. The Committee will be meeting with a representative of UKIC in September, to discuss the position of natural science conservators within the new scheme.

I am happy to inform you that we are now a registered charity. This means the funds held in trust for us by UKIC can now be released and we can start advertising our existence in a much more professional and up market manner. I would like to see us expand our influence into European countries and target foreign museums and organisations. There may come a time when we can have our AGM somewhere warmer than the UK.

The Committee will also be considering where to hold our 1999 AGM and Conference. The problem we are faced with every year is accessibility for the majority of our members and facilities. Our venue must be easily accessible by road and rail, have conference facilities, and be free or cheap. Preferably there should be Group members at the proposed institution/ museum who can liaise and help organise the conference. If members have any ideas or wish to offer their institution or museum as a venue please contact us as soon as possible.

In the past we have themed our conferences. If there is any particular theme or issue the membership would like the 1999 conference to explore please say so now.

*Bob Entwistle*



## Conservation Focus

News and Events from the Conservation World

**New Technologies for the Long-Term Storage of Oxidising Pyrite - A Solution?** 1st Oct 1998. Geological Conservation Unit, University of Cambridge.

The workshop will through practical and lecture sessions discuss:

- Identification of pyrite oxidation.
- Responses to pyrite oxidation in your collection.
- The chemistry of pyrite oxidation in the museum environment.
- Past and current treatments, how they work and their effectiveness.
- Current and future methods for storing pyrite related materials.
- Low cost methods for storing specimens in an oxygen free environment.
- Preventative approaches towards pyrite in the collection.

The emphasis of the course will be on the practical application of techniques discussed during the day. The pros and cons of all the approaches will be discussed and students will leave with a clear understanding of the chemistry of pyrite oxidation and the various treatments that have been developed. The final part of the day will be spent undertaking a practical exercise in the collections linked to the day's work.

Cost: £30

For a booking form contact Chris Collins, Geological Conservation Unit, Dept. of Earth Sciences, University of Cambridge, Madingley Rise, Madingley Road, Cambridge, CB3 0EZ.

Tel: 01223 362522

Fax: 01223 366860

Email: chris@esc.cam.ac.uk

**A Future for Fossils**, Cardiff
14th - 15th October 98. A two day symposium on the sustainable management of our fossil heritage.
Organised by English Nature, National Museums & Galleries of Wales and Cardiff University.
Papers and presentations on any aspect of fossil site conservation and mangement are invited. Early registration is advisable. Costs: £20, registration after 10th July is £30. For further information and registration details contact: Mrs Liesbeth Diaz, Department of Earth Sciences, Cardiff University, PO Box 914, Cardiff CF1 3YE.
Tel: 01222 874830,
Email: diaz@cardiff.ac.uk

ICOM-CC: **WOAM Working Group Interim Meeting**, 19th - 23rd October 98, Grenoble, France. The Regional Conservation Workshop-Nucléart (ARC - Nucléart) will host the ICOM-CC West Organic Archaeological Materials conference. This will consist of four days of papers followed by a one-day excursion. Official languages: French and English. For further information contact: Céline Bonnot, Conference Administrator, ARC-Nucléart, CEA/Grenoble, 17 rue des Martyrs, 38054 Grenoble cedex 9, France.
Fax: 33 (0)4 76 88 50 89

**Restoration 98**, 10th - 12th December 98, Amsterdam RAI; the international exhibition of techniques for the restoration and conservation of cultural heritage. The programme will include providers of services and methods for restoration and conservation and suppliers of materials. It will also feature service providers such as contractors and laboratories, together with foundations, government bodies and educational institutions. For further information contact: Loes Roos or Claartje van Mol
Tel: +31 205491212



**Bring Your Problem Specimens...** The Education Unit of SEMS (South East Museum Service) will be running a one day course on the 10th December. This may be a prelimary for another two courses to be run next year on fluid-preserved specimens and taxidermy repair. The venue will be Ferroners House. For more details contact Simon Moore at Hampshire County Museums, Chilcomb House, Chilcomb Lane, Winchester, SO23 8RD.
Tel: 01962 846337
Fax: 01962 869836
Email: musmsm@hantsnet.hants.gov.uk

**CALL FOR PAPERS**

**Display Techniques for Ethnographic Materials**, December 1998
The Conservators of Ethnographic Artifacts group will be hosting a half day seminar on mounting techniques for the display of ethnographic material as part of their AGM in London this year.
Papers are invited on the following topics:

- Mounting techniques
- Interpretation
- Preparation of the artifacts
- Environmental considerations

For further information contact: Rowena Hill, School of Conservation Sciences, Bournemouth University, Poole, BH12 5BB.
Tel: 01202 595267 or 01202 5919010
Fax: 01202 595255

# The Conservation of Natural History Materials Cambridge

This article describes a new course offered by the Geological Conservation Unit at the University of Cambridge. The following two articles are from students who both completed the course this year.

## Training for Natural Science Conservators A review of a 5 week course of Natural Science Conservators - Aims and Future Developments

Very few training courses have been run to develop the skills of the Natural Science Conservator. Those that have been developed have been run mainly as short one-off courses and have concentrated on collections management issues rather than the conservation or materials science subjects required by the conservator.

In 1996 the Geological Conservation Unit offered a five week training course in the Conservation of Natural History Materials. The aim of the course was:

- To establish some form of general syllabus covering training in Natural Science Conservation.
- To develop a training course aimed at professionals (trained conservators or qualified natural science collection managers) who wish to develop their expertise in this field.
- To review the expertise available in the UK to lecture on this course.

**Course Support and Development**

The course was structured in a series of modules that covered aspects of natural history collection's conservation and designed as a basic introduction and review of the field. The course was also designed to run as one integrated unit.

The main lecturers for the five week course included conservators from the National Museum of Wales (to provide the organic conservation expertise



for the course), members of the Geological Conservation Unit, University of Cambridge, plus other experts in the field from separate institutions.

The course was also seen as a precursor to the development and running of an M.Phil. in the Conservation of Natural Science Materials at the Geological Conservation Unit (equivalent in content and duration to Durham's M.Sc. in Conservation and now available as a two year full-time qualification targeted at recently graduated students). Through running short courses such as this we were able to develop the syllabus for the longer courses and develop and assess the expertise available for training in the field.

Despite initial support (early indications were that we could have filled the course twice over), too few people by the cut-off date had registered to make it financially viable. The days of running courses at a financial loss are long gone!

Reasons that were given for not being able to attend the course included the cost, low grant-aid , and in particular the length of the course.

The major problems when running longer courses, such as the original five week course, is the cost of bringing a group of experts together and organising diaries so that all the relevant people are available for the course. Along with low numbers of students these problems prevented us from re-running the course in its original format.

Several people, who had already obtained grant-aid to attend the course however, requested that we investigate other ways in which we could run the training course. We recognised early on that a five week course was a long period of time for people to be away from work and looked at running the course on a more flexible basis and at the possibility of splitting the course up and hosting it in a group of museums.

Students would then go to the lecturers rather than the lecturers coming to the group of students! Training could then be worked into the lecturers' work programmes and would be undertaken using an agreed syllabus and training approach. This got us around the expense of bringing groups of lecturers together and meant that the course was available for any number

of students at any time during the year. The course could then more easily be split into individual modules that could be run independent of each other. However, we agreed that students could only complete the course successfully if all the modules were attended. Payment was a one-off fee.

**Running the Course**

The flexible modular course was initially organised to accommodate those students who had obtained grants to attend the original five week course in 1996. The syllabus remained the same, the only difference being that the course was run at three centres. This allowed us to work the training schedule (which is practically based) into our lecturers' work programs and gave the staff running the course a greater flexibility in the times they could take on students. It also allowed us to run the course for individuals or small numbers of students at a time suitable to both the student(s) and lecturer(s).

Since the first course was run we have had our museum professionals attend the course with another two wishing to attend in the future. Professionals attending the course have come from the UK and North America (no similar course is being run for natural science conservators in North America). The course is currently only being advertised by 'word of mouth.'

Currently the Geological Conservation Unit, the University of Cambridge, The National Museums and Galleries of Wales, and the Natural History Museum are hosting the course. Future museums will be added as course modules are developed and integrated with this 'basic training programme.'

A formal syllabus is available for students. This is however, flexible depending on the knowledge and skill base of each particular student.

**Review of the Course**

Students are encouraged to critically review the course, what they have achieved and to pinpoint failings in the course or the lecturers. A number of reviews of the course are available on request. These have so far been encouraging and constructive. The course is structured into five modules (each five days in duration) with a degree of flexibility built into each module dependant on the student(s) ability and knowledge base.



The modules cover the core areas of natural science conservation and materials.

| | |
|---|---|
| Week 1 | Introduction to Natural History Collections (including entomological and anthropology collections)<br>Preventive conservation and management<br>Health and Safety |
| Week 2 | Inorganic materials (Preventive Conservation) |
| Week 3 | Inorganic materials (Remedial Conservation)<br>Environment Management |
| Week 4 | Organic Materials (Botany Collections and Pest Control) |
| Week 5 | Organic Materials (Zoological and associated materials) |

**Future Developments**

5 weeks is not enough time to fully train a natural science conservator. No new jobs are being developed for natural science conservators; in fact we are losing posts. It is therefore important to provide on-training for those already in a position where care of a natural science collection is within their remit. We would like to expand the training course further adding modules onto it providing further specialisation in areas covered within the course. This would bring in and encourage other people who are working within the field to develop their levels of expertise. We are also looking to accredit the course through MTI and to bring in external assessors. This would further aid in the professional development of the course.

This will require three things:

- Institutional (and Professional) support
- Co-ordination by body(s)
- Accreditation/Recognition

**Conclusion**

The approach to and development of the course to date seems to have been relatively successful. This has not made us complacent and we feel that there is much more work to be done to improve it further. We feel that in

service training for museum professionals in relevant positions is the correct way to develop expertise in this field. The current employment situation for conservators, let alone natural science conservators, is difficult. We are losing good young conservators from the field because of the lack of funding for the field and the lack of available positions for natural science conservators. This style of professional training by accredited attachment may be the best way to develop expertise in the field and to also increase awareness among 'mainstream' conservators of the field and how knowledge of natural science materials should be an essential core knowledge for conservators.

Hopefully we will also be able to develop further modules around the course using expertise from other museums. The ultimate aim must be to develop a modularised training schedule for natural science conservation which will provide training and support throughout a natural science conservator's career and allow them to 'cross-over' into 'mainstream' conservation or management. A co-ordinated professional training program in the field is essential for the future growth of our field.

**Contacting us...**
Please don't hesitate to get in touch by any means detailed below...

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*Chris Collins*



## Reviews of the Course

This five-week course was organised by Chris Collins of The Geological Conservation Unit, Department of Earth Sciences, Cambridge University. It was held at three institutions (the above, The Botany Department at the Natural History Museum, London and The Botany, Geology and Zoology Departments at the National Museums and Galleries of Wales), all well known for their contributions to natural science conservation in the UK. In addition to myself, the course was only attended by one other individual, a situation that created a relaxed atmosphere and informal approach to tuition that included preparation and storage techniques as well as remedial treatments.

Some aspects of the curation of natural science collections were covered which helped to put into perspective the role of the conservator, balancing the needs of the collections with those of the curators and others using them.

