



# **A Conservation Research Strategy for the British Library**

Dr Barry Knight  
Head of Conservation Research  
Collection Care

August 2004

## Summary

This document outlines the British Library's strategy for conservation research. The fundamental principle is that conservation research has to contribute directly to the long-term preservation of the physical collections, either by developing less interventive or more effective techniques for conservation, or by improving our ability to prevent damage to the collections. Wherever possible our tactic will be to form collaborative partnerships with other bodies, both nationally and internationally: libraries, archives or academic institutions, in order to maximise the use of resources and spread the workload.

Applied conservation research also supports the British Library's own research strategy by increasing knowledge about our collections; this provides an extra dimension to original research carried out by users of the library and by curators.

## Introduction

The British Library's consultation document "New Strategic Directions" sets out the Library's vision – Making accessible the world's intellectual, scientific and cultural heritage – and lists the enabling strategies that will permit this vision to be realised. These strategies are:

- User focus
  - Interact effectively with our users to maximise the fitness for purpose and value of what the Library provides
- Partnerships
  - Initiate and maintain effective partnerships with organisations which have a stake in our activities
- The Web
  - Migrate our traditional service offerings to the Web wherever appropriate, in accordance with users' requirements

The role of Collection Care is to ensure the long-term availability of the collections to all users by preserving both the intellectual content and the physical form of the objects. Conservation Research supports this by:

- Underpinning the activities of Collection Care
- Providing the knowledge base that permits the development of new solutions and their timely delivery
- Supporting the key corporate strategies

Conservation Research is fundamental to well-informed conservation, provides assurance of the validity of its methods and enables the development of new

techniques. Within the Library, Conservation Research supports the work of conservators and curators; outside, it complements the work of researchers in universities and research institutes, and professional colleagues in the library and archive world.

The British Library is positioned at the interface between the arts, humanities and sciences. It is a key player in the information society. Conservation research is well placed to contribute to the public understanding of science by demonstrating the significance of the information that can be obtained by applying scientific methods of examination to visually satisfying objects such as illuminated manuscripts. In the same way, conservation research helps to raise the profile of conservation by adding depth to the stories told by our collections through analysis and examination.

For conservators, conservation research enables effective treatment by improving existing techniques or developing new ones, it helps to reduce the rate of decay of collection items by developing methods for removing or neutralising agents of deterioration, and it leads to a greater understanding of the nature of objects by investigation and analysis.

For curators, it enables primary research into the collections by giving an improved understanding of the materials and techniques used in creating an item, and it assists interpretation, for example by revealing hidden information in text that may be faded, obscured or erased.

For researchers and colleagues in other institutions, it facilitates the sharing of information on treatments, techniques and methods of examination.

Conservation Research supports the Library's key strategies in these ways:

## **1. User focus**

Collection Care aims to maximise the availability and fitness for purpose of our collections by:

- Ensuring that objects remain physically available for as long as possible;
- Ensuring that items that are too vulnerable or valuable to be handled are made virtually available by digitising, microfilming or scanning.

Conservation Research will support these aims by:

- 1.1 collaborating with the ongoing condition survey of the collections: this will give a snapshot of their present condition and will inform future conservation planning.

