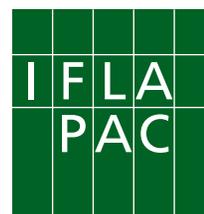


International Preservation News

A Newsletter of the IFLA Core Activity
on Preservation and Conservation



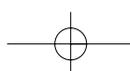
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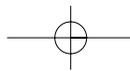
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editorial

The 73rd IFLA General Conference recently ended in Durban and the unanimous view is that it was a success. This year again, the high quality of the interventions has been noticed, in the general conference as well as in the satellite meetings.

Preservation was in favour: all the aspects of preservation. Which backs up my analysis that our core activity on Preservation and Conservation is definitively in the heart of libraries and patrimonial institutions problematic.

It was perhaps even too much, as far as Durban is concerned, since several sessions around this subject took place at the same moment. Maybe we can regret it but we are forced to admit that everything is structured around preservation and that most topics of library science have a "touch" of preservation as, if you let me use a culinary metaphor, the touch which gives all its brightness and flavour to a dish.

Johann Maree, Director of the PAC centre of Cape Town (South Africa), had prepared with great care a pre-conference entitled "Mould, Pest and Dust". Two full days, run by 3 specialists of these topics: Helen Lloyd, who offered us in a surprising way a methodology for the scientific study of dust; Diane Vogt-O'Connor, who spoke about molds whereas David Pinniger, learned entomologist wearing a tie decorated with dragonflies, gave a very exciting lecture on pests. Not to mention case studies and practical works. The bibliographies which were communicated will be precious for all of us and will be available on line on our website.

On Saturday, August 18th, the day of the standing Committees, another satellite meeting was organized by Health and Biosciences Libraries Section with a session focused on disasters plans, the subject of *International Preservation Issues* n°6 (our bestseller). The Asia and Oceania Section proposed a session too about disasters management in the field of cultural heritage.

The two sessions of the Preservation and Conservation Section and the PAC Core Activity were successful but unfortunately they took place at the same time as the exciting meeting organized by the *Koninklijke Bibliotheek* and the National Library of Australia, led by Hilde van Wijngaarden, about a hot topic for European Union: the long-term preservation of digital objects (see her paper published in this issue). It is worth reminding that it was the subject of the symposium organized by the PAC Centre for Western Europe last April in Paris. Every conference reinforces the idea that PAC Core Activity has to keep on covering all the themes related to preservation, preservation of paper and old medias as well as digital objects.

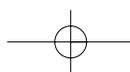
In this issue, reports on several recent events are delivered, with the websites links. Most of the feature articles are dealing with studies led in the field of preservation, concerning mainly paper. Michèle Gunn, from the Quai Branly Museum (Paris), presents anoxia; Tony Basset, from the National Library of France, ethylene oxide; Barry Knight, from the British Library, paper ageing related with the storage conditions of books; and Randy Silverman *et al.* compare drying and sterilization methods of water-damaged books.

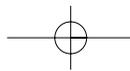
I would like to ask our readers to make an inventory of all the current research projects led in their countries or institutions in the field of preservation (inks, paper, deacidification, digital preservation, chemistry, etc.) in order to propose a list at the international level.

I also invite you to attend and organize events in your area on those topics, as Yukiko Saito in Tokyo, Chen Li in Beijing, Ximena Cruzat in Santiago or Johann Maree in Durban, who proposed fruitful meetings.

I wish you a good reading and I am looking forward to hearing your comments, critics and all the information at your disposition: *IPN* has to be the heart of our network.

Christiane Baryla
IFLA-PAC Director





editorial

Le 73^{ème} Congrès de l'IFLA vient de s'achever à Durban et ce fut, de l'avis de tous les participants, un grand succès. Nous avons pu noter cette année encore la grande qualité des interventions qu'il s'agisse de la Conférence annuelle ou des réunions satellites.

La conservation était à l'honneur à Durban : tous les aspects de la conservation. Ce qui me conforte dans l'idée que notre programme fondamental PAC s'inscrit définitivement au cœur même de la problématique des bibliothèques et des institutions patrimoniales.

On pourrait dire trop, même, en ce qui concerne Durban car plusieurs sessions autour de ce thème se sont déroulées à la même heure. Peut-être pouvons-nous le déplorer mais affirmer aussi que tout s'articule autour de la conservation et qu'il existe pour la plupart des sujets de bibliothéconomie un « fond » de conservation comme on parle, en cuisine française, d'un fond de sauce, celui qui donne tout son éclat et toute sa saveur à un plat.

Johann Maree, Directeur du centre PAC de Cape Town (Afrique du Sud), nous avait mitonné une pré-conférence intitulée « Mould, Pest and Dust ». Deux jours denses, excellemment animés par 3 grands spécialistes de ces questions : Helen Lloyd, qui de façon surprenante nous a offert une méthodologie pour l'étude scientifique de la poussière ; Diane Vogt-O'Connor, qui a développé le thème des moisissures tandis que David Pinniger, savant entomologiste à la cravate ornée de libellules, donnait une très excitante conférence sur les insectes nuisibles pour nos collections. Tout cela accompagné d'études de cas et de travaux pratiques. Les bibliographies qui ont été communiquées à cette occasion seront précieuses pour tous et nous vous les offrirons en ligne sur notre site.

Le samedi 18 août, journée des Comités permanents, se tenait un autre satellite meeting, organisé par la Section des Bibliothèques médicales et biologiques avec notamment une session sur les catastrophes et plans d'urgence, sujet que le PAC avait traité dans *International Preservation Issues* n°6 (notre best-seller). La section Asie et Océanie a proposé elle aussi une session autour du management des catastrophes dans le domaine du patrimoine culturel.

Les deux sessions spécialisées, celle de la Section Preservation & Conservation et la nôtre, ont connu un grand succès. Il est cependant dommage qu'à la même heure se soit déroulée la passionnante réunion organisée par la *Koninklijke Bibliotheek* et la Bibliothèque nationale d'Australie, animée par Hilde van Wijngaarden, sur un sujet considéré comme *hot topic* pour l'Union européenne : la préservation à long terme des ressources numériques, qui fait l'objet d'un article dans ce numéro d'*IPN*. Rappelons que le PAC Europe a organisé un symposium sur ce thème en avril dernier à Paris. Chaque congrès nous conforte donc dans l'idée que le PAC doit continuer de couvrir toutes les questions liées à la conservation, celle du papier et des anciens supports, ainsi que celle des objets numériques.

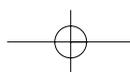
Dans ce numéro d'automne, nous vous livrons les comptes rendus de plusieurs événements récents : vous y trouverez toutes les adresses des sites décrivant les actions menées. Les articles de fond sont cette fois plus particulièrement consacrés à des études conduites dans le secteur de la conservation, principalement du papier : Michèle Gunn, chargée d'expertise chimique et biologique au Musée des Arts Premiers à Paris, fait le point sur l'anoxie. Tony Basset présente la station de traitement à l'oxyde d'éthylène de la BnF, et Barry Knight, une étude menée par la *British Library* sur le vieillissement des ouvrages en liaison avec leurs conditions de stockage. Enfin, Randy Silverman *et al.* comparent les méthodes de séchage et de stérilisation des livres endommagés par l'eau.

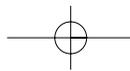
Je souhaite profiter de cet éditorial pour demander à tous nos lecteurs de recenser dans leur pays ou dans leur établissement les projets de recherche en cours dans le domaine de la conservation (encres, papier, désacidification, préservation numérique, chimie, etc.). Nous aimerions en produire la liste à un niveau international.

Je vous incite aussi à participer et à organiser dans vos régions des événements qui nous touchent : suivons les exemples de Yukiko Saito à Tokyo, Chen Li à Pékin, Ximena Cruzat à Santiago du Chili ou Johann Maree à Durban qui nous ont proposé, cette année, de fructueuses rencontres.

Je vous souhaite une bonne lecture et j'attends avec impatience, vos commentaires, vos critiques et surtout des informations: *IPN* doit être le cœur de notre réseau.

Christiane Baryla
Directeur d'IFLA-PAC





Update on Long-term Preservation Activities and Projects in European National Libraries

by **Hilde van Wijngaarden**,

Head of the Digital
Preservation Department,
National Library of the Netherlands

Paper presented at the annual meeting of the CENL (Conference of European National Librarians) the 27th of September 2007 at Helsinki, Finland.

Introduction: a hot topic

Digital preservation has become a hot topic among libraries. A recent survey by the European project DPE (Digital Preservation Europe) showed that among 34 European National Libraries surveyed, almost all of them considered the long-term preservation of digital documents to be one of their key strategic priorities. Only a few of the libraries had a repository in operation, but most of them are planning the development of an archiving system.

At the last IFLA annual conference, the national libraries of Australia and the Netherlands organized an informal session that presented thirteen updates on digital preservation activities at libraries in different parts of the world. The interest in the session was very encouraging, and it also gave us a good overview of where libraries are in addressing the issue of long-term preservation. Here as well, it was clear that every library was aware of the challenge, had been working on setting their preservation policies and started projects to define and design digital repositories. The interest in digital preservation is obvious: while at past IFLA conferences, the issue was addressed, but in combination with other digital library issues, next year two official sessions are being organized that will focus entirely on topics in digital preservation.

As a person that has been involved in digital preservation for a few years myself, the changes during the last few years are obvious. Until recently, I had to explain what digital preservation was and why it was so important. But now, an explanation is no longer necessary: everyone seems to be aware of the issue and tries to work out how to address it.