Documentation was covered throughout the course with regard to surveys, condition and treatment reports and broader collection management issues such as loan procedures. There was a strong emphasis on preventive conservation which included environmental monitoring and control, pest management and storage materials. Various health and safety issues were discussed such as toxic and radioactive minerals, pesticides in botanical and entomological collections and arsenic in taxidermy specimens. Remedial treatments ranged from basic cleaning and repair to consolidation and other specialist treatments as for pyrite decay.

The content of this course was ideal for someone involved in the care of natural science collections. The trainers were very knowledgeable in both their own specialist areas and general conservation practices. It was an added bonus to meet the tutors in their working environment. Seeing other museums' storage facilities and how their staff approach the care of collections provoked many questions and discussions and, as there were only two students the topics covered could be adapted to suit our requirements and levels of knowledge.

Although courses such as this are quite regularlyheld in North America, particularly under the auspices of the Society for the Preservation of Natural History Collections, this is the first course of its kind on this side of the Atlantic. At a time when the need to preserve this important part of our heritage is gaining greater recognition, it is not likely to be the last.

I would like to thank the course organiser and tutors for their advice and assistance throughout the course and the Museums and Galleries Commission for a grant towards the cost.

*Jill Kerr*
*Ulster Museum*

This five week course was set up and co-ordinated by Chris Collins of the Geological Conservation Unit, University of Cambridge and was divided into three components at three institutions: two weeks at Cambridge (Geological Conservation Unit), one at The Natural History Museum, London (Botany Department) and two weeks at the National Museums & Galleries, Wales (Conservation team within Geology, Botany and Zoology).

The modular nature of the course meant that only one other participant attended the course at the same time as myself. Jill Kerr, the natural history conservator for the Ulster Museum. With just two of us this gave rise to very relaxed sessions which proved more accommodating to our individual needs. The course aim is to provide a solid overview of the factors which influence the deterioration of natural science materials, how collections are maintained and how conservation problems could be resolved. This was achieved by a good course structure and balance between theory, documentation and practical work.

The first week was an introduction covering many aspects of preventive conservation. Agents of deterioration, health and safety, ethics, materials



science, and surveying whole collections were discussed. A number of collections were reviewed (zoological, anthropological and geological) and a survey report was written for each. Particular attention was given to condition surveys of collections and specimens to stress the importance of documentation. The subsequent weeks focused on particular types of collection and their associated problems, working alongside the conservator or curator responsible for specific collections. All aspects of conservation were considered both on a large scale and at collection and specimen level.

The course has been of great value to me as a curator. In five weeks a wide range of conservation problems and possible solutions in all fields of natural history was covered. The informal structure and flexibility of this course is ideally suited to small groups and, with such competent tutors, will adequately accommodate the needs of museum workers from a variety of backgrounds and levels of knowledge. One of the great strengths of the course was its division into three placements. This provides an opportunity to see how different collections work in practice. In addition to this, by working alongside the individual conservators in their own workplace different approaches are revealed that may not become apparent from a formal teaching structure. I believe this course has given me both the knowledge and confidence to tackle conservation issues in my workplace.

I would like to thank all of the conservators and curators involved in the teaching of this course and also to express my gratitude to the Museums & Galleries Commission who awarded me a grant towards the cost of the course.

*Suzanne Lewis*
*Lead Curator – Hymenoptera*
*Department of Entomology*
*The Natural History Museum*

## Conservation Project Reaches Milestone

In 1992 a project was launched to conserve the Roylean herbarium held at Liverpool Museum. John Forbes Royle amassed the core of the collection between 1823 and 1831 when he was superintendent of the Saharanpur Botanic Garden in India. There are also examples of material from as early as the 1760's. Most of the specimens were gathered in the Himalayas but later Royle added plants from South Africa, Siberia and Chile.

Royle's widow donated the herbarium to the Liverpool Royal Institution after his death in 1859. However, it was effectively lost to science until it was rediscovered among the remnants of the Institution's museum in 1952. In the 1990's it was decided to launch two projects to conserve and document this important historical collection.

The collection was in very poor condition. Conservators from the Paper Section of NMGM and curators collaborated to arrive at a method in which to proceed with the project. This successfully combined the knowledge and standards of paper conservation with the techniques of plant mounters and the requirements for use by researchers.

At the outset of the project it was thought that there were a possible 100 Type specimens within the collection. After intensive re-curation, following conservation, it is now estimated to contain over 600.

In the first week of September this year the 10,000$^{th}$ specimen was conserved (the collection possibly contains 13,000) by Aileen Collis, Assistant Conservator. To celebrate this milestone, an event was organised to re-unite all the staff, past and present, who have worked as conservators or curators on the collection. The local press were invited to view the 10,000$^{th}$ specimen *(Cyperus corymbosus)* along with other parts of the collection.

Details of the methods used in this project can be found in:
**Walker, N. & Hughes, D. (1994)** The Royle Herbarium - a Conservation Approach , in Child, B. (ed) *Conservation and the Herbarium.* The Institute of Paper Conservation: Leigh. ISBN 0 9507268 6 9

*Donna Hughes*



## New Publications

### Pest Management in Museums

The Museums & Galleries Commission (MGC) has published *Integrated Pest Management.* The aim of the book is to provide practical, safe and cost-effective advice on the prevention and control of pests in museums.

*Integrated Pest Management* explains how a museum can protect its collections, furnishings and buildings from harm by pests. It describes how to prevent infestations and how to control them should they occur. The book also includes lists of useful addresses, suppliers and publications.

Peter Winsor, Collection Care Officer at the MGC commented: "*Integrated Pest Management* is an illustrated book which clearly outlines how to devise and implement a non-invasive, ongoing IPM system. The IPM approach has considerable advantages regarding health and safety, and is less harmful to both humans and the environment."

*Integrated Pest Management* is available from MGC Publications priced £6.00 plus £1.25 p&p (UK), £2.50 (Overseas). Cheques should be made payable to the Museums & Galleries Commission and all orders should be sent to: MGC Publications, 16 Queen Anne's Gate, London, SW1H 9AA. Alternatively, e-mail n.poole@mgcuk.co.uk or telephone 0171 233 4200.

### Cost/benefits Appraisals for Collection Care

MGC has also published *Cost/benefits Appraisals for Collection Care - A practical guide.* This publication demonstrates how museums can move away from collection care decisions based solely on cost, towards a more equitable assessment of the benefits of different decisions. This tool is designed to help balance the cost of collection care with the need for a commitment to the long-term survival of museum collections.

The publication features two case studies, the first is an analysis of the appraisal carried out by English Heritage on options for the conservation of the Chiswick Tables, and the second shows how Worcester City Museum Service used this tool to decide on suitable premises to re-house its reserve collection. After the cost/benefits appraisal, English Heritage was subsequently awarded 75 per cent funding for the conservation of the Chiswick Tables by the Heritage Lottery Fund. The Heritage Lottery Fund now recommends that museums carry out a cost/benefits appraisal as part of their business plan.

May Cassar, MGC Environmental Adviser and author of the publication, commented: "The purpose of *Cost/benefits Appraisals for Collection Care* is to draw museums' attention to the wider issues and consequences of decisions which are frequently being made using solely financial criteria. *Cost/benefits Appraisals for Collection Care* is an invaluable guide for everyone involved in prioritising resources in museums."

*Cost/benefits Appraisals for Collection Care* is available from MGC Publications priced £12.00 plus £1.25 p&p (UK), £2.50 (Overseas). Payment details as above.

*Note from NSCG Editor:*
*The reports given on these publications have come from the MGC themselves. If any of our members have obtained these publications and would like to review and comment on their practical application the Editor would be most grateful. Reviews of any new publications concerning the care and conservation in any area of natural science collections are invited.*



*The two new publications from the Conservation and Collection Care section of the Museums & Galleries Commission are reviewed here by Kate Andrew.*

**Cost/benefits appraisals for Collection Care by May Cassar**
**ISBN 0 948630 64 7 price £12.00**

May Cassar spoke on her work in developing and testing cost/benefits appraisals for collection care as the keynote speaker at our 1997 AGM and joint meeting with the Biological Curator's Group. This new publication will clarify those notes scribbled in the dark and complete the half-copied down tables.

Cost/benefit appraisals can offer a structured route for discussing and quantifying options for collection care projects and making an informed decision rather than attempting to draw together opinions from a group discussion or relying on personal "gut feelings".

May has set our her methodology in this new publication and presented two actual worked examples that used the appraisals, one project was assessing options for re-housing an entire museum service, the other conserving a newly acquired object. Scorings and calculations are required and at first sight may be a little off-putting, but a careful reading of the text with reference to the worked examples should clear this hurdle. Master scoring sheets are included at the end of the book to be photocopied and used for the exercise. The other book reviewed here offers copies of the publication in alternative formats, perhaps the tables could be provided on computer disc from this book too. The concept could also usefully be developed into a one-day training course with this book as the course manual.

Although the author warns that this team approach to problem solving would not be appropriate in all management environments, it would be very useful to institutions operating project teams, particularly for bids to the Heritage Lottery Fund. The approach is perhaps analogous to the equal opportunities interview and selection procedure. This book allows the interested team to try the approach themselves and present the results as a coherent argument to funding bodies.

**Levels of collection care - a self-assessment checklist for UK museums**
**by Peter Winsor**
**ISBN 0 948630 62 0 price £6.00 - alternative formats are available**

This publication melds the requirements of Registration phase II with the guidelines set out in the MGC series "Standards in the Museum Care of" and sets out three possible levels of achievement of these requirements. The levels are basic practice (required to achieve registration), good practice (achieved by the majority of museums) and best practice (the level to aspire to). The checklists at the back can be photocopied or are available in "alternative formats", presumably standard spread sheets on computer disc. The three levels of achievement are a useful development from the high levels of collection care set out in "Standards", offering a stepped route to achieve "Standards" level best practice via basic practice and a realistic good practice.

For institutions yet to go through Registration phase II, this publication would be a great help during the process of checking procedures and paperwork (the alternative formats would also save a lot of copy-typing.) It will be useful to consultants or in-house staff carrying out first time collection and conservation assessments, perhaps in preparation for a lottery bid. The Standards recommend an annual inspection of collections; this publication also offers a format for an annual in-house audit and review of procedures to enable museums to work towards best practice in all areas. This book would be a valuable addition to any UK conservator or collection manager's library and presents a useful methodology to adopt or adapt elsewhere in the world.

Although threatened performance indicators for UK museums have now been dropped, this publication sets out a far more rounded and comprehensive set of indicators and levels of achievement than the simplistic bums-on-seats indicators sent out for comment and now abandoned.



# Papers presented at NSCG AGM 98
# STORAGE
# The Conservation Centre, National Museums and Galleries on Merseyside 14th May 1998

## Environmental Control by Conservation Heating at Ipswich Museum

Ipswich Museums and Galleries has two main buildings, the High Street Museum (listed grade 2, built in 1881), and Christchurch Mansion (listed grade 1, built in 1550).

The High Street Museum, originally a purpose built museum, displays natural history, ethnography and archaeology.
The Mansion, (until a hundred years ago a family house), displays furniture paintings, costume and fine art.

Both buildings were originally designed to be heated by coal fires, but wet central heating systems were installed early this century causing very low relative humidities especially in winter. Relative humidity regularly dropped below 30 % for long periods at a time.