- 1.2 undertaking a full assessment of the risks to the collections: this will point up the principal threats to their long-term survival and in particular the relative importance of hazards which are recognised but not necessarily quantified. This will enable us to prioritise our preventive conservation efforts, taking account of the probability of a particular hazard occurring and the proportion of the collection likely to be affected. Major agents of deterioration that threaten the collections include those that are inherent in the materials themselves (eg acid paper, iron gall ink, cellulose acetate microfilm); the environments in which items are stored, displayed and used; wear and tear caused by handling and use; and disasters, principally fire and flood.
- 1.2.1 Most paper made between about 1850 and 1950 is acidic, due to changes in papermaking technology. Acid paper gradually becomes yellow and brittle, and eventually becomes too fragile to handle. The response to this has been two-fold: firstly to produce surrogates of fragile documents, usually by preservation microfilming, and secondly to develop methods for deacidifying large quantities of material. The British Library has invested heavily in the first of these for many years, but mass deacidification has not proceeded beyond small-scale trials. National libraries in other countries (eg USA, Germany, Switzerland) have invested in mass deacidification, and it appears from their experiences, and from the INFOSAVE project (in which the British Library was a partner), that two of the processes that are commercially available would be viable for the British Library. *We will therefore commission a larger-scale study which will examine the technical, organisational, legal, logistical and financial implications of adopting either of these two processes.*
- 1.2.2 We recognise that the existing deacidification processes are still being developed, and that new processes may emerge in future. *We will therefore undertake research to establish the long-term effects of these processes on the chemical and mechanical properties of paper, and the extent to which they reduce the rate of deterioration. In addition, we will investigate whether any of these processes can be modified to strengthen degraded paper.*
- 1.2.3 It is well known that iron gall ink, which was widely used from the Middle Ages until the 20<sup>th</sup> century, is liable to fade or to damage paper, even to the extent of perforating it. These problems afflict an unknown number of manuscripts in the British Library's collections. *We will undertake a survey to discover the extent of this problem, we will examine existing methods of treating affected items, and we will collaborate with international efforts to develop improved methods.*
- 1.2.4 The deterioration of cellulose acetate microfilm affects many libraries in the UK and elsewhere. *We will continue to collaborate with international partners to determine the best methods of preserving the content of these films, whether by cold storage, duplication or digitisation.*
- 1.2.5 Although parchment is generally a very stable material, it is susceptible to physical damage in unsuitable or fluctuating environments, and is readily damaged by fungi and bacteria. *We will collaborate with international efforts to identify the early symptoms of deterioration before it becomes obvious, and to identify the mechanisms of degradation.* In this way preventive measures can be put in place before serious damage is caused.
- 1.2.6 The longevity of collections depends on the environments in which they are stored, displayed and used. While conditions at St Pancras generally reach accepted standards, those in other locations often do not. *We will seek to define the optimum storage and display conditions for different classes of material, and to define more precisely the*

*way in which objects respond to changes in their environment.* The results from this work will feed into the design of the new storage building at Boston Spa, and will contribute to the sustainable management of the HVAC systems elsewhere.

- 1.2.7 Simple preventive measures, such as phase boxing, can protect vulnerable bindings from damage, and timely intervention can prevent minor damage from becoming major. Since prevention is economically and ethically preferable to remediation, *we will examine ways in which wear and tear can be minimised by improved handling and boxing, and by the use of more durable materials for binding. We will also investigate how damage during digitisation, microfilming and scanning can be minimised.*
- 1.2.8 The British Library needs to be constantly aware of the risks of disasters, principally water damage as a consequence of fire or flooding. *We will undertake research to explore more effective and low-tech ways of drying water-damaged books and documents, and minimising mould growth.* This will benefit not only our own disaster response, but will also benefit other libraries and archives that may experience a disaster.