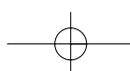
Models of preservation infrastructures

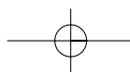
Taking up long-term preservation of digital collections entails more than secure storage on durable carriers. Durability of digital objects starts at the point of creation: the file format that is chosen, production settings and the fonts that are used all determine the lifespan of the object. Once an object is transferred to an archiving environment, identification and validation processes have to be performed to determine the requirements for preservation for every type of file. Preservation metadata are added and regular checks have to be performed to ensure the accessibility of the stored items. Ensuring future access is the most challenging part of the digital preservation workflow. Possibly actions have to be performed on the objects or on the technical environment that gives access to the files if software has become obsolete and the objects are no longer accessible. To know what to do and to execute migration or emulation techniques, preservation planning and preservation action tools have to be developed and have to be added to the preservation infrastructure. In practice, this means that any institution that is responsible for the long-term maintenance of digital collections, needs preservation tools and services as well as a (trusted) digital repository.

When we look at ways (European) libraries have started to organize their digital preservation activities, three models can be distinguished:

- The library runs its own repository and develops and/or employs its own services.
- The library runs its own repository and shares the development and use of services with others.
- The library shares both its repository as well as the development and use of services.

Because implementation of preservation systems at the European libraries is in its first phase, it is not possible yet to place each of your libraries in one of the three models. To illustrate the models, I do want to mention two examples: the KB at the Netherlands that operates its e-Depot and works together with colleagues to develop additional functionality would fit in model two. DNB that has chosen to set up the KOPAL project to share its repository





ry with other institutions and collaborates with international partners to develop tools and services is a good example of model three.

Ongoing international and European projects

Continuous research and development are needed to produce tools and services and enhance our knowledge on how to tackle the technological and organizational challenges that we are facing in digital preservation. This can not be done by single institutions but this has to be a joined effort. Fortunately, a growing number of projects have started, both on an European and international level.

Under the Sixth Framework Programme, three European projects on digital preservation have been funded: PLANETS, DPE and CASPAR. These three projects each have their own focus, but collaborate on dissemination and training activities. Their joint activities even have a name and a website: wepreserve.eu. Late September, a joint workshop was organized in Lisbon and in October the first joint training session is held in Vilnius. All three projects started in the first half of 2006 and have published their first results.

PLANETS

PLANETS stands for Preservation and Long-term Access through Networked Services. The project is coordinated by the British Library and the consortium consists of the national libraries of the Netherlands, Austria and Denmark, together with the national archives of the UK, the Netherlands and Switzerland, and research institutes and commercial companies. PLANETS develops tools and services to enable long-term preservation of digital content. The PLANETS network will consist of three sets of tools: for preservation planning, for characterisation and for executing preservation actions. Planning services will help organizations to make informed decisions on how to preserve their collections. These decisions will be based on knowledge about their content, generated through a set of characterisation tools (including identification and validation of file formats), and knowledge about available options. These options are called preservation actions and include procedures and tools to apply migration or emulation. The project has just gone through a successful first year review, where the first results could be demonstrated: a prototype of the interoperability framework that will bring the PLANETS services to the archiving institutions, a first version of a characterisation registry, based on the existing file format registry PRONOM and a working emulator for digital preservation, developed by the Dutch National Archives and the KB (which are just a few examples of

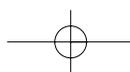
the development so far). The composition of the consortium, based on joined expertise from stakeholders with research experience at technical universities and developing skills at technology companies, has already proven to be productive. The panel also made recommendations to help maximize the impact of PLANETS. The areas in which more attention was recommended include PLANETS' sustainability, greater exploration of the current state of digital preservation activities, and further analysis of the organizational impact of PLANETS. To take up these recommendations, PLANETS will organize dedicated workshops to discuss uptake of the project after it has ended and employment of the tools by other organizations.

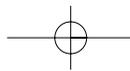
CASPAR

CASPAR has another focus than PLANETS, incorporating digital preservation approaches in art and e-sciences. On the one hand, CASPAR aims to define a preservation infrastructure that can be applied for different types of digital objects. Specific challenges are analysed and solutions are tested. It also aims to implement, extend and validate the OAIS reference model. The Open Archival Information Systems reference model has been an ISO standard since 2002 and has turned out to be *the* standard in the digital preservation community. Since it is being used and applied, additions and revisions are being discussed. Among other things, CASPAR is working on an elaboration of the concept Representation Information, that defines what kind of information needs to be registered to allow not only future accessibility, but also future understanding of stored digital items.

Digital Preservation Europe

DPE is a collaborative action, also funded through the European Sixth Framework Programme. Its objectives are to set up a collaborative platform for the exchange of knowledge, best practices and experiences among different sectors working to preserve Europe's cultural and scientific heritage. It also aims to raise awareness and enhance skills for dealing with the challenge through training and workshops. Since its start, DPE has set up a number of activities. It organized several workshops, ran a survey and published three briefing papers and two reports: a state of the art review of competence centres in digital preservation, and a market and technology trends analysis. It also launched an exchange programme that provides young researchers with the opportunity to work at a different organization for a month, and set out a preservation challenge, which is a contest on retrieval of digital objects that have become inaccessible. Apart from the clear benefit of their reports, using different, new and creative ways to engage different communities really stimulates proactive collaboration.





IIPC

In 2003, the International Internet Preservation Coalition was launched by eleven national libraries and the Internet Archive. Since the beginning of 2007, the IIPC opened up for new members. The original members, including the national libraries of Iceland, Finland, Italy, Denmark, France, Norway, Sweden and the UK, were joined by sixteen new members. Among these are the European national libraries of Switzerland, the Netherlands, Germany, Slovenia, the Czech Republic. More new members are expected to join it in 2008.

During the first years of its existence, IIPC started to develop a set of tools for harvesting, indexing and giving access to Web resources. These tools, available in open source, are now being used by almost all institutions that archive the Web. Preservation, however, was not high on the agenda during the first years of the IIPC. This changed this year with the start-up of a new IIPC working group on preservation. This working group is led by the national library of Australia and includes old and new members of the IIPC. Its first objective is to identify the specific challenges of webarchiving for long-term preservation and access. Secondly, an action plan will be drawn up to address these challenges.

European Commission

In May 2007, new proposals in the area of digital preservation could be submitted. The EU-project officer Carlos Oliveira expressed some concern about the number of proposals for that specific call. There are two projects currently under negotiation, but overall, proposals submitted were below expectation. For those of us that are involved in the ongoing projects, this was not a big surprise: the lead institutions in digital preservation were already heavily involved and most of them decided that they could/would not participate or coordinate another project in the area at that time. This is a logical explanation, however, Mr Oliveira expressed a concern that we should share: although digital preservation is a hot topic, there is still a very limited group that has the expertise, capabilities and desire to set involved in international projects in the area.

Among colleagues in this area, we do expect new project proposals to be formed for the next call in this area in 2008. Already ideas are being exchanged, on software repositories, on preservation of websites and hopefully on more directed tool development. We have to be aware that we will reach out beyond the 'safe' centre of known colleagues and start to work together with other colleagues that enhance our knowledge with new and different worthwhile approaches.

(Inter)National Coalitions

Another recent development is the initiation of national coalitions for digital preservation. With the Digital Preservation Coalition at the UK as an example, collaborative organizations are being started in several other countries (Denmark, Germany, the Netherlands). Almost always, it is the national library that plays a determining, significant role in the initiative. It is very clear that libraries see their national mission, but realise they need to cooperate with other institutions and other sectors to address the big challenge of sustainable access to digital objects.

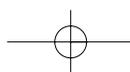
On a European scale the Alliance for Permanent Access should be mentioned. At the initiative of the KB and BL, a group of Research laboratories (ESA, CERN), and representatives of publishers, researchers are working on the development of an European infrastructure to safeguard the access to records of science. The EU expresses much interest in this development. National libraries are represented in the process through KB, BL and DNB.

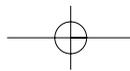
Emerging developments

Engaging with e-science

The Alliance turned out to be a front-runner of other initiatives that are currently started that build connections between libraries and archives and e-science communities. I already mentioned DPE, that is specifically aimed at setting up collaboration between different community. Another project is DRIVER, and more specifically DRIVER II. This is a European project that aims to link the European Universities' Institutional Repositories, and will also examine how the content of these repositories can be transferred and stored in long-term archiving systems. The Alliance for Permanent Access has initiated two European proposals recently: PARSE Forum and PARSE Insight, which hopefully will be allowed to put into practice some of the goals of the Alliance: write a Roadmap on how to preserve our records of science, study roles and responsibilities in preservation in specific scientific communities and set up an interdisciplinary network.

Of course, it's not just Europe where this new focus on preservation of e-science is emerging. Early 2007, the US National Science Foundation published their new 'Cyberinfrastructures programme' that includes substantial attention for data management and preservation. This programme will finance project proposal (starting this fall) that will set up durable data-infrastructures. Already, contacts are being made to link these new US proposals to the European projects.





Preservation of products of mass-digitisation

Last but not least, let me turn to another type of digital objects: the master image files that are being produced by digitisation projects. With the start-up of many large-scale digitisation projects, the question of how to preserve image-files has come to the front. It is realised that the preservation issue has to be addressed, to prevent that digitisation projects will have to be repeated if the digital products are lost. These had started research on definition of quality and metadata that will improve the durability of the scans. Since digitisation projects are becoming bigger and bigger, there's also another issue that has emerged: how durable are compressed image formats? It has become clear that the cost of storing petabytes of TIFFS will be enormous. It is encouraging that research into ways to deal with storage costs, takes preservation issues into account, as one of the basic aspects of the topic.

To conclude

With this last remark, I have returned to the start of this paper: digital preservation has managed to climb up the priorities ladder and is now accepted as a key issue at national libraries. That doesn't mean that our problem is solved. Libraries know that they have to take action, but do not have the tools and procedures to do so. Fortunately, a growing number of international R&D projects are working very hard to provide organizations with the knowledge, tools, techniques and networks that will allow them to start preserving their digital collections.