It was evident that the environment was causing damage to objects when splits appeared on recently restored mounted specimens, cracks appeared on painted panels, and veneer began to lift from furniture.
We asked for advice from the Energy Design Advisory Service, the MGC and from the Horniman Museum who have a similar problem, and we set about organising an environmental plan for both museum sites.

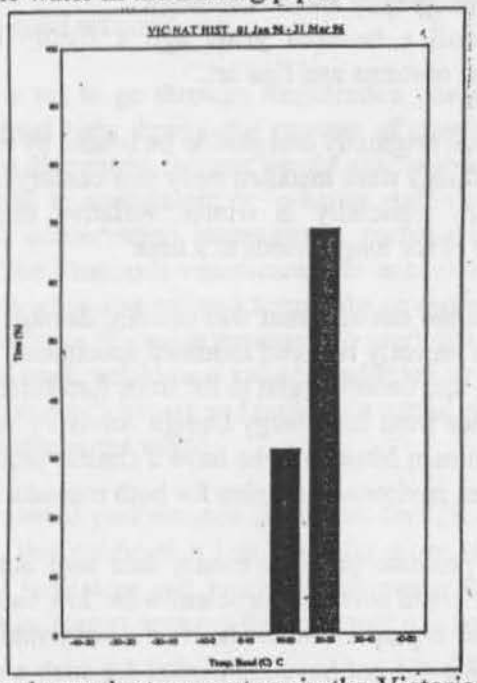
We received the promise of grant money and sent out tenders asking consultants if they could solve our problem with 'low tech' solutions. We did not wish to use expensive methods of environmental control such as air conditioning. We did not have the capital for such a solution and nor was it practical to duct conditioned air around two listed buildings.
We engaged Bob Hayes, environmental consultant to the National Trust. He advised us to use his method of Conservation Heating to raise relative humidity levels in our buildings.

Method 1: Conservation Heating by Lowering Temperature.

Conservation heating utilizes the existing heating system to improve the environment. This is done principally by lowering the temperature. The first thing we did was to make a plan of our heating system. In this way we were able to see where the pipework led, and under which exhibits or cases they ran. We were also able to see which galleries were over-heated and which under-heated.

The museum galleries where most damage was occurring were those that were over-heated, and so we hopedlowering the temperature in these galleries would have a beneficial effect on the RH, but it would also have a "knock on effect" in the under-heated galleries.

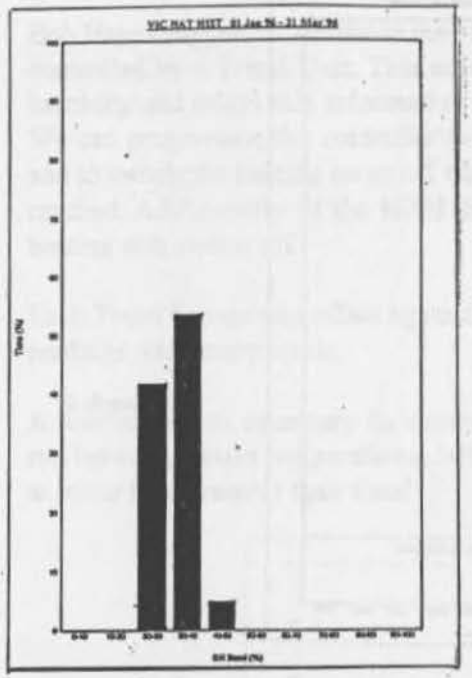
We then conducted a number of experiments in which we lowered the flow temperature of the water in the heating pipes.

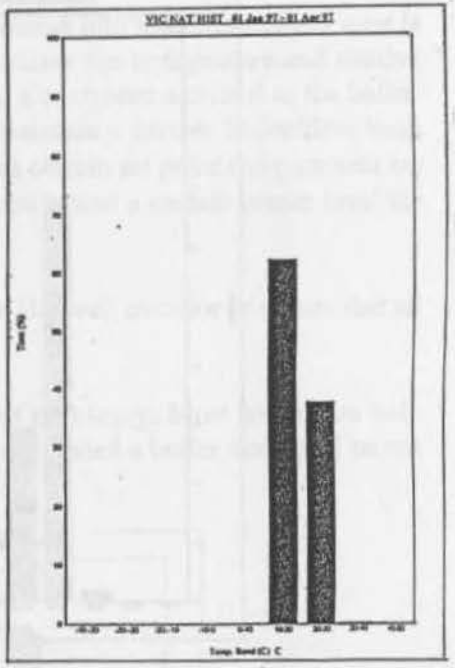



Graph 1

**Graph 1** This shows the temperature in the Victorian Natural History Gallery from January to March 1996, before Conservation Heating began. The temperature is in the 20-30°C range for 70% of time. This is much too hot for the gallery and the specimens.





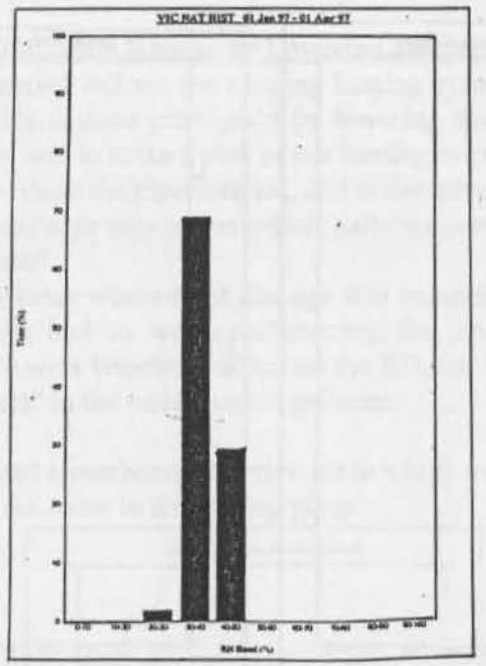




Graph 2

Graph 3

**Graph 2** This shows the relative humidity in the Victorian Natural History Gallery from January to March 1996, before Conservation Heating began. As you can see the RH is in the acceptable 40 -50% range for only 5% of the time, and below 30%RH for 40% of time.

**Graph 3** Here we see the temperature in the same gallery in 1997, when conservation heating was being used. Overall the temperature is lower, in the
20-30°C range for only 40% of time



Graph 4

**Graph 4** Here we see the RH in the same gallery in 1997. The lower temperature has had the effect of increasing RH. It is now in the 40-50% range for 30% of the time, and below 30% for only 3% of the time. This is a considerable environmental improvement.

However, the under-heated galleries were cooler. The public, who usually keep their coats on, found little difference in temperature. School parties taking part in activities in the galleries usually took their coats off and so were cold. Gallery staff also complained. Temporary electrical heating had to be provided in these areas.

Method 2: Zoning with humidistat and temperature control.

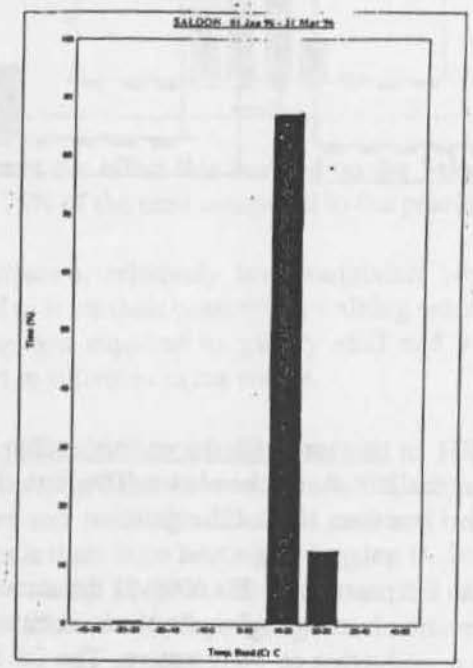
More funding was available to make necessary changes to the heating at Christchurch Mansion to allow a conservation heating regime to be instituted in the 16th century building. In the past we had tried to increase the relative humidity by using humidifiers, but this was ineffective as we had too few humidifiers and filling them was a problem.



Bob Hayes suggested we divide the Mansion into four zones. Each zone is controlled by a Trend Unit. This unit senses the temperature and relative humidity and relays this information to a controller attached to the boiler. We can programme the controller to maintain a certain boiler/flow temp and to switch the heating on or off when certain set point temperatures are reached. Additionally if the %RH drops below a certain preset level the heating will switch off.

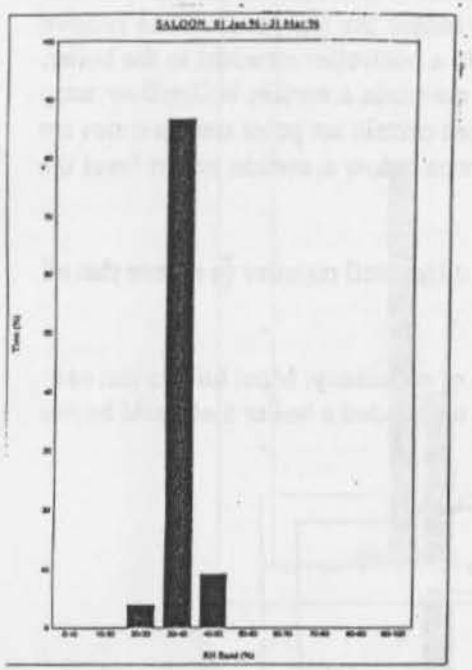
Each Trend Sensor was offset against a Hanwell monitor to ensure that all readings were comparable.

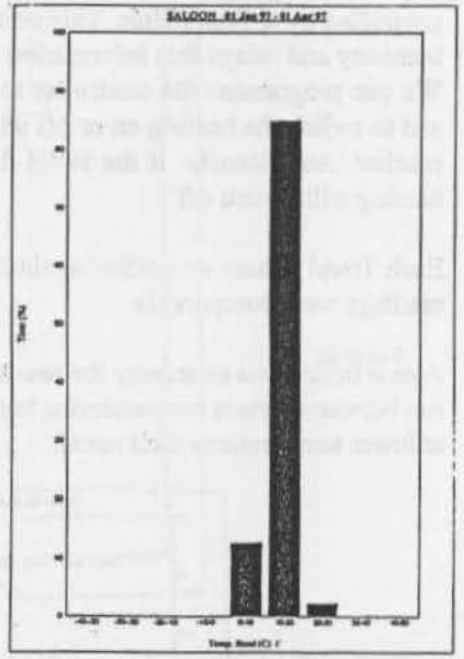
A new boiler was necessary for needs of efficiency. Most boilers can only run between certain temperatures, but we needed a boiler that could be run at lower temperatures than usual.



Graph 5

**Graph 5** Shows the driest room in the Mansion, the Saloon, before the new conservation heating regime was instituted. The temperature in this room from January to March 1996 was 10-20°C for 87% of the time, and 20 - 30°C for 13% of the time.