### 1.3 supporting the work of conservators and empowering them to develop their own solutions to practical problems.

- 1.3.1 The Conservation Department recently undertook a review of treatments used in the studios. Comparison with international best practice has brought awareness of the shortcomings of some existing treatments and materials, and as a result, we will focus initially on methods of treating iron gall ink corrosion, leafcasting, and alternatives to lamination. *We will encourage and facilitate the adoption of alternative techniques and materials through a programme of technical seminars and practical workshops.* This will enable conservators to develop new and appropriate skills that will enable them to adapt to future developments, such as the opening of the British Library Conservation Centre. Wherever possible, conservators will be encouraged to undertake their own research relevant to projects in hand, subject to operational constraints and without detracting from the conservation of the collections. *We will assist conservators to develop new treatments and techniques and facilitate the introduction of new materials by carrying out tests on their physical and chemical properties and on their stability, and we will compile databases of materials that are both suitable and unsuitable for use in conservation.*
- 1.3.2 *We will support the work of conservators by making available appropriate methods of technical examination and analysis, and by investigating how novel techniques could be beneficial to conservation.*
- 1.3.3 Conservators face the challenges of new materials and new processes introduced into traditional areas, which may have effects on their stability or may pose unexpected problems for their conservation. In papermaking, the increased use of acid-free pulping procedures should lead to a more stable product, but the introduction of optical brightening agents and the increased use of recycled paper may have the opposite effect. A pilot survey in 2003 showed that approximately 80% of new legal deposit monographs were printed on acid-free paper. However, it is not known for how long these papers will remain acid-free. *We will investigate this, and we will extend the survey of the pH of paper to incoming newspapers, periodicals and serials.*
- 1.3.4 In book production, new adhesives and new materials for covers have been introduced. Children's books may incorporate a variety of mechanical parts, or be made of intrinsically unstable materials such as PVC and polyurethane. The convergence of the technologies of photography and colour printing with digital imaging mean that a variety of inks and papers of limited stability may appear in books and documents. Finally, an increasing proportion of the British Library's holdings is in the form of

information carriers such as microfilm, magnetic tape, floppy disks and CDs – both as surrogates and as originals, and in books, archives and sound archive material. *We will carry out research on the behaviour of all these materials, in order to develop conservation techniques and appropriate preventive strategies before they become serious conservation problems.*

#### 1.4 supporting primary research by curators and users of the collections.

- 1.4.1 Analysis of materials and techniques can assist in understanding the nature of objects and can help in revealing their date and provenance. Scientific examination, for example under infra-red or ultra-violet light, can assist interpretation by visualising faded, obscured or erased text. Techniques used in the examination of easel paintings or miniatures are equally applicable to manuscript illuminations. Awareness of trends in humanities research will enable us to engage with curators by suggesting techniques that could be useful for their studies. *We will facilitate such studies, for example by borrowing the methods of molecular biology to identify the species of animal skin used to make parchment, or by adopting techniques used in archaeology for dating paper, leather or boards.*

#### 1.5 supporting other activities of the Library.

- 1.5.1 *We will investigate technical solutions that will contribute to the security and ease of retrieval of collection items, such as invisible security marking or radio-frequency identification tags.*

### Priorities

The risk assessment for the totality of the collections can be viewed as the overarching priority to which the elements listed above contribute. Within this, we believe that the highest priorities in terms of preventing damage are management of the environment (1.2.6), disaster response (1.2.8) and pH evaluation of new acquisitions (1.3.3). Priorities for interventive conservation are iron gall ink corrosion (1.2.3) and cellulose acetate degradation (1.2.4), although our perceptions of the relative importance of the risks may change as a result of the assessment.

### 2. Partnerships

Most of the problems identified in the preceding section affect all libraries and archives, and some, like acidic paper, are so universal that they can only be tackled economically on a national or international basis. Other problems affect so many different areas that it would be impossible for one institution to tackle them on its own. Such subjects are most effectively addressed by teams of people from different institutions working in partnership, with each partner bringing their own skills and knowledge to bear on different aspects. By sharing resources, even limited funding will go further and deliver more. *We will therefore develop partnerships with appropriate organisations, wherever possible, in order to carry forward our own research objectives.* Nevertheless, there will be circumstances, such as the early phases of projects, where initial

developmental funding may have to come exclusively from the Library's own resources.