Le point sur les projets européens de conservation à long terme

La conservation du numérique est devenue l'une des priorités stratégiques des bibliothèques. Seules certaines d'entre elles ont déjà un entrepôt opérationnel, mais la plupart projettent de développer un système d'archivage. À la conférence annuelle de l'IFLA cette année, l'intérêt pour la conservation du numérique était évident.

Trois projets européens sur la conservation du numérique ont été lancés : PLANETS, DPE et CASPAR. Ils ont chacun leur domaine d'action, mais collaborent au niveau de l'information et de la formation. Leur association a même un nom et un site Web : wepreserve.eu. Les trois projets ont débuté dans la première moitié de 2006 et ont publié leurs premiers résultats.

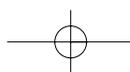
PLANETS (*Preservation and Long-term Access via Networked Services*) est un projet coordonné par la *British Library*, qui rassemble les bibliothèques nationales du Pays-Bas, de l'Autriche et du Danemark, les archives nationales du Royaume-Uni, des Pays-Bas et de la Suisse, des instituts de recherche et des sociétés commerciales. PLANETS entend développer des outils et des services qui permettront la conservation à long terme de contenus numériques. Les premiers résultats ont déjà vu le jour : premier pas vers la mise en place d'un réseau commun qui permettra aux institutions de bénéficier des services de PLANETS, première version d'un répertoire en ligne d'informations techniques, basé sur le fichier existant PRONOM¹ et développement d'un émulateur par les Archives nationales des Pays-Bas et la KB.

CASPAR concerne la conservation du numérique dans l'art et l'e-science. CASPAR aspire d'une part à définir une infrastructure de conservation qui peut être appliquée à différents types d'objets numériques et d'autre part à mettre en œuvre, étendre et valider le modèle de référence OAIS (*Open Archival Information Systems*).

DPE (*Digital Preservation Europe*) a pour objectif de fonder une plateforme pour favoriser l'échange des connaissances, des meilleures pratiques et des expériences dans des secteurs différents qui contribuent tous à la préservation de l'héritage culturel et scientifique de l'Europe. Il aspire aussi à sensibiliser et à renforcer les compétences grâce à des ateliers de formation.

Autre développement récent : les coalitions nationales pour la conservation du numérique. Sur le plan européen, on peut mentionner *Alliance for Permanent Access*, à l'origine de deux projets européens : PARSE Forum et PARSE Insight, qui ont pour but d'établir un consensus à propos de la stratégie de conservation de l'information scientifique et de fonder un réseau interdisciplinaire. Autre projet européen : DRIVER et plus spécifiquement DRIVER II, qui entend créer une infrastructure reliant les archives institutionnelles scientifiques.

¹ PRONOM : répertoire technique en ligne, développé à l'origine pour les Archives nationales du Royaume-Uni, recensant les formats de fichiers, logiciels et autres composants techniques permettant l'accès pérenne au contenu numérique.



Anoxia – Treatment by Oxygen Deprivation of Museum Objects

by **Michèle Gunn,**

in charge of chemical and biological expertise and of physico-chemical analysis, Quai Branly Museum, France

Introduction

A large part of the Quai Branly Museum collection - near the Eiffel Tower in Paris - is composed of cellulose and protein-based organic materials. Such materials are favourable media for the development of microorganisms and insects, leading to their degradation.

This collection was treated in a series of steps which included cleaning, the taking of photographs, packaging and biological decontamination in the Le Berlier building which was especially equipped for this purpose.

The Quai Branly Museum collection, numbering about 275 000 objects, comprises on the one hand collections from the *Musée National des Arts d'Afrique et d'Océanie* (MNAAO) and the *Musée de l'Homme* (MH), and on the other hand has been enriched by new acquisitions.

Studies of the general state of conservation of these collections in their original institutions by experts demonstrated the existence of infestation by *Anobiidae*, *Dermestidae* and *Tineidae*, to name just a few. Infestation was found to be more or less serious depending on the institution and departments in question. Given that it is difficult to reconstruct an accurate case history of the infestation and the steps taken to counter it, it was decided to proceed with treatment of all objects containing organic materials, without exception.

This prudent choice was made in view of the fact that the treated objects were not intended to return to the site from which they came, but were going to be housed in a new museum: a "complete overhaul" of the objects in order to reduce the infestation level to zero was advisable under such circumstances. Furthermore, the objects are treated by oxygen deprivation (anoxia), which minimizes the risk of chemical degradation, although discolorations of some pigments have been reported (Kleitz, M. O.; Valet, J. M., 2002); this cannot be said of classical fumigation treatments even though the treatment times are much shorter in the latter cases.

Heritage institutions currently employ oxygen deprivation treatment times (T_i) of 21 days. This duration appears to have been adopted in the light of the results of experiments carried out on a particularly resistant species, the rice weevil, an important pest in food industry: 500 hours (21 days) at 26°C, 12% of relative humidity, in a nitrogen

atmosphere containing 1% of oxygen. The exposure time is extended to 1000 hours (6 weeks) if temperature is lowered to 20°C (Selwitz, C. *et al*, 1998).

Of more relevance in the museum field, the old house borer, *Hylotrupes bajulus*, is also a species resistant to treatment by oxygen deprivation. Its favourite medium is resinous wood. Eradication of this insect required 20 days in somewhat different conditions: 20°C and 40% of relative humidity. The duration can be reduced to 10 days if temperature is raised to 30°C (Valentin, N., 1993).

It has gradually become standard practice to use a treatment time of 21 days. The recommended conditions are in general: less than 0.1% of oxygen, a temperature above 20°C and a relative humidity of 50%.

In the case of the Quai Branly Museum, there was a very large number of objects to be treated (more than 80% of the collection), with important constraints of time. It was therefore appropriate to analyze the time given to each stage of the object treatment process. If a reduction in the duration of oxygen deprivation treatment turns out to be possible, this would permit to speed up the collection treatment programme. Consequently the key conclusion awaited from this study is the answer to the following question: is the anoxia treatment efficient for an exposure time less than 21 days?

Each anoxic treatment installation has its own characteristics. Thus, since the installation we have used, named EPMQB (according to the name of the museum, *Etablissement Public Musée du quai Branly*), was specially designed for the Quai Branly Museum treatment site, and was new and as yet untried in the field of heritage and conservation, it was necessary to carry out a study in order to optimize the conditions of treatment for objects, in particular as far as oxygen drop times and exposure times are concerned.

The feasibility of treating infested museum objects by oxygen deprivation, either through the use of oxygen scavengers, or in a controlled atmosphere of an inert gas such as nitrogen (N_2) or argon (Ar) or carbon dioxide (CO_2) is now well-established. Resistant species such as *H. bajulus* or *A. punctatum* (cellulose) can be totally eradicated, and this is also possible if insects are at the egg or larval stage, which makes them more resistant to treatment (Rust, M. *et al*, 1996; Selwitz, C.; Maekawa, S.,

1998). Many studies have already been carried out by teams in the USA (Getty Conservation Institute) and Australia (Australian Museum), for example. They permitted to evaluate the influence of different parameters, such as the level of oxygen (O_2), temperature and relative humidity, on the exposure times needed to achieve 100% of mortality whatever the life cycle stage of insects is.

Therefore, the study goal is to determine the efficiency of the EPMQB equipment and the effectiveness of the treatment in the case of insects buried deep within an object. This study phase should enable to evaluate the degree to which oxygen is removed from the inside of treated objects.

We report and discuss results obtained in the following areas:

- 1) the exposure time, T_e , in the new EPMQB installation, leading to 100% of mortality irrespective of life cycle stage of the insects present in infested objects.
The treatment conditions are based on previous literature reports. They must be optimized from a mortality viewpoint whilst avoiding endangering at the same time the physical structure of the treated objects: an atmosphere with highly reduced oxygen content is used, between 1000vpm and 30vpm, a temperature of $25^\circ\text{C} \pm 1^\circ\text{C}$ and hygrometry of $50\% \pm 5\%$.
- 2) the oxygen drop time, T_i^1 , defined as being the time taken to lower the oxygen content in the treatment unit to the required level (0.1 %) and to study the effect of the degree of loading with museum objects.
- 3) the oxygen desorption time of the objects T_d .
The T_d value depends intrinsically on the nature of materials and the volume of the objects to be treated and of the anoxia chamber. The T_d varies as a function of the permeability of the materials to gases, *i.e.* nitrogen and oxygen in this case.

1. Main results obtained by other institutions

The main results obtained by other institutions show that:

- the most resistant life cycle stages of insects are eggs and larvae;
- not all the insects react in the same way, the old house borer is the most resistant;
- the treatment is more effective with argon than with nitrogen;
- temperature is an important factor whatever the other conditions are.

The exposure time is reduced when the temperature increases. The studies carried out in the museum environment showed exposure times much lower than the standard of 21 days when the climatic conditions are chosen appropriately, including for the most resistant species. The experimental parameters for treatment, according to the infestation, are actually well-known.

1. T_i , i for inert.

The key questions which now remain to be answered are whether or not the experimental conditions are really achieved within the treated objects.

Hylotrupes bajulus (common name: old house borer), although it is not commonly encountered in museum objects, was chosen for the present study on account of its resistance. At the same time as carrying out experiments on the insects, other experiments were performed in order to evaluate oxygen desorption times from the materials used, the degree to which the oxygen content within the materials was lowered and the effect of the type of objects loaded on the oxygen drop time.