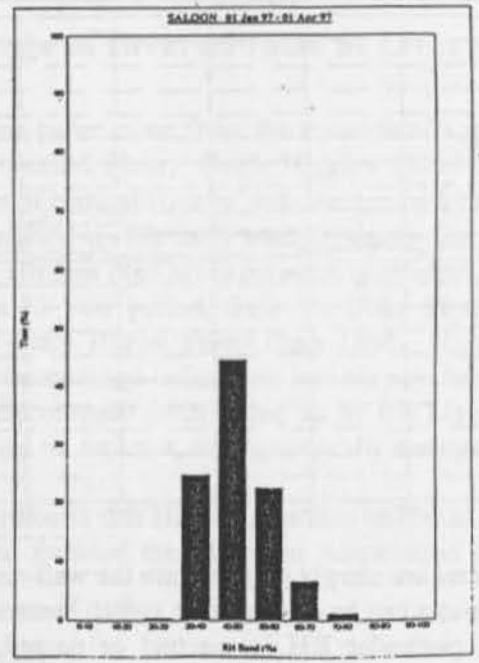


Graph 6 Graph 7

**Graph 6** Shows RH in this room for the corresponding period of time. For organic material the RH should be above 40%, but as you can see it attained this level for less than 10% of the time.

**Graph 7** Shows the temperature in this room in the same period in 1997 after the new conservation heating regime had been instituted. As you can see there has been a reduction in temperature. The 20-30°C range has been drastically cut, and a 0-10°C range has appeared, but these temperatures occur mostly at night.





Graph 8

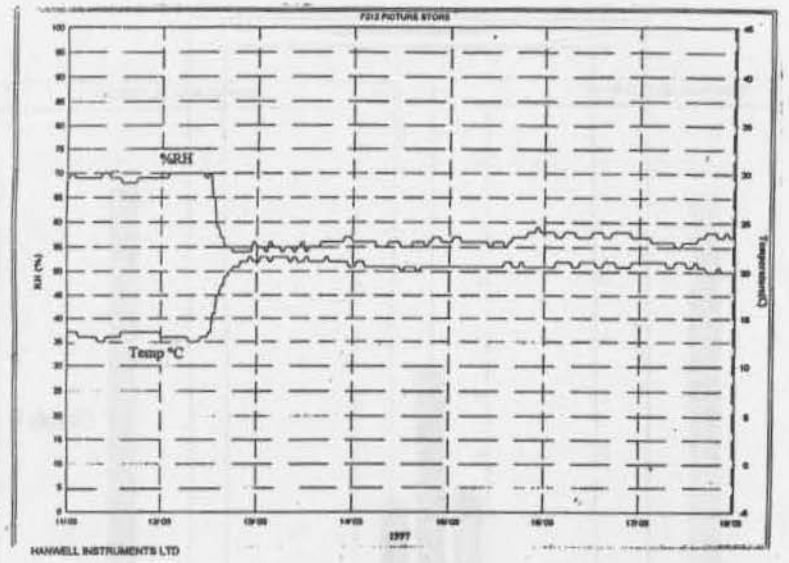
**Graph 8** Shows the effect this has had on the Saloon. The RH is now above 40% for 75% of the time compared to the previous 10% figure.

As with the museum, relatively few complaints were heard from the public who tend to wear their coats when walking around the rooms. Extra portable heating was supplied to gallery staff and when school parties were taking part in activities in the rooms.

Method 3: Humidistatically controlled heaters.

The attics in the Mansion have stores containing organic materials, namely furniture and paintings. Here the problem is the opposite to the lower floors. Since their is no heating or lagging in these areas the RH is much too high usually 70-80%. Too high an RH can result in mould growth, insect attack and warping of organics.

We have lessened this problem considerably by fitting low voltage convector heaters attached to Hanwell Humidistats. The Hanwell Humidistats consist of a black relay box attached to a small wall mounted




Graph 9

sensor. The heaters are simply plugged into the wall-mounted relay boxes beneath. The sensors can be calibrated to switch heaters or humidifiers on or off when a particular RH is reached or passed. In our case the humidistats are calibrated to switch the heaters on when the RH passes above 60%
All stores are also monitored with Hanwell monitors.

**Graph 9** This shows what happened in one of the Mansion attic stores when the heater and humidistat started to work. The heater immediately started warming the room and correspondingly lowered the RH to between 55% and 60 %.

We are not finished with improvements to the heating system yet. We are awaiting money to upgrade the heating system in the Museum and place humidistats and sensors in the gallery.
In the Mansion we are wiring each radiator with its own humidistat which will turn it on or off at its own individual set point.
Many problems still exist, principally the expectation of staff that all galleries should be as warm as their own living rooms. However the Conservation section is still on speaking terms with all the staff, and the environment in both buildings has definitely changed for the better.

*Bob Entwistle and Jeanette Pearson.*



# Historic Storage of Invertebrates at Liverpool Museum

Information for this paper came from the research of a museum volunteer and collector, Reverend Henry Hugh Higgins (1814-1893). A paper entitled 'Museums of Natural History' was written by him in 1884 and this gave much information on the early natural history displays, particularly the invertebrates. Higgins used his experience in rehousing the invertebrate collections over a 12 year period, from the Duke Street premises to its present site in William Brown Street from 1860. Higgins was keen to incorporate the palaeontology collections into his new invertebrate storage/ display but was discouraged from doing so by the Liverpool Geological Society who insisted on separate, stratigraphically arranged displays.

It may also be mentioned that Higgins was also chairman of the Museum's sub-committee and founded the Museums Association late in his life in 1890.

**Invertebrate Storage**

The invertebrate collections seem to be stored in a 'storage on display' system quite typical of the time with drawers at the base and glass cases at the top. In the 'Animals without Bones' section there were approximately 20 table cases, each measuring five by ten feet. In total, the cases held drawers which accommodated 240 trays of specimens to display 1000 square feet. The cases were equipped with upright compartments and drawers measuring 27 by 16 inches. The drawers were arranged so that they could be lifted out if required for lectures, an indication, perhaps of just how vital it was to use the collections and that access was considered important.

Each drawer gave about three square feet of exhibition space. One third of each drawer was divided into three sections. The left side contained fossil representatives of the group, the central area contained a tablet of information relating to the objects in the drawer, and the right-hand side contained British examples. The remaining two-thirds of each drawer were used to display examples of foreign specimens. Higgins also mentions that this type of storage was not used for the microscopic or soft-bodied specimens.

**Conservation Problems**

1. Custodial Neglect

Higgins criticises the labelling, particularly of display specimens, noting that he has observed inaccurate, absent, faded and illegible labelling in museums. He also mentioned the problems caused by vibrations from visitors viewing the collections, which often separated the specimen from its label and that this was made worse if the display was overcrowded. To Higgins, good labelling was one of the most important factors.

Although Higgins does not use the word 'Conservation' he does describe collection care as 'the passage of a living hand,' describing custodial neglect in the following way:

"In a public museum where the cases are supposed to be, but very rarely are, dust tight, their contents, if left to themselves soon acquire an indescribable aspect of neglect. I remember to have seen many very respectable series of insects, birds, shells etc. wearing such an obsolete look as to repel the advances of all except the most resolute observers."

He also states that the specimens in many displays look as if they have been assembled by a "porter or charwoman." Higgins suggests that all the work on maintenance of displays should be carried out by the Curator and assistant and that this should occupy about 1/3 of their work time for a large collection. Do we spend that much time on collection care for storage on display? Higgins states that "yet that too frequent uncared-for look must be banished from within the walls of the museum if it is properly to fulfill its function."

In the paper, Higgins does not make it clear which museums he is referring to, but it does show that even when many museums were new, it was not long before displays of natural history objects were neglected. He also emphasises that collecting policies need to be rigorous to exclude material which cannot be of use or will cause curatorial problems later on.



2. Theft and Vandalism

Not mentioned as being a particular problem for natural history specimens at Liverpool Museum in 1884. However, it is stated that all important specimens (?type and figured) should be stored in closed cabinets. Storage of microscopic specimens such as rhizopoda, radiolaria and diatoms on slides should be in a laboratory with microscopes, close to the aquarium and not on public display.

3. Light Damage

Described in the following way: "So injurious was known to be the long -continued and direct action of light upon a large proportion of museum specimens, that two roller-blinds, one of brown holland[1] the other of black and nearly opaque stuff, were affixed to each skylight in the invertebrate rooms." However, Higgins complained that the blinds were not always in working order and that they kept a number of American oil-cloth covers to place over the sloping table-cases, except when the museum was open.

It is mentioned that certain categories of insect are prone to fading, particularly the nocturnal Lepidoptera. Higgins also observed that light did not seem to affect insects whose colour was due to diffraction (i.e. striated surface) like the *Morpho cypris* butterfly. However, those whose colour was dependant on pigments faded on exposure to light.

Higgins also stated the effect of light on shells, again mentioning that those with pigments faded, whereas those with iridescence and no pigment maintained their colour, such as the nacreous interior of *Haliotis iris.* Other materials which were found to experience colour loss in light included some of the brightly coloured corals, but he suggested the use of specimens which can be easily replaced for displays. Higgins said that "for specimens that can be replaced, no better end can be desired than an honourable decay in the service of the public."

4. Polution

Of pollution, Higgins mentions the particulate variety only saying "The penetrating power of particles floating in the atmosphere exceeds what is easily credible." One of the solutions to this problem was to have the table cases made with extreme care so that they fitted closely when closed. The lids were lined with slips of velvet border on both sides so they closed together without a gap. Once shut, the lids were screwed down by a half-turn clamp and were locked in the centre. The hinges to these cases were of the type used on pianos and a tin gutter ran below the hinge to catch any dust particles which might get through. Despite all these measures to prevent particulates from accumulating, Higgins stated that "The continued trampling of thousands stirs up swarms of impurities that find their way into the cases to an extent that is positively painful, and admits of no remedy except by passing every group under the good offices of a loving hand at least four times in the year."

The lid of table cases had a glass covering underneath and some drawers had glass lids to prevent particulate pollution. Higgins also mentioned a type of pollution which appeared as minute black specks on the surface of the glass cases. He observed that this was difficult to remove and seemed to cause a chemical reaction with the glass surface. If removed, the glass appeared damaged underneath. This may have been due to the chemical factories in Liverpool, which used open methods of producing acids, with disastrous pollution problems. Higgins suggested the avoidance of soft, fine plate glass for table cases as they were easily scratched when cleaned if particulates like sand were present.

5. Pests

This problem is not specifically dealt with in Higgins' paper, but he mentioned that insect, spider and crustacea collections were stored in corked, entomology-style drawers with glass lids. These drawers had double sides so that camphor could be applied.



6. Physical Force

Certain categories of material, such as insects, scorpions and spider crabs were secured by pins, but they had a problem with shell materials and it was mentioned that "the vibrations caused by the constant tread of many visitors would send them wandering off, far from their names, in all directions." A common solution to this was to attach the specimens to a mount made of bay wood, to which a thin paper covering was attached. The edges of the wood were then planed with fine sandpaper. Once dry, a label was then pinned rather than pasted on. The pins were then cut down. We still have many old labels in the collections with pin marks where they were attached.

With the mollusca specimens, Higgins stated that the easiest way of securing them was by gluing the shell down. He did not approve of this method, saying that it "destroys the character of the natural object, turning it into a piece of museum furniture." He mentioned that occasionally a little isinglass[2] may be used to fix a smooth shell in position, but that the gluing down of small shells seems "simply barbarous." To these problems, Higgins suggested two solutions, the first was to use pins to hold some shells, echinoderms and crustaceans and the second to use pill-box lids or shallow porcelain dishes, infilled with cotton wool to protect the specimens. Some pill boxes had glass lids so the specimens were secure whilst on display. He felt that this was the most satisfactory way to display small, fragile specimens. Glass tubes were used for dry microscopic specimens like foraminifera and flattened glass phials used for wet preparations of worms, myriapods and spiders. Sertularian zoophytes were pressed flat and held down with spots of India-rubber adhesive dissolved in turpentine.