Other libraries in the UK look to the British Library to provide leadership in conservation research, and several have expressed interest in forming a research consortium. By sharing resources and equipment this would avoid duplication of effort in areas such as the testing of materials for quality assurance, developing common specifications and developing appropriate test methods for library materials. *We will take this forward by investigating the most cost-effective means of supplying these services.*

Some problems will be most effectively tackled at the national level, others at the European or global level. At the national level, we will seek to involve end-user partners who, like ourselves, have a practical interest in applying the outcomes of the research. These include bodies such as the National Archives, the National Library of Scotland and the National Archives of Scotland. We may also involve partners who have a specific interest in the materials we use, such as the Leather Conservation Centre or the Textiles and Paper Department at Manchester. At the European level, we will seek to work with partners who are already active in areas of interest to ourselves and who have a reputation for producing results, such as the Royal Library of the Netherlands, the Netherlands Institute for Cultural Heritage or the National and University Library of Slovenia. On the global scale, we will seek to work with partners who have the resources and breadth of interest to work on the most challenging and large-scale problems, such as the Library of Congress, the Image Permanence Institute and the Canadian Conservation Institute.

Since the British Library is effectively a new entrant into the field of conservation research it will take time to build up our own research capability. We will identify the most appropriate level for each collaboration, and where possible we will seek to join existing groups. This will enable us to participate meaningfully while building our own expertise. We will endeavour to obtain funding for projects from research councils, grant-giving bodies and the European Union, recognising the need to balance the effort involved in applying and the risk of not succeeding against the rewards of success.

*We will convene an international meeting of national library and research institute representatives, to try to set a wider agenda for conservation research in the library and archive sector. This will explore the possibilities of developing collaborative applied research programmes which are specifically focussed on the needs of libraries and archives.*

### **3. The Web**

The British Library is committed to making more of its holdings available via the Web, both for the convenience of users and to reduce handling and risk of damage to vulnerable items. We will investigate methods of minimising damage to objects during digitising and scanning.

*We will work in conjunction with the National Preservation Office to ensure that more conservation and technical information, of use to professionals and the public, is made available on our website.*

### **Conclusion**

In all we do we will seek to obtain value for money and maximise successful outcomes. Where possible we will build on existing research undertaken by the Library, and we will prioritise our efforts by mapping research proposals against the needs identified here. Although the majority of our work will be oriented towards practical goals, we do think it is appropriate to dedicate a small percentage of our time to projects that do not have an immediately obvious practical benefit, but which have the potential to lead to worthwhile future applications.



## Appendix 1

Conservation research projects undertaken by the British Library since 1990

Project title	Person / place	Date completed	Outcomes	Comments
Paper strengthening by graft copolymerisation	Alan Millington / Christine Butler, University of Surrey, + BL	1991	A successful process was developed, but it was not commercialised	This was the only viable process that strengthened paper. One problem was residual odour of monomer. It would be worth investigating whether this could be overcome. Requires publication in professional literature
Ancient colorants and dyes	Prof Ken Seddon, Dr Peter Gibbs, Queen's University, Belfast	1998	Identification of the yellow colour in ancient Chinese paper	Published in <i>Studies in Conservation Science</i> , <b>2</b>
The pH microprobe	Alan Kennedy, QUB (PhD supervisor Prof Ken Seddon)	1999	Successful proof of principle	Would require extensive development to become a sufficiently rugged, commercially viable instrument
Thermal effects of scanners on photographs	Mark Browne, BL (part of the EU-funded SEPIA project)	2001	No adverse effects demonstrated	See: <a href="http://www.knaw.nl/ecpa/sepia/workinggroups/wp4/scanningequipment.pdf">www.knaw.nl/ecpa/sepia/workinggroups/wp4/scanningequipment.pdf</a>
Development of archival quality leather	Shad Mehmet, BL (part of the EU-funded BRITE-EURAM III CRAFT programme)	2001	Commercially available product produced	See: <a href="http://www.hewit.com/sd12-leat.htm">www.hewit.com/sd12-leat.htm</a>
Anoxic storage and pest control	David Jacobs, BL	Ongoing	Storage in a low-oxygen environment has been shown to decrease the rate of yellowing of poor quality paper	In collaboration with Natural History Museum, British Museum, Tate
Raman microscopy	Prof Robin Clark, UCL + David Jacobs, BL	Ongoing	Many inorganic pigments identified on manuscripts	A review of this work, to be edited by Prof Clark, will be published in <i>Studies in Conservation Science</i>