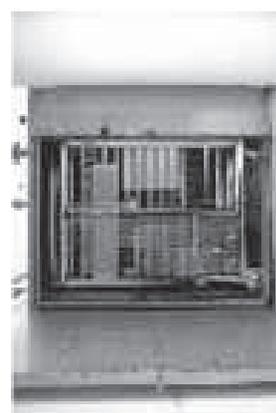
2. The installation used: EPMQB Anoxia System²

The anoxia system equipment has five parts:

- 1) A Pressure Swing Adsorption (PSA) nitrogen production unit (TechnicAir) composed of **a**) an air compressor, **b**) an air dryer and submicronic filter system, **c**) a compressed air reservoir (1m³), **d**) a nitrogen/oxygen separation subunit made of two receptacles containing activated charcoal molecular sieves (CMS), **e**) a vessel containing distilled water for humidifying nitrogen, **f**) an oil-water separator to avoid discharging insoluble compounds into the general waste water sewage system.
- 2) A nitrogen storage unit with four nitrogen reservoirs with a capacity of 3m³ each.



- 3) A treatment unit with three rigid containers A, B, C with a volume of 1x25m³ (B) and 2x35m³ (A, C).



2. This installation was built by the company Mallet (division of CATS).

4) A remote control system enabling control and monitoring of treatment containing: an electric command desk housing a TSX 37 system sold under the name of Télémécanique-Schneider, a PC computer connected to a printer, which enables the reading and recording of the treatment parameters throughout the treatment cycle.

5) An oxygen level control unit including: a Xentra oxygen trace analyzer for the containers, two OLDHAM oxygen detectors for the area.

3. System operation

The technique chosen for oxygen deprivation is a dynamic system based on a continuous flow of nitrogen through the enclosed treatment units. The nitrogen used is prepared from the air in the room. The nitrogen is separated from the oxygen by the molecular sieve system. The nitrogen is stored in a series of reservoirs. Oxygen is desorbed from the molecular sieves under the pressure of nitrogen.

Treatment protocols are entered by keyboard and recorded in a computer file reserved for these data: degree of humidity: 50%, exposure time: 14 days, level of oxygen: 1000vpm (0.1%). The temperature of the enclosed treatment units is the same as that of the surrounding area, e.g. 25°C. The humidification of the enclosed treatment units is performed through the humidification of nitrogen.

There are three steps in the treatment cycle:

- 1) a purging phase of the enclosed units called "Gas injection 1" and "Gas injection 2", which reduce the oxygen level below 0.1%;
- 2) a treatment phase with an oxygen level below 0.1%, called "gas contact";
- 3) a "rinsing" out phase: the oxygen level is raised to 20% by sucking in air from the room, followed by the end of the treatment cycle.

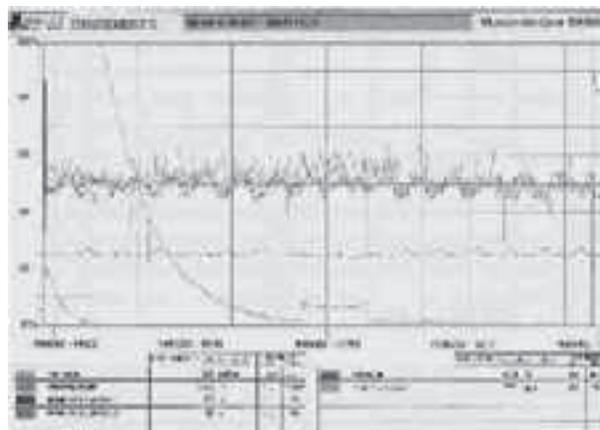
The oxygen drop times depend on the volume of the enclosed treatment units and on the nature of the objects loaded within them.

As a matter of definition, the exposure time T_e , is considered to start once the oxygen level has decreased to 0.1% at the beginning of the "gas contact" phase.

All the parameters are recorded and stored in files which can be accessed using Excel.

Averages are calculated on the basis of these data. At the end of a treatment cycle, a report is produced. The latter displays the dates and times of the following events: beginning of the treatment, moment when oxygen level reaches 0.1%, end of the treatment.

Figure 1: Curves of parameters throughout the cycle of treatment.



4. Looking for the proper exposure time: experiments on insects

Four series of experiments were performed with *Hylotrupes bajulus* at egg and larval stages with the aim of determining the lowest exposure time. Each series was composed of three experiments with identical treatment times. The eggs are placed on blotting paper and conditioned in Petri dishes. Larvae are placed in small wooden blocks and enclosed in Petri dishes.

Each experiment was carried out in the following manner: three egg test samples and three larvae test samples were placed in the oxygen deprivation sealed unit. One reference egg test sample and one reference larvae test sample were left in the atmosphere of the area outside the enclosed treatment units. The first series were treated using an exposure time T_e of 10 days. This is the shortest time given in the existing literature. After the experiments, the test samples were put back in steam-room for 15 days. The % of mortality arising from the oxygen deprivation treatment can then be calculated after counting dead eggs and larvae and also survivors. Results are shown in table 1.

Table 1: Mortality rates for exposure times of 10, 7 and 5 days.

H. bajulus (old house borer)

Experiment	Exposure time (days)	Test samples in nitrogen atmosphere Mortality rate (%)	
		Eggs	Larvae
Series 1	10	100 no hatching	100
Series 2	7	100 no hatching	100
Series 3	5	64 hatching	100
Series 4 Samples in plastic boxes	14	no hatching	100

In the case of series 4, samples conditioned in Petri boxes were enclosed in sealed plastic boxes to mimic the deep burying of insects.

The lowest exposure time at 25°C, 50% RH, with an oxygen level below 0.1% is 7 days.

5. Oxygen drop times T_i and desorption time T_d in the treatment unit

These values were calculated in the following manner, based on the automatic treatment report:

T_i = (time at which oxygen level of 0.1% is reached, called "gas contact") - (time of the beginning of treatment).

Desorption times T_d are determined by comparing the T_i observed when the containers are loaded with objects to be treated with the T_i observed when the containers are empty.

$$T_d = T_i (\text{loaded unit}) - T_i (\text{empty unit})$$

Table 2: Average desorption time for unit A, B and C.

Unit	Average T_i of treatment units when loaded	Average T_i of empty treatment unit	T_d
A 35m ³	33hrs ± 2hrs	23hrs	10hrs
B 25m ³	24hrs ± 1hr	13hrs	11hrs ± 1hr
C 35 m ³	37hrs ± 2hrs	22hrs	13hrs ± 2hrs

The T_i and T_d averages were calculated on the basis of six loadings. The load is analyzed, batch by batch and object by object, using TMS (The Museum System) files, where information concerning the materials of which the objects are made, as well as their dimensions and weight, are recorded.

It appears possible to infer from the composition of the different loads that a load made up principally of wooden objects, or wooden object and textile or skins, requires *a priori* a longer oxygen drop time than a load of wood and vegetal pulp or vegetal fibres. However differences in the space occupied by objects appeared to be the dominant factor. When the volume of the closed treatment units is most effectively filled, the oxygen drop time is longer.

In contrast, it became clear that the sealed treatment units A and C, which each have a volume of 35m³, reach the stage called "gas contact" (oxygen level reduced to 900vpm) after a day and a half whereas the treatment unit B, having a volume of 25m³, only required one day.

Conclusion

The conclusions we draw after the study carried out with the EPMQB installation are based both on the results of teams abroad working in this field and on our observations at the Quai Branly Museum.

Temperature plays a crucial role for hastening the death of insects found within objects. Thus, at a temperature of 25°C, it is entirely possible to reduce exposure times to 10 or 15 days for the insect species commonly found in museums.

The role played by humidity is less clear-cut in spite of the fact that the principal mechanism leading to insect mortality is desiccation, both for larvae and for adult insects. In view of the results obtained with the EPMQB installation and also in view of those recorded in the relevant literature for tests on reference samples and on real objects (such as the results of the Getty Conservation Institute), and taking account of the experimental conditions (temperature, relative humidity, oxygen levels) we can move to an exposure time (T_e) of 14 days (2 weeks). The oxygen drop times (T_i) being situated between 1 and 2 days for most objects, this corresponds to a treatment time T_t between 15 and 16 days.

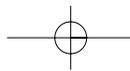
$$T_t = T_i + T_e$$

In parallel with the treatment of objects, the rigorous hygiene monitoring programme put in place on the collection treatment site will enable any new infestation to be detected.

For more information, please contact Michèle Gunn at mgu@quaibrnly.fr.

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L'anoxie – Traitement par privation d'oxygène des collections de musée

Les collections du musée du quai Branly sont en grande partie constituées de matériaux organiques à base de cellulose et de protéine, un terrain propice au développement de microorganismes et d'insectes, entraînant leur dégradation.

Ces collections proviennent pour la plupart du Musée national des Arts d'Afrique et d'Océanie et du Musée de l'Homme. Des études sur l'état général de conservation de ces collections ont révélé des cas d'infestation par des insectes. Il a alors été décidé de procéder au traitement de tous les objets organiques, sans exception, par privation d'oxygène (anoxie), censée minimiser le risque de dégradation. Les collections ont donc été traitées par étapes allant du nettoyage, à la prise de vues, l'emballage et la décontamination biologique sur un site spécialement équipé à cette intention, l'hôtel industriel Le Berlier.

Les institutions patrimoniales ont habituellement recours à une durée de traitement par privation d'oxygène de 21 jours, selon les conditions suivantes : moins de 0,1% d'oxygène, une température au-dessus de 20°C et une humidité relative de 50%.

Dans le cas du musée du quai Branly, au vu du très grand nombre d'objets à traiter (plus de 80% des collections) et des contraintes de temps, il convenait de se demander si le traitement par anoxie était efficace pour une durée d'exposition inférieure à 21 jours.

Description de l'installation

L'équipement du musée du quai Branly se décompose en cinq parties :

- un dispositif de production d'azote à partir de l'air ambiant comprenant un compresseur d'air et un générateur d'azote ;
- quatre réservoirs d'une capacité de 12 m³ au total ;
- une unité de traitement constituée de trois enceintes étanches en acier inoxydable ;
- un système de contrôle par ordinateur ;
- un instrument de mesure du taux d'oxygène.