For larger specimens, such as sponges and echinoderms, protection by being suspended on brass wire frames in a lattice, secured them, allowing viewing from the underside.

**Conclusion**

From this paper written in 1884, we can see that many of the conservation problems associated with storage and display areas of museums had already been identified. All these storage problems had been given solutions at least in the short term. Where modern storage differs is that more

consideration is given to the types of materials used and their stability for the long-term. Our range and choice of materials is now much greater, particularly following developments in polymer chemistry. What we must remember is that at the time this paper was written the storage materials were probably less than 20 years old and long term changes in many of them would not be apparent. Whatever we know now, it is useful to have an account of the materials used in the past and although materials have changed, the same conservation problems with storage and display areas still exist today.

**Reference:**

Higgins, H.H. (1884) **Museums of Natural History,** Liverpool Literary and Philosophical Society, Volume 38, 1883-4, p.183-221.

**Materials used in Storage and Display**

Liverpool Museum 1884.

| MATERIAL | USE | DETAILS |
|---|---|---|
| Brown Holland | Roller Blind | Used in conjunction with a second blind of unspecified material. |
| American oil-cloth | Table case covers | Light-proof substitute for blinds. |
| Velvet | Dust seals for cases | |
| Tin | Gutter in case | Used to collect dust par ticles. |
| Glass | Case/drawer cover | Pollution and damage protection, |
| Lid, phial & shelf | Containers for small specimens. | |
| Wood (Bay) | Text/ label tablet | Paper and specimens sometimes attached. |
| | Dividers | Also used to separate groups of specimens in drawers. |
| ?Brass | Pins, frames | Used to hold specimens in place. |
| Cork | Drawer base | An attachment for pinned objects. |
| Silk (scarlet-corded) | Dividers | Used to separate rows of insects. |
| Isinglass | Adhesive | To attach smooth shells to tablet. |
| Porcelain | Containers | To display small specimens. |
| Cotton-wool | Packing | Used to protect fragile objects in pill-boxes. |
| India-rubber | Adhesive | To attach sertularian zoophytes |
| Turpentine | Solvent | Used to dissolve india-rubber |
| Wood (unspecified) | Display case and drawers. | |
| Cloth (unspecified dark blue material) | Drawer lining | Used to protect and display coral specimens. |
| Camphor | Pesticide | Applied to double-lined drawers. |

[1] A fine heavy-duty linen material

[2] A glue derived from the air bladders of fish.

*Wendy Simkiss*
*NMGM Earth Sciences*

# Guesstimating Storage Space

In the new world of lottery bids and option appraisals people seem to want expert opinions at the drop of a hat or by the end of the week. I've been forced to develop some rules of thumb for answering questions such as "How much space would we need to store that lot properly?", "Would it fit into this building," and "Would it fit into that building if we decided to devote this gallery here to storage on display?".

Industrial space management techniques are not very helpful when it comes to planning for museum collections, except perhaps archive collections, since they assume large numbers of identical sized objects. Sue Walston and Brian Bertram wrote "Estimating Space for the Storage of Ethnographic Collections" in 1992 and it is excellent if you have a small enough collection or sufficient time to measure each object individually. The guidelines below work for assessing large collections, where most of the objects are relatively small, the sort one person can lift unaided. Heavy and large objects, requiring mechanical handling, are more difficult to generalise about.

**Calculating the volume**

The first step is to calculate how much space the collections need, in cubic metres. Start by measuring all filled storage, in other words not the aisle ways or empty shelves, and adjust the figures where the objects are crowded or stacked in such a way that access is unsafe. Add in growth figures, calculated from previous records, or curatorial expectations, and adjust them for the expected life of the new store. With mixed collections the total volume may be subdivided by environmental requirements.

At the National Museums and Galleries on Merseyside (NMGM) a survey was carried out on the re-storage of the Humanities collection. We used survey forms for each readily identifiable group of objects. Notes were made on the suitability of the existing storage, packing needed for transport, ideal storage, curatorial access required, and potential for storage on display, as well as the volumes and environmental requirements. All this information was then put on a database. Tackled this way 100,000 objects were represented by less than 300 survey forms. We calculated that the main collections we have assessed in this way needed twice as much space now, 3 times as much in 25 years time.

**Calculating the floor area needed for storage**

Having arrived at a figure for the volume of storage required there are three main options; conventional fixed racking and shelving, compactor or mobile systems, and low density "storage on display" arrangements.

In compactor systems bays of shelving and cupboards are mounted on long trolleys which run on rails on the floor. When closed the system forms a solid block. For access the trolleys are rolled apart to create an aisle way where needed. "Storage on display" usually seems to end up looking like a very crowded museum display, with less labels than normal. Some of the objects will be on permanent view, behind glass doors, or case tops; others may be in drawers below a desk case, with Perspex or glass covers on each drawer for security. Public access implies that there will be more people in the store, so the aisles will need to be wider than in a "Museum Staff Only" store.

For the safety of both the objects and the staff it seems desirable to avoid the use of ladders as far as possible. It would therefore make sense to limit the maximum height of storage units to around 2 metres when most of the objects in the collections can be lifted by hand.

The formulas below give an indication of the floor space needed for each type of storage:

- **Fixed storage**: One square metre of floor space will accommodate one cubic metre of storage. *Diagram 1* shows this represented schematically. *Diagram 2* shows how it might look in real life.
- **Compactor storage**: One square metre of floor space will accommodate two cubic metres of storage. *Diagrams 3 & 4*
- **Storage on display**: One square metre of floor space will accommodate 0.5 cubic metres of storage. *Diagram 5 & 6*