## Appendix 2

### Provisional timetable for research projects

Partners → Time scale ↓	BL Collection Care	BL Scholarship & Collections	External
Short term (during FY 2004/05)	<p><b>Iron gall ink treatment</b></p> <p><b>Leafcasting</b></p> <p><b>Alternatives to lamination</b></p> <p>Projects resulting from the Treatment Review. Will be undertaken by Conservation staff, will involve critical evaluation of options and will produce practical recommendations for methods of working.</p>	<p><b>Risk assessment for all collections</b></p> <p>Will examine critically and estimate the relative magnitude of the different risks to the long-term survival of different parts of the BL's collections. Will make specific recommendations for the management of risk for different collections.</p> <p><b>Extended survey of pH of new acquisitions</b></p> <p>To obtain a more accurate estimate of the proportion of new acquisitions (purchased monographs and serials) on acid-free paper, and the extent of any alkaline reserve. Will inform decision-making on desirability of mass deacidification at point of acquisition.</p> <p><b>Survey of pH of newspapers</b></p> <p>To assess acidity of incoming newspapers and to estimate the rate of decrease of pH. Will inform decision-making on mass deacidification.</p> <p><b>Develop scientific examination techniques</b> to support projects such as Codex Sinaiticus.</p> <p>In collaboration with curatorial staff, develop techniques for the examination and analysis of library materials using visible, infra-red and ultra-violet light, in order to enhance art historical and technical knowledge.</p>	<p><b>Agreement on research consortium</b></p> <p>In collaboration with the Legal Deposit Libraries and National Archives in the UK and Ireland, to agree on a framework for standard-setting, and procurement of testing and analysis of common conservation materials.</p> <p>October 2004</p> <p><b>Agreement on international conservation research agenda for paper-based library and archive materials</b></p> <p>In collaboration with international conservation research leaders, develop international conservation research agenda for the next 5 – 10 years.</p> <p>December 2004</p>

<p>Medium term (FY 2005/06 to 2008/09)</p>	<p><b>Stability of new materials and digital information carriers</b> Will monitor degradation of new materials used in books, and digital media. Will produce recommendations for storage and treatment of these materials. Possible collaboration with The National Archives.</p>	<p><b>Assessment of cellulose acetate microfilm</b> To assess the issues relating to the preservation and storage of cellulose acetate microfilm. Will produce detailed recommendations for the management of this material. <b>Assessment of practical problems surrounding mass deacidification</b> While PaperTreat will examine the technical performance of different treatment methods, this project will examine the practical implications for the BL of undertaking mass deacidification: financial, logistical, legal etc.</p>	<p><b>Drying water-damaged books</b> Project led by Univ of Utah, funded by US National Center for Preservation Technology and Training. Will improve our own disaster response capability and enable us to give authoritative advice to others. Commences September 2004, ends August 2005 <b>Evaluation of mass deacidification treatments (PaperTreat)</b> Project led by the National Library of Slovenia, funded by the EU. Will monitor long-term efficacy of existing mass deacidification treatments. Commences 2005, ends 2008 <b>Developing NIR tool for assessing paper degradation (SurveNIR)</b> Project led by the Univ of Ljubljana, funded by the EU. Will develop instrument to quantify volatile substances produced by degrading paper. Commences 2005, ends 2008</p>
<p>Long term (FY 2008/09 onwards)</p>	<p><b>Real-time study of paper ageing</b> Will monitor gradual changes in paper properties under normal storage conditions. Will produce realistic lifecycle estimates and recommendations for future storage conditions.</p>		<p>Externally-funded research programmes flowing from global research agenda</p>