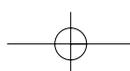
La technique choisie pour la privation d'oxygène est un système dynamique fondé sur le balayage continu d'azote dans les unités de traitement étanches. L'azote utilisé est produit à partir de l'air ambiant : il est séparé de l'oxygène par un système de tamis moléculaire puis stocké dans une série de réservoirs.

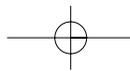
L'étude menée au quai Branly

Les principaux résultats des études antérieures ont montré que :

- les insectes sont plus résistants aux stades d'œufs et de larves ;
- tous les insectes ne réagissent pas de la même façon au traitement, certains sont plus résistants, comme le capricorne des maisons ;
- le traitement est plus efficace avec de l'argon que l'azote. Cependant l'utilisation de ce dernier est plus onéreuse.
- la température est un facteur clé quelles que soient les autres conditions.

Le capricorne des maisons (*Hylotrupes bajulus*), bien que rarement rencontré dans les musées, a été choisi comme sujet de cette étude du fait de sa résistance au traitement. Les résultats ont montré que le temps d'exposition peut être réduit si la température augmente, et ce même pour les espèces les plus résistantes. Ainsi, à une température de 25°C, il est tout à fait possible de réduire le temps de traitement par anoxie dynamique de 21 à 10 ou 15 jours.





Anoxia – Tratamiento mediante privación de oxígeno: optimización del tiempo de tratamiento de los objetos museísticos

Una gran parte de la colección del Museo del Quai Branly de París está formada por materiales orgánicos a base de celulosa y proteínas. Dichos materiales constituyen un medio favorable para el desarrollo de microorganismos e insectos que conducen a su degradación.

Las colecciones del nuevo museo provienen principalmente del *Musée national des Arts d'Afrique et d'Océanie* y del *Musée de l'Homme*. Los estudios realizados acerca del estado general de conservación de las mismas mostraron la existencia de infestación por insectos (*Anobiidae*, *Dermestidae* y *Tineidae*). Se decidió entonces proceder al tratamiento de todos los objetos que contenían materiales orgánicos, sin excepción, mediante la privación de oxígeno (anoxia), la cual minimiza el riesgo de degradación química. El tratamiento de esta colección se realizó siguiendo una serie de pasos que incluyeron la limpieza, la toma de fotografías, el empaquetado y la descontaminación biológica en un sitio especialmente equipado para ese fin.

Las instituciones de patrimonio emplean tiempos de tratamiento de privación de oxígeno de 21 días. Las condiciones recomendadas, en general, son las siguientes: menos de 0,1% de oxígeno, una temperatura superior a los 20°C y una humedad relativa de 50%.

En el caso del Museo del Quai Branly, existía un gran número de piezas que requería tratamiento (más del 80% de la colección), con limitaciones de tiempo importantes. Por ello, se planteaba el problema de saber si el tratamiento de anoxia sería eficiente con un tiempo de exposición inferior a 21 días.

Descripción de la instalación

El equipo del sistema de anoxia del Museo del Quai Branly consta de cinco partes:

- una unidad de producción de nitrógeno;
- una unidad de almacenamiento de nitrógeno con cuatro depósitos de reserva con una capacidad de 3 m³ cada uno;
- una unidad de tratamiento con tres contenedores rígidos;
- un sistema de control remoto;
- una unidad de control del nivel de oxígeno.

Técnica

La técnica seleccionada para la privación de oxígeno consistió en un sistema dinámico con base en un flujo continuo de nitrógeno a través de las unidades de tratamiento cerradas. El nitrógeno que se emplea se prepara con el aire del recinto. Se separa el nitrógeno del oxígeno mediante un sistema de tamiz molecular. El nitrógeno luego se almacena en una serie de depósitos. Por su parte, el oxígeno se elimina del tamizado molecular bajo la presión del nitrógeno.

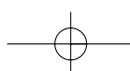
Estudio realizado en el Museo del Quai Branly

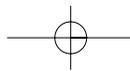
Los principales resultados obtenidos por otras instituciones muestran que:

- los estadios del ciclo de vida más resistentes de los insectos son los huevos y las larvas;
- no todos los insectos reaccionan de la misma manera, el más resistente es la carcoma;
- el tratamiento es más eficaz con argón que con nitrógeno;
- la temperatura es un factor importante indistintamente de cuál sea el resto de las condiciones.

El *Hylotrupes bajulus* (nombre común: carcoma), aunque no se encuentra comúnmente en los objetos museísticos, se escogió para el presente estudio debido a su resistencia. Al mismo tiempo de los experimentos con los insectos, se realizaron otros experimentos a fin de evaluar los tiempos de desabsorción de oxígeno de los materiales usados, el grado en que se redujo el contenido de oxígeno dentro de estos materiales y el efecto del tipo de objetos cargados sobre el tiempo de reducción del oxígeno.

Los estudios demuestran que el tiempo de exposición se reduce cuando aumenta la temperatura, incluso para las especies más resistentes. Por lo tanto, a una temperatura de 25°C, es completamente posible reducir los tiempos de exposición a 10 ó 15 días para las especies de insectos que comúnmente se encuentran en los museos.





Le traitement de désinfection à l'oxyde d'éthylène d'ouvrages moisiss

par **Tony Basset**,

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Bussy Saint-Georges

Le traitement de désinfection à l'oxyde d'éthylène d'ouvrages moisiss

Malgré les moyens de prévention, il peut arriver que les collections d'une bibliothèque moisissent. Ainsi les conservateurs sont souvent confrontés à la problématique du traitement curatif (désinfection).

En effet, il est important de rappeler que le développement des microorganismes sur/dans les ouvrages entraîne une détérioration des matériaux qui les constituent (cellulose, collagène). En conséquence, lors d'une infestation, il est impératif de réagir le plus vite possible en préconisant un traitement des collections mais aussi en agissant sur les causes ayant favorisé le développement de ces microorganismes.

La procédure choisie devra répondre à plusieurs critères :

- la moins délétère pour les collections ;
- la plus efficace ;
- la plus pratique ;
- d'une utilisation qui permettra un arrêt de la propagation le plus court.

Il subsiste beaucoup d'amalgames entre tous les moyens de désinfection, de désinsectisation, entre les produits fongicides, insecticides, et ceci pour l'ensemble du domaine patrimonial. Or ces moyens n'ont pas tous des propriétés fongicides et ils ne sont pas tous utilisables sur des livres. Faut-il rappeler que les ouvrages sont constitués de matériaux organiques variés qui vont réagir différemment à ces divers traitements. Cet article a pour but de présenter l'oxyde d'éthylène, qui est le traitement curatif utilisé par la BnF.

Comme tous les produits chimiques actifs, les produits désinfectants sont plus ou moins toxiques pour les utilisateurs et les supports. Comme le pentachlorophénol, le bromure de méthyle ou le formaldéhyde qui ont été longtemps utilisés avant que l'on sache que ces molécules étaient non seulement toxiques mais pouvaient également altérer les ouvrages.

A l'heure actuelle, en France, on utilise l'oxyde d'éthylène pour son action insecticide, fongicide et bactéricide en fonction de sa concentration. Il faut savoir que ce traitement spécifique utilisé généralement dans le domaine

hospitalier requiert des recommandations particulières dans le domaine patrimonial.

Ce produit qui se présente sous la forme d'un gaz est utilisé dans le domaine patrimonial depuis les années 1960. Extrêmement toxique il est connu pour ses effets cancérigènes, mutagènes. Par ailleurs, ses caractéristiques physiques font qu'il est également explosif et inflammable au contact de l'air. Toutefois, mélangé avec un autre gaz inerte (le dioxyde de carbone pour la BnF), ces caractéristiques sont amoindries.

Tous ces points négatifs ont conduit certains pays à l'interdire. On comprendra donc que l'utilisation de l'oxyde d'éthylène soit soumise à une réglementation très stricte en France et qu'il soit utilisé dans des structures particulières (enceintes hermétiques) soumises à des contrôles permanents et par du personnel compétent.

Se pose également le problème du rejet de l'oxyde d'éthylène (nocif) dans l'environnement¹, qui peut toutefois être pallié par un système de recyclage comme c'est le cas à la BnF².

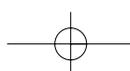
L'oxyde d'éthylène réagit rapidement avec les molécules constituant les microorganismes (protéines, ADN) et intervenant dans les réactions métaboliques. Celles-ci étant bloquées, cela entraîne la mort.

Ces réactions dépendent de plusieurs facteurs : la température, l'humidité, la concentration en gaz et la durée du traitement. La désinfection à l'oxyde d'éthylène n'utilise pas de « phase liquide », il n'y a donc pas de risque de solubilisation des encres, par exemple. Selon le protocole utilisé par la BnF, les conditions pour la désinfection du patrimoine écrit sont une température de 25-30 °C et une humidité relative de 50 %.

Le traitement est réalisé sous vide d'air ce qui améliore la pénétration de l'oxyde d'éthylène, permettant ainsi de désinfecter en profondeur les ouvrages contaminés. Il est

¹. Circulaire ministérielle du 7 décembre 1980 fixant les conditions de rejet de l'oxyde d'éthylène dans l'atmosphère.

². Protocole de désinfection de la BnF, CTBnF. Voir aussi : Leclerc B., « Effluents des installations de désinfection à l'oxyde d'éthylène : état de la réglementation et dispositifs de traitement », *Actualités de la conservation*, 9, 1999, p. 4-5.



ensuite impératif de faire désorber les ouvrages après un traitement, à l'intérieur même de l'autoclave, mais aussi en laissant les collections désorber dans un local spécial et ventilé. Selon le matériel, cette désorption sera plus ou moins longue. Certaines matières plastiques, par exemple, désorbent plus lentement que les supports papiers. Ainsi, dans la procédure habituellement utilisée à la BnF, les ouvrages désinfectés restent 3 semaines dans un local spécifique. L'oxyde d'éthylène résiduel est contrôlé à l'aide de détecteurs et les ouvrages sont réexpédiés uniquement quand l'oxyde d'éthylène n'est plus détectable. On s'assure ainsi que les collections traitées ne présentent aucun risque pour les futurs manipulateurs.