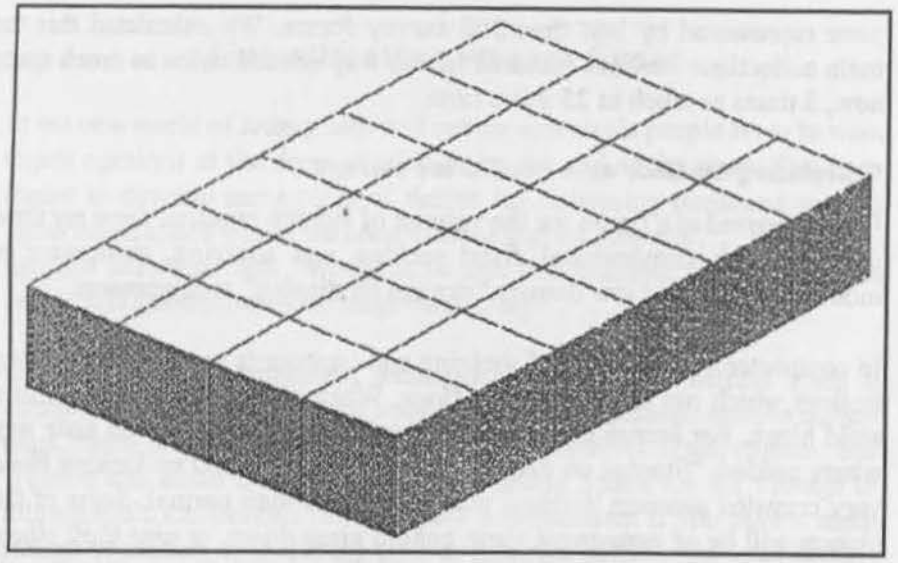


Diagram 1

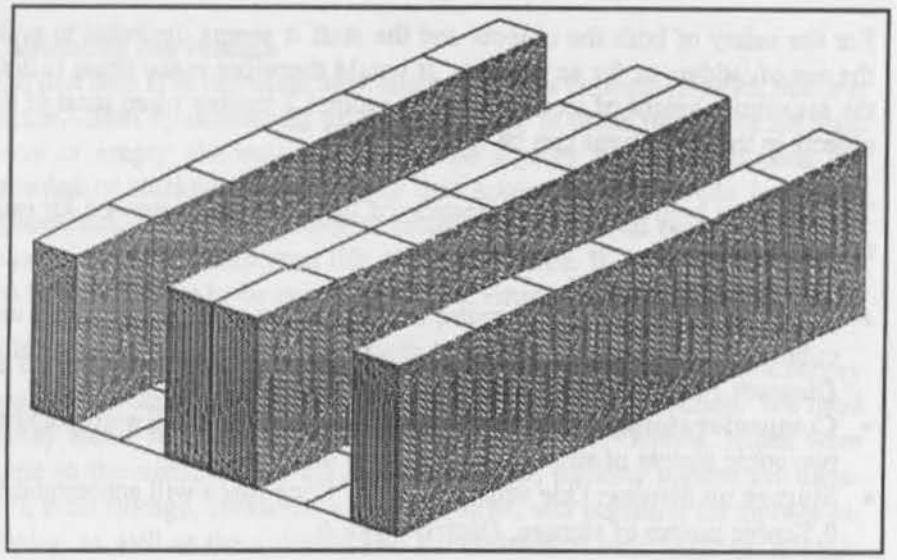


Diagram 2



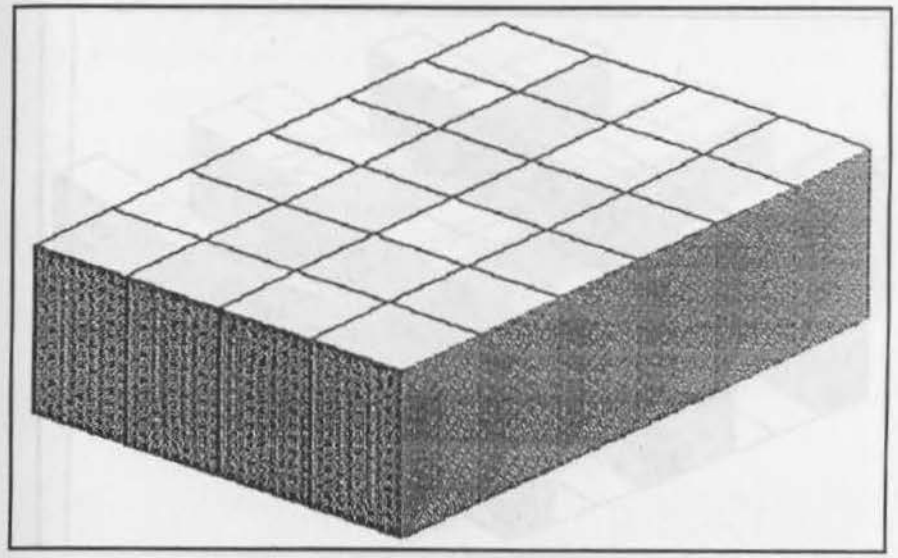


Diagram 3

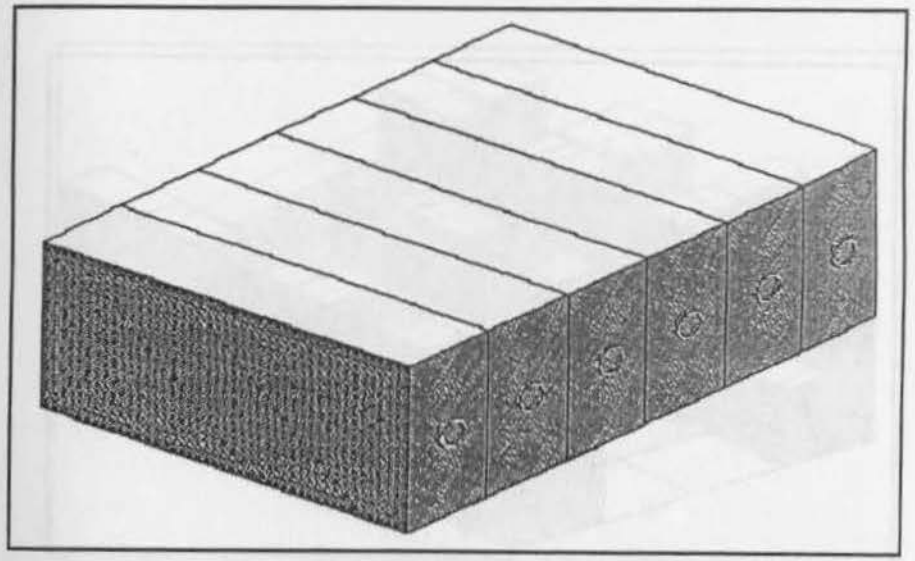


Diagram 4

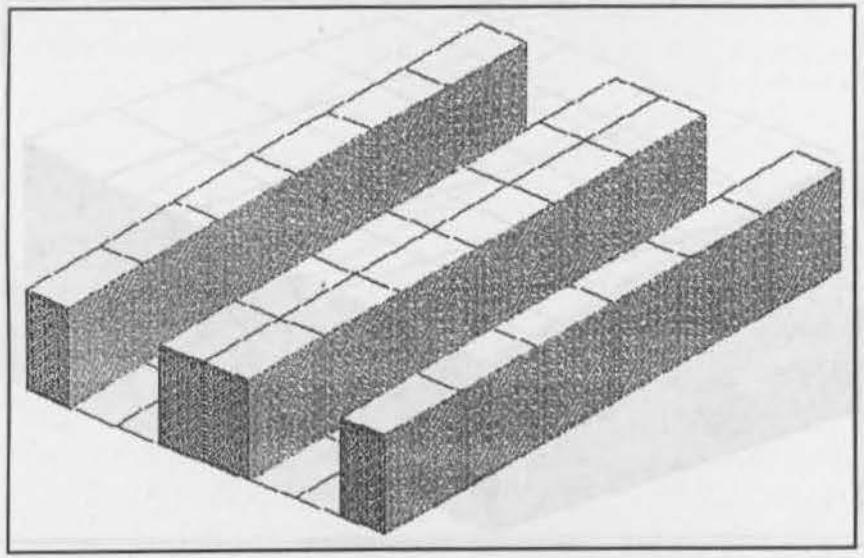


Diagram 5

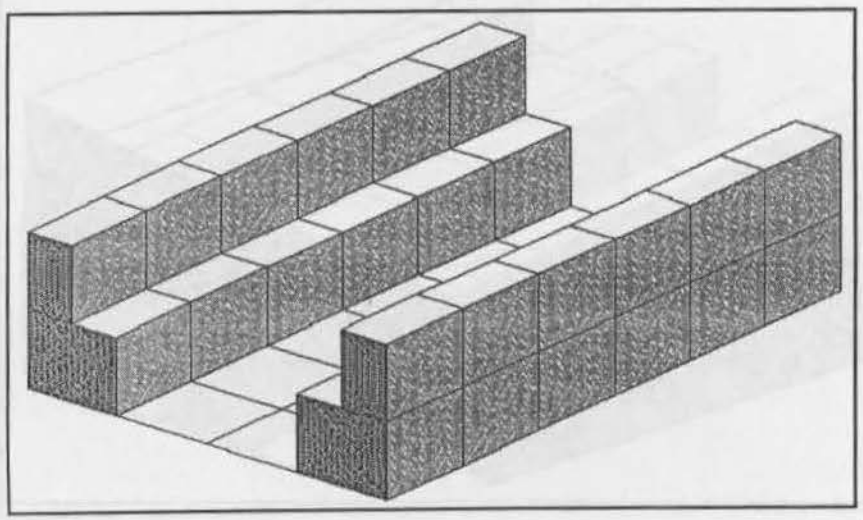


Diagram 6



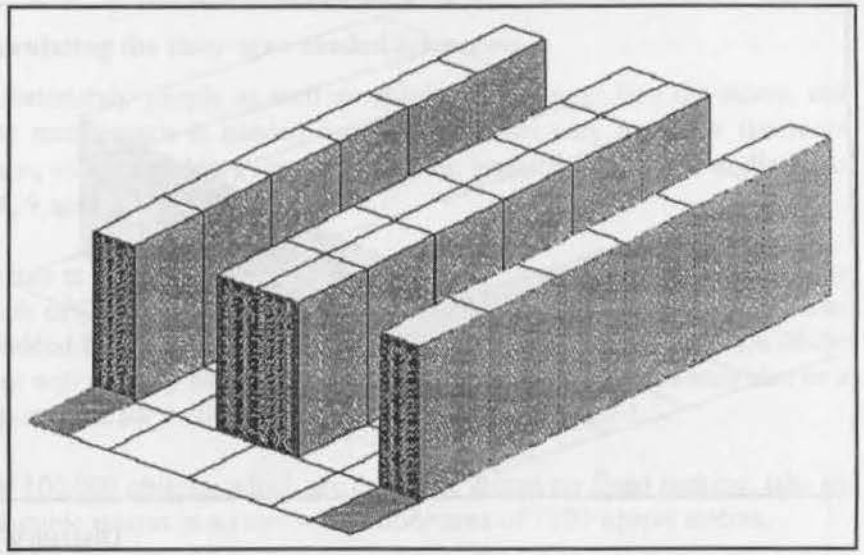


Diagram 7

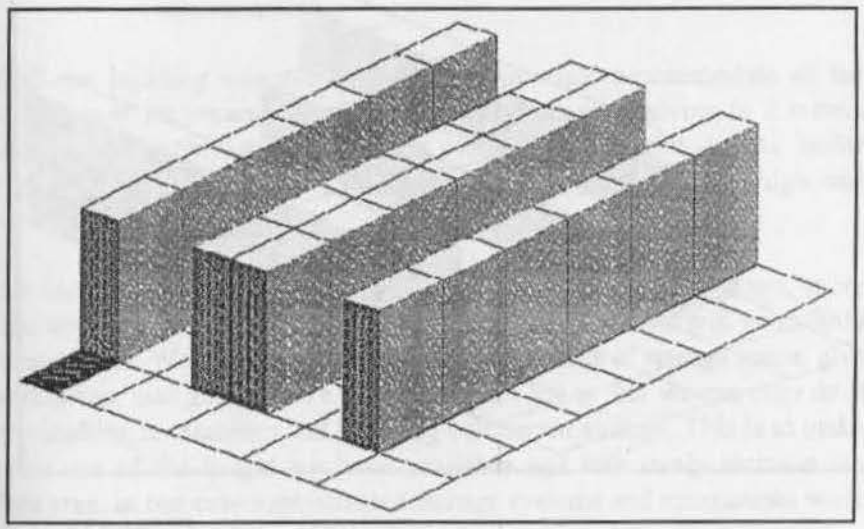


Diagram 8

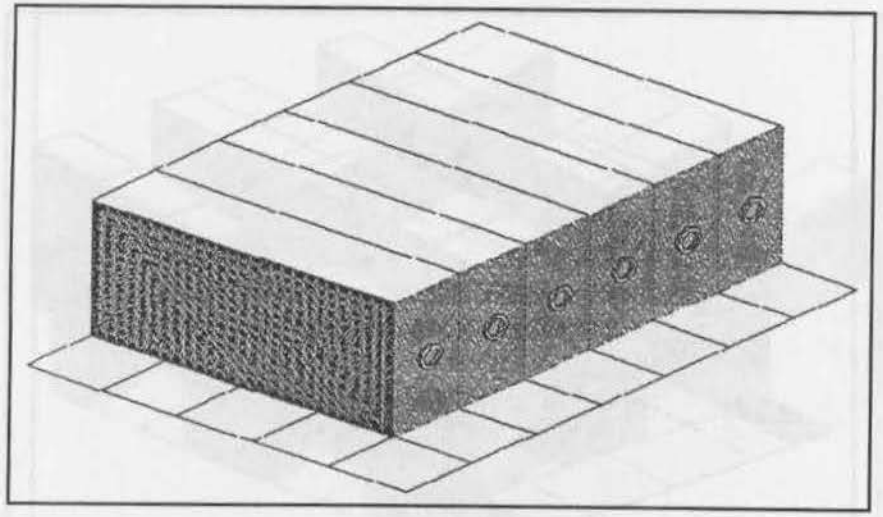


Diagram 9

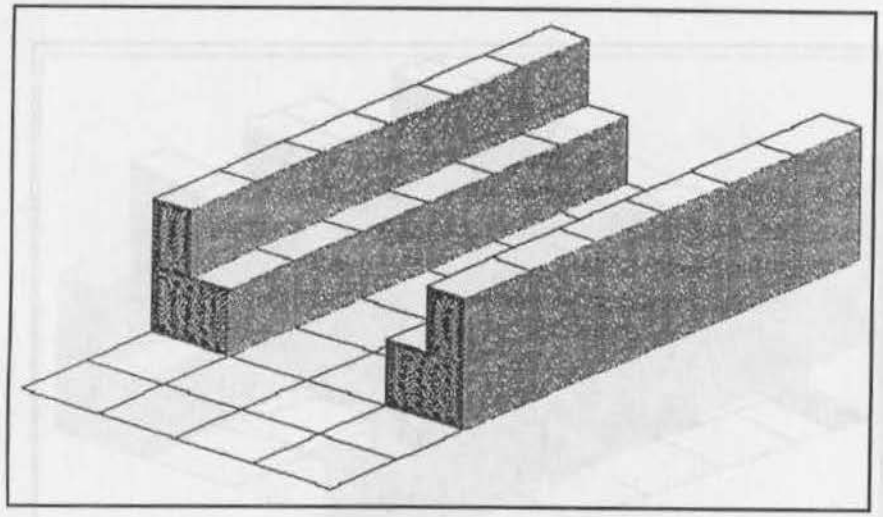


Diagram 10



**Calculating the floor area needed for access**

Unfortunately people as well as objects have to get into the stores, and how much space is needed for them depends very much on the room shape, where the doors are, and what the layout is, as shown in diagrams 7, 8, 9 and 10.

Deduct at least 20%, better 30% of the floor area before calculating how much of your collection will fit in. (This corresponds with guidelines provided by storage firms that with fixed storage only 30 to 40% of the floor will actually be occupied by the shelving units.) There may also be a requirement for workspace, desks, etc., to be considered.

Our 100,000 objects, which are currently stored on fixed racking, take up 900 cubic metres in a store with a floor area of 1300 square metres.

- Floor area available for storage = total floor area less 30 % access space
- Thus for our store floor area for storage = 1300 - 30% = 910 square metres.

If all our building was used for storage we could accommodate all the collection in its present overcrowded conditions on shelving to 2 metres high. However parts of the store are used for staff rooms, toilets, boiler rooms and work areas, so our shelving is actually 3 to 3.5 metres high, and our aisles are rather narrow.

Our survey showed that we needed 1900 cubic metres of storage, more than double what we have now, and in 20 years time we will need 3000 cubic metres. We are going to fit 1900 cubic metres of storage space, plus work areas, into 1000 square metres of floor space, but we can only do it by installing mezzanines and by using compactor storage. This is to make better use of the height we have available and effectively increase the floor area. In our case sophisticated storage systems and mezzanines work out cheaper than buying additional space.

**Caveats and tips**

- Check floor loadings
- Check sizes of doorways
- Check the room dimensions are correct
- Use mezzanines rather than high shelves, if possible, since access will be safer.
- Existing wooden drawers can be transferred to new storage.
- Shallow plastic Eurocrates cost about £12 each, and can slot into a shelving system. They could provide similar storage conditions to metal drawers which cost about £90 each.
- Existing cabinets can be mounted on mobile bases to convert them to compactor storage
- Compactor systems keep dust and light out without doors when they are closed. Cupboard doors add 30% to the cost of each cabinet .

**Conclusions**

The method described is only a first step, a feasibility stage in planning storage, but gives comparable results with cutting cupboards out of graph paper and shuffling them on floor plans, and saves an awful lot of time.

*Vivien Chapman*
*Head of Organics Conservation*
*NMGM*



# Microscope Slide Collection Storage, the horizontal or the vertical?
# How should slide collections be housed?

This is a write up of the lecture I gave at our meeting at Liverpool this year. It has elements of previous information given at Ipswich AGM 1996, printed in the Biology Curator Issue 10 special supplement and presented as a poster at the Cambridge SPNHS meeting in 1997. But I make no apology for being motivated by a mission to evangelise and spread the word about microscope slide collection care and conservation.

Do you have a collection of microscope slides in a corner of your stores that quietly gathers dust? Are you aware that they may not be permanent? Do you consider the specimens and their mounts to be as seemingly inert as the glass of the slides? Of course, glass must not be considered to be permanent in the long-term scheme of things either. If the answer to this question is yes then do I have news for you! I used to think that the slides I made would last forever but I no longer take such for granted.

I look after a collection of about half a million microscope slides. The first problem with storing a collection of this size is its weight! My slides are on the top floor of the Entomology building at the Natural History Museum in South Kensington so if they decided to break through the floors, they would take all below to destruction. I have calculated that the floor has to cope with 0.3 metric tonnes per square metre, or circa 4 kiloneutons per square metre. Most normal house floors have a weight loading of 5 kiloneutons but in my case the 17 kiloneutons quoted put my mind at rest. Our floors are built to take the weight of a tank.

With some disquiet other colleagues, and I noticed that some aphid greenfly slides were deteriorating. Shrinkage of the mountant due to water or solvent loss distorts and destroys the specimen and allows air in which may oxidise both mountant and specimen. Crystallisation of a gumchloral mountant occurs when chloral hydrate crystals form after water loss. Such crystallisation can be reversed by removing the protective ring and rehydrating the slide in a warm moist environment, although the crystals may

have disrupted the specimen already. Another form of gum chloral deterioration is blackening which can erode the specimen away. This may be due to a surfeit of phenol in the process and be precipitated by exposure to light as photographers use phenol as a blackening agent. Remounting such slides are a major raison d'être for me at the NHM.

Such problems arise from the unstable chemistry of the mounting medium but some deterioration can be alleviated by the four lines of defense against environmental variation. Controlling the ambient conditions, firstly inside the store and secondly inside the cabinet is important; and then thirdly the protection offered by plastic or paper slide envelopes (used in vertical storage) and finally by sealant rings of a suitably inert substance. Old plastic envelopes were manufactured out of plasticised Polyvinyl chloride which became brittle and yellow and possibly emitted hydrochloric acid. With the cooperation of Cliff Gothorpe of Preservation Equipment Ltd., we have developed a thick archival quality polyester envelope for our needs that can be bought from this company.

The final line of defense, the sealant ring painted round the coverslip reduces the drying out of mountants especially in dry environments. When the ring fails in a dry environment, evaporation, shrinkage, discolouration and cracking can occur. When relative humidity and temperature are too high, sweating can occur making a sticky slide and which promotes fungal attack of the mountant especially in water based mountants. So the main point of this talk is that microscope slides need a controlled environment as much as any other group of specimens. Environmental conditions should be as stable as possible and this helps if ones storage furniture is sealed as much as possible.

In the Natural History Museum generally the thinner and more solid the slide mounts the more likely they will be stored vertically. The thicker or more liquid the mounts, the more likely they will creep under the influence of gravity when stored vertically. Some say that all mountants will creep with time, as does the glass itself such as in the glass panels of the giraffe case at Ipswich Museum.
A draw back with horizontal storage is that fewer slides can be stored in the same sized cabinet than if they were vertical. Hill units with horizontal



slide drawers hold 5,250 slides. Hill units with vertical slide drawers can hold 10,000 slides when full. Before storing slides vertically they must be baked hard in an oven at 30-40 degrees centigrade to avoid the mountant creeping. Often have the inexperienced placed wet slides vertically to find after a few weeks, a gooey mess of mountant and specimen on the floor of the drawer and sticking neighbouring slides together.

Liquid mounts should never be stored vertically as the seal will be much more prone to damage by jostling with other slides and the specimens will also sink to the lower edge and be damaged against each other or against the edge of the mount. Likewise dry mounts in wood or plastic well slides should be stored horizontally.

Other less satisfactory storage systems are storage in loose slide boxes each holding 100 slides in racks with can fall off shelving and which take up far more space than drawers do. Horizontal storage in wooden or cardboard trays in boxes also takes up much more space. The NHM Copepod collection is stored on cardboard trays in cardboard boxes within wooden cabinets. The method by which a collection has been stored has often been dictated by the method of storage of the major donated collection of that group of organisms which formed the nucleus of the Natural History Museum's main collection.

Vertically stored collections in drawers can be more easily added to than horizontally stored slides. They can be arranged taxonomically with closely related families, genera and species together with associated indices, as with many other dry or spirit collections. They can also be arranged alphabetically, and because they are thin and card-like with some protection afforded by the glass (and envelopes), they can be their own index. This forms a database of genera, species, geographic distribution, host species data, collection dates and different sexual forms etc. without the need for a separate card index. Also vertical slide collections can have short bottles of specimens in spirit, pinned dry specimens in unit trays and dried host plant samples all in the same drawer.

Specimens on stubs used for Electron Microscopy can be added to a slide collection as in the NHM's Copepod collection where they are housed

horizontally in 'dry' card well slides. The curation of scanning electron microscope stubs is discussed by Julia Golden (1989, 17-26).

Are you aware of any active deterioration in your slide collection? It is so easy to think of slides as being inert and safe as they cannot be eaten by *Anthrenus*. Some mountants were never meant to be permanent preservative media. So beware, store your collection in stable conditions and monitor them for deterioration.

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## The Perfect Relationship? Balmforth Cabinets and The Natural History Museum Entomologist.

This is a story about the importance of a good working relationship between the customer and the manufacturer, the customer being the Natural History Museum in South Kensington and the Manufacturer being Balmforth Engineering Ltd. of Bedfordshire.

The story starts with old wooden mahogany Hill units each filled with 20 well manufactured and original wooden and glass topped drawers. Our problem was that the Hill units are often warped and split so were not sealed against environmental variation and the predation of insect munching *Anthrenus, Attagenus* and *Rheesa* beetle species. We have cleared many of these carcasses of their drawers and then sold off the carcasses. Initially Mike Fitton visited the Smithsonian Institute in 1990 and was impressed by their insect storage system and the efficient and cheap metal cabinets they have. He was keen to improve and standardise our storage systems and to try and stop the endemic local pest problems inherent in the old Hill cabinets and open accessions racking and allow for planned collection expansion. We used Ron McKinley's specifications as a basis for our own requirements.

Other companies have supplied us with metal cabinets. Spirit collections have been stored in metal spirit cupboards such as this but we are now rehousing such collections
Spirit cabinets made by Dexion Ltd. of Brierley Hill, West Midlands, which now hold the Caddis fly and lacewing spirit collection. Abbeycross Fabrications made carcasses for the compactor units which have been used to store the glass topped and bottomed Rothschild lepidoptera collection drawers. Here we have a birdwing butterfly seen from below so that the specimen need not be removed from the drawer to view its underside. Each cabinet cost £195 in 1994.

The compactor system itself was manufactured for us by Brittania Storage systems of Colchester, which cost us £139,044. On an older compactor base, the buffer bars were sited low on the frame which caused a trip hazard. The new specification avoids this by siting the buffer bars high up on the cabinet tops.

We needed new steel cabinets to hold the Hill unit drawers. Three companies were approached who made prototypes for us and we took the best features and worked up the final specification from them. These companies kindly allowed us the freedom to do this. Balmforth won the contract and we liaised closely to improve the specifications and so we jointly developed the design. We do not hold the design copyright but we do get a cheaper deal on the cabinets. They prove to be similar to secure cabinets used by the Ministry of Defence for their secure telephone exchanges. The NHM Coleoptera collection now has 569 cabinets in six double-backed rows and two cabinets high. We are expecting a further 31 cabinets to arrive on this floor.

Other cabinets have been built to hold the different dimensioned accession drawers that have been, and still are, in open racking. In 1996 a further 36 cabinets were ordered to rehouse our Mosquito collection of which 16 have been funded by Zeneka Agrochemicals to the tune of £8,990. Also a collection of Acridid grasshoppers from the Natural Resources Institute at Chatham came with £30,000 pounds to cover cost of 36 new cabinets.

The cabinets sit on square metal plinths which in turn sit onto bolts which can be adjusted to level the unit. The units do flex if the floor is not flat so the adjustable legs keep the carcasses square thus ensuring the doors close and locks fit perfectly. These units are also designed with magnetic face panels which can be easily removed to gain access for cleaning.

The Hill drawers run on wide metal runners edged with Teflon to ensure smooth running. The runner flanges are wide so as to take narrower drawer sizes if required. Initially these Teflon edges were not glued and were prone to fall off the metal flanges, so now they are 'superglued'. The doors are edged with a foam buffer with a fifty-year life expectancy so the foam needs to be accessible for replacement. Two strips also run along the back panel to cushion drawers as they are replaced in the carcass. The foam used is EPDM ethylene prodimethylene which is resilient to squashing.

Closure bolts on the top and bottom edges of a door pull the door toward the carcass when turned shut to improve the seal. These cabinets are not completely airtight as this would make them too expensive but they are



considered *Anthrenus* proof. Dead spaces in the carcasses have access holes with rubber bungs so that insecticides such as Constrain and Drione can be inserted. The handles chosen are based on a car door handle, which was decided upon after much discussion. Some say that these handles are a hazard as they catch passing staff. Older similar cabinets have no handles, being opened by key only which run the risk of keys braking in locks. The label holders are made of acrylic and are prone to snap if abused.

Problems with the specifications were identified and quickly rectified and the design improved for future orders. We did not pay up until the cabinets were perfect. The big order of £¼ million and the knowledge of replacing all our Hill units and open racking ensures good customer care. In Edinburgh the same cabinets can be seen at the Royal Museum Storage and Research facility at West Granton and 12 drawer cabinets can be seen at the National Museum, Cardiff who also have joined us thus increasing the order and reducing the price for each unit. At York Museum, Paul Ensom has used these cabinets to store minerals. Using computerised jigs, the dimensions can be changed easily with little change in cost. You can order these cabinets from Balmforth or from Preservation Equipment.