Concernant les effets de l'oxyde d'éthylène sur les matériaux constitutifs des ouvrages, des tests³ réalisés en laboratoire sur des papiers de différentes compositions (cotons, lins, pâte mécanique, etc.), du cuir et du parchemin n'ont montré aucune modification de la résistance physico-chimique. Certaines études⁴ montrent même une faible augmentation de la résistance physico-chimique des papiers après un traitement à l'oxyde d'éthylène. Concernant les pigments organiques et minéraux⁵, aucune modification notable des couleurs n'a été constatée. Une diminution de l'adhésivité de certains liants organiques est somme toute à noter.

Enfin, il n'a pas été prouvé qu'un objet désinfecté à l'oxyde d'éthylène soit plus sensible à une re-contamination. Toutefois, il faut citer l'étude N. Valentin⁶ datant de 1986, qui a montré que sur des papiers désinfectés à l'oxyde d'éthylène, remis à 80 % d'humidité relative et à 28 °C, il se développait plus de moisissures que sur des papiers non désinfectés. Cette étude démontre d'une part que le traitement de désinfection est un traitement curatif, et non préventif, et d'autre part que le contrôle de l'environnement est aussi important que la désinfection. Le traitement à l'oxyde d'éthylène qui n'a pas d'effet rémanent ne permet pas de protéger les collections d'une contamination future. Il est désormais admis que lors d'une contamination fongique, il faut agir sur le développement des moisissures par la désinfection, mais

aussi sur les causes favorisant leur développement, généralement les conditions thermo-hygrométriques, la ventilation.

Conclusion

Les moyens de désinfection ne sont pas nombreux pour traiter en masse des documents graphiques moisissés. Malgré tous les travaux de recherche, il n'est pas encore possible de remplacer l'oxyde d'éthylène pour des désinfections de masse et en dépit des risques inhérents au gaz, il faut reconnaître son utilité lors de catastrophe microbologique. De plus, afin de limiter l'usage systématique de l'oxyde d'éthylène, son utilisation au sein de la BnF n'est réalisée que sur préconisation du laboratoire après expertise du fonds moisissés.

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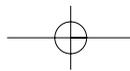
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The Use of Ethylene Oxide for Mass Treatment of Mouldy Books

by **Tony Basset**,

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Bussy Saint-Georges

In spite of means of prevention, the library collections are liable to become mouldy. So curators are often confronted with the issue of curative treatment (disinfection). The development of microorganisms on/in books is known to deteriorate the materials which constitute them (cellulose, collagen). That is why, in case of infestation, it is imperative to react as quickly as possible by treating collections but also by acting on the causes responsible for the development of these microorganisms.

The chosen procedure will have to answer several criteria:

- the least noxious for collections;
- the most effective;
- the easiest to implement;
- able to stop the propagation in the shortest time.

There is a mix-up over means of disinfection and desinsectization, fungicidal and insecticidal products, for the whole cultural heritage domain. But all these means do not have fungicidal properties and cannot be used on books. Books are made of different organic materials which don't react to these treatments in the same way. This paper presents ethylene oxide, which is the curative treatment chosen by the National Library of France.

As all active chemicals, disinfectants are more or less toxic for users and supports, as pentachlorophenol, methyl bromide or formaldehyde which were used for a long time before we know that these molecules were not only toxic but could also deteriorate books.

Currently, in France, we use ethylene oxide for its fungicidal and bactericidal action according to its concentration. It is necessary to know that this specific treatment used generally in the hospital domain requires particular recommendations in the cultural heritage domain.

This product which appears as a gas has been used in the cultural heritage domain since the 1960s. Extremely toxic, it is known for its carcinogenic and mutagenic effects. Besides, its physical characteristics make it also explosive and flammable on contact with air. However, mixed with another inert gas (carbon dioxide in the case of BnF), these characteristics are weakened.

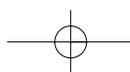
All these negative points led some countries to forbid it. It is necessary to understand that the use of ethylene oxide is subjected to very strict rules in France and is only used by the competent staff, in particular facilities (hermetic units), subjected to permanent controls.

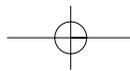
The discharge of ethylene oxide (harmful) in the environment is also problematic, but it can be however mitigated by a recycling system, as it is the case of the BnF installation.

Ethylene oxide quickly reacts with the molecules which constitute microorganisms (proteins, DNA) and act on metabolic reactions. These molecules are blocked, which leads to death. These reactions depend on several factors: temperature, humidity, gas concentration and treatment duration. As disinfection by ethylene oxide has no "liquid phase", there is no risk of making inks soluble, for instance. According to the protocol used by the National Library of France, conditions for written heritage disinfection are a temperature of 25-30°C and 50% of relative humidity.

The treatment is realized under vacuum conditions, which improves the penetration of ethylene oxide and allows to disinfect in depth the contaminated books. It is then imperative to let books offgas after treatment, not only inside the autoclave, but also after in a special and ventilated place. This offgassing will be more or less long, depending on the equipment: for instance, some plastics offgas more slowly than paper supports. So, according to the procedure usually used by BnF, the disinfected books stay 3 weeks in a specific room. The ethylene oxide residual is controlled by a detector and books are only put back when ethylene oxide is not detectable any more, to make sure that the treated collections present no risk for future readers.

Concerning the ethylene oxide effects on books constituent materials, tests conducted in laboratory on papers of various compositions (cotton, linen, mechanical pulp, etc.), on leather and parchment showed no alteration in physico-chemical resistance. Some studies even showed a small increase in physico-chemical resist-





ance of papers treated by ethylene oxide. Concerning organic and mineral pigments, no significant discoloration have been reported, but some organic binders became less adhesive.

An object disinfected by ethylene oxide has not been proved to be more susceptible to re-contamination. However, it is necessary to refer to the N. Valentin study of 1986, which showed that more molds developed on papers disinfected by ethylene oxide, when put back to 80% of relative humidity with a temperature of 28°C. This study demonstrates on one hand that disinfection is a curative treatment, and not a preventive one, and on the other hand that the environment control is as important as disinfection. The treatment by ethylene oxide has no residual effect and cannot protect the collections from a future contamination.

During a fungous contagion, it is necessary to act on molds development by disinfection, but also on the causes facilitating their development, generally the thermo-hygrometric conditions, ventilation.

Conclusion

There are not many means of disinfection to treat mouldy graphic documents. In spite of all the research works, it is still not possible to replace ethylene oxide for mass disinfections. Despite the risks inherent to this gas, we have to recognize it is of great help in case of microbiological disaster. Moreover, treatment by ethylene oxide has to be recommended at first by the laboratory once the damages have been evaluated, in order to limit its use at the BnF.

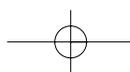
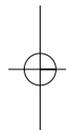
Tratamiento de desinfección de masa de los libros mohosos por el óxido de etileno

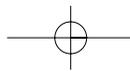
A pesar de los medios de prevención, las colecciones bibliotecarias están expuestas al moho, lo cual plantea el tema de los tratamientos preventivos. La Biblioteca nacional de Francia emplea el óxido de etileno para tratar los libros contaminados, para lo cual se requieren recomendaciones específicas y controles permanentes, debido a los efectos carcinogénicos de la substancia.

Este tratamiento depende de varios factores: temperatura, humedad, concentración del gas y duración del tratamiento. Debido a que la desinfección con óxido de etileno no tiene "fase líquida", no hay riesgo de que las tintas se vuelvan solubles. Además, los estudios muestran que no hay alteraciones de la resistencia físico-química ni de los colores.

Después de la desinfección, los libros permanecen tres semanas en un lugar especial para dejar que se remueva la substancia. Los libros se devuelven solo cuando el óxido de etileno ya no se detecta, para asegurar que la colección tratada no presente ningún riesgo para los futuros lectores. La descarga de óxido de etileno en el ambiente es también problemática, pero se puede mitigar mediante un sistema de reciclaje, como ocurre en la BnF.

A pesar de los riesgos inherentes a este gas, tenemos que reconocer que es muy útil en el caso de desastres microbiológicos.





The Identical Books Project

by **Barry Knight**,

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Collection Care, British Library

Introduction

The British Library was created as a new institution in 1973 from a number of separate library organisations in England. In 1998, the new building on Euston Road was opened, bringing many scattered functions together¹. Previously, conservation research for books had been carried out at The British Museum. Over the past decade, the BL has been increasing its activity in this area, starting in 2003 with the first conservation scientist to be employed by a British library.

A research strategy for addressing the future of care of the massive collections of books and other materials in the BL (ca. 625km of shelves and growing at a rate of 12km per year) and the other libraries in the UK was developed in 2004². Because conservation science is so inter-disciplinary and requires so many diverse skills, the BL aims to carry out research collaboratively. The expertise and equipment in appropriate university and other institutions are at the forefront of their areas of research. The BL will share and develop the necessary resources with those who know them best.

Mellon Conservation Research Project

The first major project is a collaboration between the six legal deposit libraries (LDL) of the UK and two of the national archives. The topics were identified in *Future Life of Collections*: natural ageing of materials, effects of the storage environment and non-destructive assessment methods. The research proposal has been generously funded by the Andrew Mellon Foundation, with a grant of \$698k.

Aims of the project

- To create and test a model of paper ageing *versus* storage environment.
- To investigate non-destructive methods of determining the state of books.
- To increase collaboration between conservation departments.
- To raise standards of conservation research.
- To increase UK conservation science capability.