*Paul A. Brown*
*The Natural History Museum*

# Planning for Growth
# Liverpool Museum Herbarium 2001

## Introduction

The Botany Department at Liverpool Museum (NMGM) contains just over 325,000 specimens. The department is currently developing plans for the restorage of this collection as part of a major programme of redevelopment in the museum. It is planned to move to a new storage area in 2001 which will meet our needs for the next 20 years. This paper describes some of the aspects of this planning.

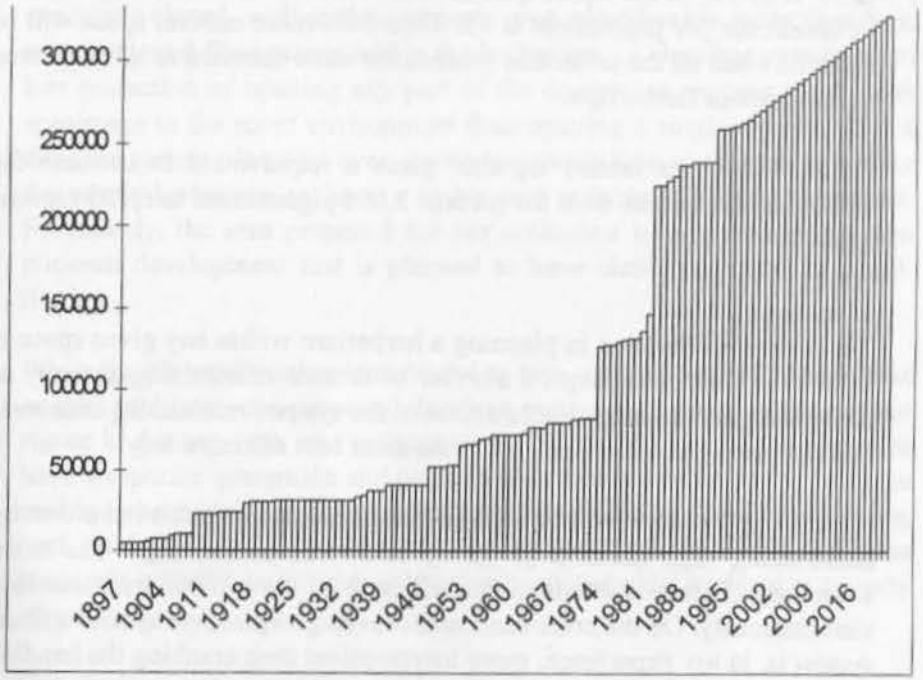
When looking at our space requirements for the future we are attempting to match the likely size of the future herbarium to the spaces which will become available as part of the redevelopment. This paper will review how we have estimated our future size of the collection and consider some of the factors, especially those which raise conservation issues, which have led to the current proposals. It deals with the section of the plan involving material preserved on herbarium sheets, numbering around 275,000 specimens. It does not include the collections of packeted cryptogams and economic botany items, which makes up the remainder.

## Expected growth through acquisitions

While planning for future accessions can never be a completely accurate science. There are some lines of evidence, which should be analysed. The most important of this is of course the track record of past growth of the herbarium (Figure 1). This shows that growth has averaged 2,600 specimens per annum over the last hundred years. However there has been wide variation from this average with some very inactive periods e.g. the 1920s, while the acquisition of 150,000 specimens from the University of Liverpool herbarium in a sequences of transfers in 1974 and 1986 also distort the picture. Removing this single acquisition gives a lower long-term average of 1,400 specimens p/a. However, even if we exclude this major acquisition, the average for the last 20 years has been higher than the longer historical trend with an average of 2,800 specimens per annum. It is reasonable to assume that the most recent past will be our best guide to the immediate future, so we have adopted this last figure for planning.



Figure 1. *Growth of Liverpool Museum Herbarium*




## Space requirements of the conservation programme

A very large fraction, that is around 60%, of the sheets in the herbarium do not meet the conservation standards we are currently trying to achieve. Until about 20 years ago, collections donated to the herbarium, including those from amateur collectors, were accepted and incorporated without consideration of their long-term conservation requirements. Thus many specimens are mounted on paper too thin to support the specimens adequately and include such horrors as specimens mounted on newspaper. Other specimens are mounted on very small sheets which, when mixed with larger sheets, can move around and damage the specimen below. Yet others have used pressure sensitive adhesive tape (*Sellotape*) which loses its adhesion and stains the mounting paper after a few years, and nearly all the specimens are stuffed into overflowing genus folders.

Evidence from the Roylean Herbarium conservation project currently underway in Liverpool shows that following conservation the average

maximum number of specimens that can be stored in a pigeon hole reduces to 50. A survey of the whole herbarium has shown that the average number of specimens per pigeonhole is 75. Thus 50% more cabinet space will be required when all the collection reaches the same standard as that achieved in the Roylean Herbarium.

Putting these two factors together gives a requirement to increase the volume of the system from the present 3,666 pigeonholes to 6,755 pigeonholes.

**Planning options**

The main consideration in planning a herbarium within any given space is to strike a balance amongst a number of factors: maximising capacity of the system; maximising ease of access to the system; minimising conservation threats to the collection - all in the most cost effective way.

Maximising capacity within a given floor area can be achieved either by constructing high cabinets (2.4m +) or by compactorising. The main advantage of static systems is that all parts of the system are accessible simultaneously. On the other hand manoeuvring stepladders around a fixed system is, in my experience, more inconvenient than cranking the handles to open and close a mobile system. Of course, if space is very pressured, a high, mobile storage system could be considered and while it combines the benefits of both systems it also compounds the problems as well.

If very high ceiling heights are available (over 4 metres) another option to consider would be installing a mezzanine floor. However, this is not possible within the space allocated in the master plan for the herbarium.

An advantage of mobile storage schemes is that they can be cheaper than static systems. The extra cost of laying tracks and installing mobile bases can be more than offset by using a doorless system as, the doors can contribute a third or more to the cost of a herbarium cabinet, depending on the door design. It is likely that we will choose this route for the additional cabinets we will require because of the significant cost savings mentioned above.



**Conservation issues**

RH and temperature monitoring in our herbarium has shown that (as expected) closed, well-sealed cabinets give considerable protection from environmental fluctuations within the herbarium. A doorless system offers less protection as opening any part of the compactor exposes many more specimens to the room environment than opening a single cabinet. Thus a doorless system places an even greater emphasis than usual on the need for the whole herbarium to have a stable and suitable RH and temperature. Fortunately, the area proposed for our collection is in a zone of the new museum development that is planned to have close-controlled air conditioning.

While the air conditioning is expected to take care of any RH, temperature or dust problems, the proposed doorless system also requires the greatest rigour in dealing with pest management. Thus a key part of the plan is to have a separate quarantine and packing area to ensure that every specimen entering the herbarium is first fumigated by freezing. Insect monitoring, both inside and outside the herbarium room, and the highest insect hygiene standards will also be maintained to arrest any potential problem at an early stage.

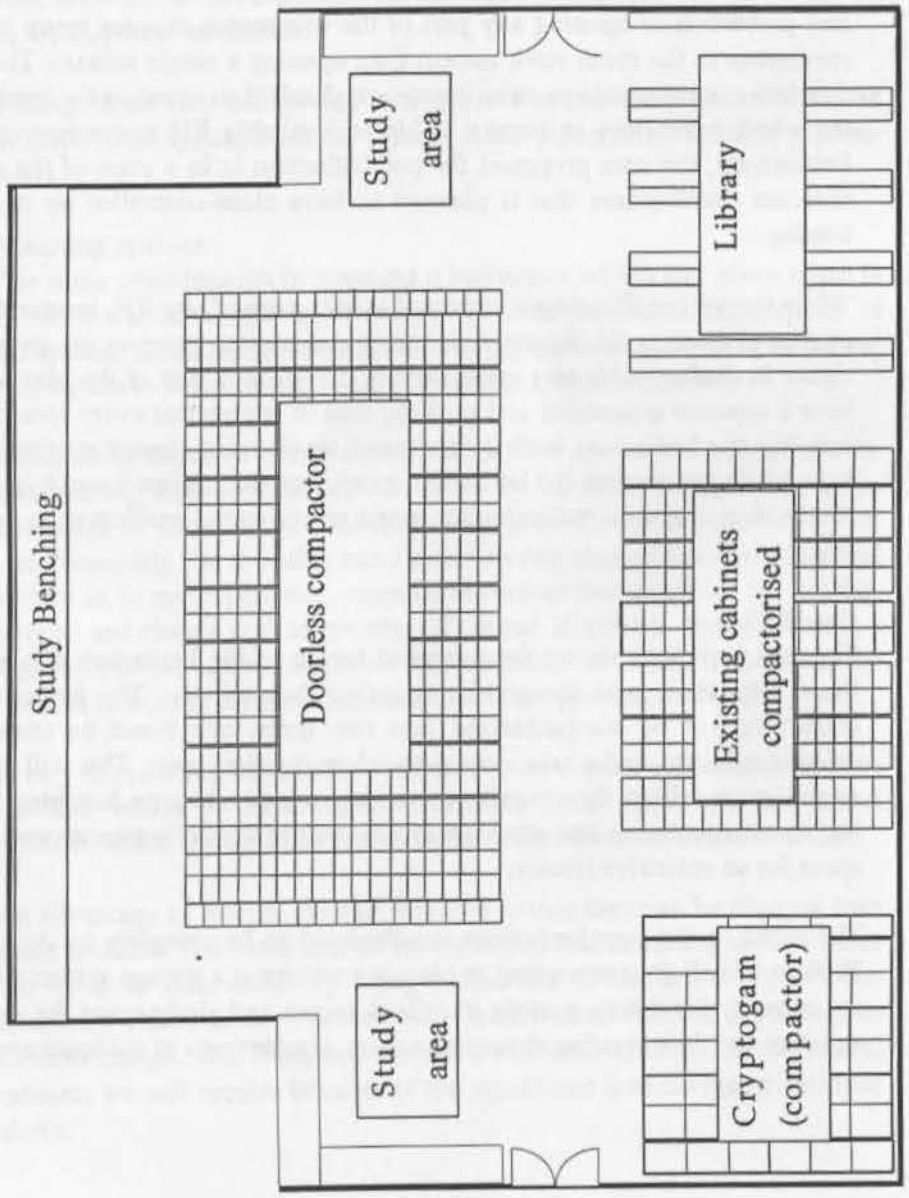
**Conclusion**

Figure 2 (overleaf) shows the proposed layout of the herbarium although these may change as the architects refine their plans. The herbarium collection will be compactorised into two units; one based on reusing existing cabinets, and a new system based on doorless units. This will give us the space within the overall scheme to include adequate benching for laying out specimens and study areas adjacent to the collection as well as space for an extensive library.

The move to the new herbarium is scheduled to be complete by August 2000 and, if all goes according to plan, we will have a storage system with the capacity for future growth, excellent access and study space for staff and visitors while meeting the conservation requirements of the specimens.

Figure 2. *Proposed layout for Liverpool Museum Herbarium*

Scale approx 1:150



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