1. <http://www.bl.uk/about/toppage.html>

2. *Future Life of Collections*, The British Library [2004].

Participants

- Collection partners: British Library, Cambridge University Library, National Archives of Scotland, National Library of Scotland, National Library of Wales, The National Archives, Oxford University Library Service, Trinity College (Dublin) Library.
- Academic participants: Strathclyde University, Centre for Sustainable Heritage (University College London), Ljubljana University, Manchester University.
- International advisory panel: Royal Library, Netherlands (Henk Porck), Library of Congress, State Academy of Graphic Arts Germany (Gerhardt Banik).

The project is now divided in 6 strands.

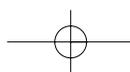
Process and deliverables

1. Choosing Identical Books: types of books, choosing books by libraries.
2. Condition assessment: current state of the art.
3. Measurements: methodology, sampling of books.
4. Environmental modelling: construction of virtual model, methodology, comparison with condition data.
5. Volatile organic chemicals: current knowledge, methodology, scoping VOCs produced by books, comparison with condition data.
6. Capacity building: training conservators, building a community of research aware conservators, building external partnerships.

The application was developed during 2004-5 and started in October 2006 when a project manager was appointed. In parallel, considerable advances on assessing the condition of paper had been made, especially by workers in Ljubljana. The research plan built on these improvements, resulting in slight changes to the project.

1. Choosing Identical Books

400 books, identical in all six libraries, were to be chosen, covering the range of modern paper types, 40 books from each decade, 1900-1980 and 2000s, published in the UK. We chose books from 16 categories of object (from newspapers to maps) in order to sample a wide range of papers. This range enables us to study changes in both production and condition. These books will also provide a snapshot of the current condition of books so enabling





Picture 1: Most of the "400" Identical Books of the BL.

long-term evaluation of changes over future decades. The choosing process was not simple. The major libraries in the UK have pooled their electronic catalogues under an umbrella organisation, the Consortium of University and Research Libraries, Curl³. A search of this database for books published in London in 1905 revealed a worrying distribution (See figure 1, p. II.). Of the 33,000 corresponding books in the 6 LDL, only 26 titles were found in all 6. According to the database, 27,000 books are present in one only library. It is impossible for a normal user to extract this data via the web interface. We were kindly helped by staff who ran searches directly on the database. One frequently finds that databases can answer only those questions that the original designers of the information expected to be asked.

Also of interest are books which are not present in the database. No serials (newspapers, journals, parliamentary papers, maps) are included, nor (until much later publications) is any music. A couple of examples. For British Parliamentary Papers filling 600 metres of shelving and still growing, the BL has one catalogue record, dated 1833. The NLW has an active programme of converting its paper/microfiche records of non-Welsh books into electronic format – it had reached "D" when the database was interrogated. The electronic union catalogues do not provide a good overview of the nation's library holdings.

An alternative strategy was also used. Curators in the libraries produced lists for each of the book categories, 4 titles per decade, which were then circulated to the other libraries. This manual checking of the catalogues and shelves revealed a far healthier view of the holdings (See figure 2, p. II.). The large majority of the books are held by 5 or 6 of these libraries. Although months of work went into list creation and checking, this method produced only about half the number required. Extracting common books from the Curl database filled the remaining slots.

Because these books cannot be removed from the holding libraries, photographs of the title and sample pages of each book are compared with those of the primary

3. <http://www.curl.ac.uk/> (accessed 17/09/2007)

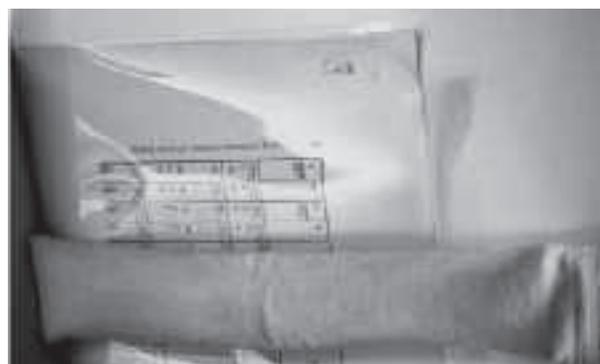
book as a further check on the "identicalness" of the books. A few in each library prove to be missing or not identical, because of different printings, etc. The number of books included in the project is now ca. 390.

2. Condition Assessment

Book condition: the UK's current method of assessment is the National Preservation Office, Preservation Assessment Survey (PAS)⁴ which has been widely implemented. PAS data on the Identical Books will relate the analytical results to current practice by librarians.

Paper condition: Kolar, Strlič and co-workers have shown that past measures such as surface pH and double fold tests are inadequate and that the best measures of paper condition is pH by extraction and cellulose molecular weight distribution (MW)⁵⁻⁶. These can now be measured using the same small sample, ca. 1mm in diameter. We follow these widely accepted methods to enable direct comparison with results from EU research projects, PaperTreat⁷ and SurveNIR⁸. The samples are also used to assess the fibre composition of the paper, providing another check on identicalness. The colour of the paper is measured as a further criterion of condition. Each library has agreed to have two samples taken from each book.

In order to reduce the inevitable errors in measurement, a number of protocols have been put in place. The conservators carrying out the measurements were trained together by Kolar and Strlič. They are retrained at the start of each library's period of measurement. The same equipment is used, an experimental kit transported around the libraries. The same two positions on the identical page in each Identical Book are ensured by locating the measurement and sampling points through a standard template. A set of sacrificial books is circulated with the kit and tested alongside the Identical Books, to check inter-laboratory consistency.



Picture 2: A Melinex template applied to the appropriate page to mark the sampling points.

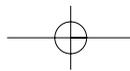
4. <http://www.bl.uk/services/npa/paslib.html> (accessed 17/09/2007).

5. Strlič, M. et al., "A new electrode for micro-determination of paper pH", *Restaurator*, 26 (2005) 159-171.

6. Strlič, M. and Kolar, J., "Size exclusion chromatography of cellulose in LiCl/N,N-dimethylacetamide", *J. Biochem. Biophys. Meth.*, 56 (2003) 265-279.

7. <http://www.infosvr.nuk.uni-lj.si/jana/papertreat/index.htm> (accessed 17/09/2007).

8. <http://www.science4heritage.org/survenir/> (accessed 17/09/2007).



3. Measurements

The conservators call for the books, check their identicalness, carry out the PAS assessment, photograph the relevant page, measure the colour at two points, then take the two samples. They carry out the first measurement, pH, on these two samples by extracting solubles using 5µl of water and measuring with a micro-pH electrode. The solution is then returned to the container and allowed to evaporate. The data are entered into a common database.

In each library, it takes two conservators about 3-4 weeks to process the 400 books. The kit is therefore circulating around libraries, from April to December 2007. When all the books have been examined, a sub-set of the samples will be chosen for fibre analysis and cellulose MW, with the assistance of epidemiological statisticians. This further analysis will be carried out by paper scientists at Ljubljana and Manchester Universities.

These measurements will provide as accurate an assessment of the condition of these books as can be achieved at this time. The data will then provide one side of the correlation needed to construct an environmental model for change of condition.

4. Environmental Model

It is well known that the environment affects the condition of paper. Although many accelerated ageing studies have studied this relationship, few have analyzed in detail the relationship between natural ageing conditions and the rate of deterioration. The advantage of accelerated ageing experiments is that all the experimental factors can be controlled and known: type of paper, its initial state, temperature, humidity, atmospheric pollution, time of exposure, size of samples, etc. In a natural ageing experiment looking backwards, none of these factors can be controlled, few can be known in detail, and there may be confounding factors which are unsuspected. The aim in this project is to gather environmental information (primarily relative humidity and temperature) and relate this to the condition of the books. One should use daily RH/T data that can be directly associated with each book in order to obtain the best possible correlation with its current condition.

Unfortunately, libraries have regular campaigns of building new storage buildings, while continually moving books between storage positions depending on their level of use and available space. Few libraries retain detailed records of these book movements. The project is still looking for collections which have not undergone movement and for which there is a good sequence of environmental data. Once that data is available, the correlation and construction of the environmental model can begin. This work will be carried out by the Centre for Sustainable Heritage (University College, London).

5. Volatile Organic Chemicals

The smell of old books and stores indicates something about their condition. The project will analyze the VOCs in stores of both the libraries and archives and in individual books⁹. These data will be correlated with the condition of the books as assessed by the PAS and analytical measurements. The aim is to assess the production of the VOCs, and predict their evolution using the inexpensive PAS methodology, then how the institutions can deal with these internal pollutants. The work will be carried out by the Department of Chemistry, Strathclyde University.

6. Capacity Building

The project builds upon existing cooperation between the heads of preservation of the LDLs and the national archives. Conservators from these institutions were brought together for the training sessions, leading to improvements in the project and independent networking. These participants all benefit by learning from the active experts in the field.

The project also builds upon the existing EU research networks, using the advances in techniques and is generating spin-off benefits. The use of an international advisory panel has also proved valuable, not just in improving the details of the project but also in strengthening relationships and prompting other joint initiatives. Paper conservation science has been neglected in the UK for many years. This project is helping the renewal of interest in this topic in university departments.

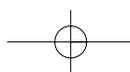
Conclusion

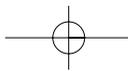
The field of paper and book conservation research is undergoing a long-delayed renaissance, reflecting the importance, and size, of the collections to be preserved.

This project began to work in October 2006 as a contribution to this effort. So far it has been successful with inevitable problems overcome. In March 2009 at the end of the project, we are planning a major conference to bring together its results as part of a survey of the advances that are being made around the world.

⁹ e.g. Lattuati-Derieux, A. *et al.*, "Identification of volatile organic compounds emitted by a naturally aged book using solid-phase microextraction/gas chromatography/mass spectroscopy", *J. Chrom. A* 1026 (2004) 9-18.

To be continued p. 21.





British Library : Identical Book Project

La *British Library* a lancé en 2006 un nouveau projet en collaboration avec les six bibliothèques britanniques de dépôt légal et deux des archives nationales, intitulé *Identical Book Project*. Il porte sur les thèmes suivants :

- le vieillissement du papier ;
- les effets des conditions de stockage ;
- les méthodes non destructives permettant de mesurer les dommages causés au papier.

Le projet comporte six étapes :

- sélectionner les livres identiques conservés dans chacune des bibliothèques partenaires du projet ;
- évaluer la condition actuelle de ces livres ;
- procéder à des mesures et des échantillonnages ;
- construire un modèle en mettant en relation les informations relatives à leurs conditions de stockage (la température et l'humidité relative, principalement) et la détérioration du papier ;
- mesurer les composés organiques volatils produits par ces livres ;
- former les conservateurs et promouvoir des partenariats.

Le projet doit prendre fin en 2009.

Biblioteca Británica: "el proyecto de los libros idénticos"

La Biblioteca Británica inició en 2006 un proyecto en colaboración con las seis bibliotecas del depósito legal y dos de los archivos nacionales, que se llama "el proyecto de los libros idénticos".

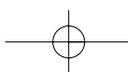
Los temas son:

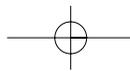
- el envejecimiento del papel;
- los efectos del ambiente de almacenamiento;
- los métodos no destructivos para evaluar el daño a los materiales.

El proyecto se compone de seis etapas:

- escoger los libros idénticos conservados para cada una de las bibliotecas copartícipes;
- evaluar la condición actual de estos libros;
- hacer medidas y muestrarios;
- construir un modelo virtual al poner en relación las condiciones de almacenamiento con la deterioración del papel;
- evaluar los compuestos volátiles orgánicos productos por los libros;
- formar a los conservadores y promover la colaboración.

El proyecto debe acabarse en 2009.





Comparing Mass Drying and Sterilization Protocols for Water-Damaged Books

by Randy Silverman, Miranda Bliss, Hal Erickson,
Niki Fidopiastis, Dr. Jan Francl, Dr. Barry Knight,
Kirk Lively, Dr. Jiří Neuvirt, Deborah Novotny, Nicholas Yeager

Overview

Defining the most effective way to dry water-damaged books *en masse* is a problem endemic to all libraries, with the field of book conservation tracing its own origins directly back to the Florence flood. Yet, despite dozens of large-scale disasters and literally thousands of smaller events that have occurred in libraries worldwide since 1966, “best practices” remain unclear, especially for large-scale recovery efforts, because of the limited amount of research conducted on the long-term consequences of various drying and sterilization methods¹.

Recovery specialists need to have a clear sense of the pros and cons of existing treatment options before they can respond effectively. This information is critical to making event-specific decisions so that collection permanence is optimized and distortion minimized within fiscal and operational constraints. Questions to be addressed in reaching those event-specific decisions include: What is the optimal approach to drying water-damaged books given the amount of material affected? What constraints are imposed by the availability and capacity of freezers, electricity, heating, ventilating and cooling (HVAC) systems, labor (trained and untrained), equipment (e.g. book presses, sorbants, fans) and vendors? What regional industrial resources can be called into service (e.g. freeze driers, flash freezers, sub-zero warehouses)? What percentage of the damaged material is rare and which technical options are preferable for material with significant cultural or monetary value? How will a chosen treatment affect paper permanence or the physical cockling of damaged books? When is sterilization justified and what

is a responsible treatment option? And if the collection is insured, what constitutes “restoration to usability”?

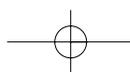
These judgments must be predicated upon an understanding of the comparative benefits, contraindications and expenses of the proposed alternatives. The grim reality of flood situations where entire collections are submerged is that all choices are less than optimal and a recovery can potentially be complicated by sewage-borne contaminants, pathogens, pollutants, and exponentially accelerated microbial growth.

Working with a sense of urgency to address these questions for the population of books most frequently affected by floods, a research project was forged in 2004 that included stakeholders (British Library, National Library of the Czech Republic and University of Utah Marriott Library), research scientists (British Library, National Library of the Czech Republic, Huntsman Cancer Institute and Applied Paper Technology, Inc.), and vendors of emergency drying services (BELFOR USA and Artifex Equipment, Inc.). Support for the research was generously provided by the National Center for Preservation Technology & Training².

The goal of this research project was to define which of five drying and two sterilization techniques caused the least mechanical damage to eighteenth-twentieth century handmade and machine-made book papers. The enquiry hoped to determine reasons recovery specialists should chose one drying or sterilization technique over another given:

² Investigators for this project included: conservation administrators – Deborah Novotny (Head of Preservation, Collection Care, The British Library); Dr. Jiří Polišenský (Director of Preservation Division, National Library of the Czech Republic) and principal investigator Randy Silverman (Preservation Librarian, Marriott Library, University of Utah); research scientists – Barry Knight (Head of Conservation Research, British Library), Dr. Jiří Neuvirt (Chemist, National Library of the Czech Republic), Hal Erickson (Researcher, University of Utah Health Sciences Center) and Miranda Bliss (Lab Manager, Applied Paper Technology, Inc.); microbiologists – Dr. Jan Francl (Chemist, National Library of the Czech Republic) and Niki Fidopiastis (Market Development Manager, Sterigenics); disaster drying specialists – Kirk Lively (Director of Technical Services, BELFOR USA); and Nicholas Yeager, (President, Artifex Equipment, Inc.) and bookseller Tony Weller (Owner, Sam Weller’s Zion Bookstore). Special thanks for creative input go to Olivia Primanis (Senior Conservator, Harry Ransom Humanities Research Center, University of Texas at Austin).

¹ Previous studies include: National Library of the Czech Republic, Prague and State Central Archives in Prague, “Study of the effect of drying methods on the physical chemical and microbiological properties of various kinds of paper”, January 2003, typescript; Søren Carlsen, “Effects of freeze drying on paper”, Preprint from the 9th International Congress of IADA, Copenhagen, August 15-21, 1999, retrieved from the World Wide Web 6 July 2007: http://palimpsest.stanford.edu/iada/ta99_115.pdf; and, Hilary A. Kaplan and Kathleen A. Ludwig, “Efficacy of Various Drying Methods”, published online 27 Sept 2005 by the National Archives and Records Administration, Washington, DC, and retrieved from the World Wide Web 3 Sept 2007: <http://www.archives.gov/preservation/conservation/drying-methods-01.html>



- 1) the age and historical value of the collection;
 - 2) predominant paper types comprising the damaged material;
 - 3) institutional or insurer-imposed fiscal constraints.
- Importantly, the performance of bindings and binding materials was not addressed in this study because books exposed to major flooding typically require rebinding.

Experimental Design

The sample set for this study was culled from books published between 1767 and 1979. Multi-volume sets were used in the expectation that the paper would be sufficiently similar from volume-to-volume within each set to provide a reasonable basis for comparison of the methods. While it was recognized at the outset that this choice eliminated the possibility of precisely replicating the study, the experimental design erred on the side of simulating real life situations so the results would correlate in a meaningful way with real library disasters.

A total of 171 volumes (39 three, five and seven volume sets) were used as samples. Of these, nine sets were published in the eighteenth or early nineteenth century and printed on handmade (cotton/linen) paper, while the remaining 25 sets were published in the nineteenth and twentieth centuries and printed on machine-made (wood fiber) paper. The ratio of handmade to machine-made paper roughly approximated the distribution that might be expected in a mid-sized research library collection, except that sets printed on clay-coated paper were unavailable for destructive testing.

One volume from each test group was retained undamaged as a control, while 22 volumes were wetted and subsequently dried by one of five contemporary drying techniques (air drying, vacuum freeze drying, thermal drying, vacuum packing and Vacme press drying with Zorbix), or were sterilized after freeze drying with one of two commercially available options (ethylene oxide or gamma irradiation). The experimental design produced 528 data points for each of the seven protocols tested.

Wetting Protocol

Each book was submerged completely for 24 hours in distilled water in a flat bottomed sink (See Picture 8, p. II.). While not realistic, distilled water was used because of the difficulty of providing uniformly contaminated flood water at five sites in Europe and the U.S. When buoyancy posed a problem the text was weighted slightly to maximize its submersion and the text's subsequent wetting. The wet books were then drained under a polyethylene sheet to maintain high relative humidity

(approximately 95%) at ambient room temperature for 24 hours (22°C/72°F), simulating a flooded library prior to pack-out. Books to be vacuum freeze dried were frozen (-18°C/0°F) using a commercial freezer facility, while each of the other techniques proceeded directly to drying.

Books prepared for sterilization followed the same wetting procedure but after draining for 24 hours were individually bagged in polyethylene freezer bags and left to mold at ambient room temperature for seven days (168 hours).

Drying Protocols

Following wetting, five drying protocols were tested in five different locations³.

Air Drying with Intermittent Pressing

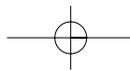
In a low relative humidity environment (30% RH) at the University of Utah (Salt Lake City, Utah, USA), wet books were stood on end on counter-high tables and fanned open to stimulate evaporation. None of the books were printed on coated stock paper so interleaving with silicon release paper (or wax paper) was unnecessary. Supports to prevent books from falling over included plastic VeloBind⁴ combs inserted at the head of the text to act as a cross brace, as well as five-pound weights placed as necessary at the base of the boards. Six large electric fans were positioned around the table and turned on the maximum setting to circulate air thoroughly throughout the drying process, accelerating evaporation and discouraging microbial growth. As the still-wet books approached dryness (after approximately three days) they were pressed for approximately 12 hours overnight between boards in a bookbinder's standing press and returned to the tables each morning for further fanning and air drying until all were thoroughly dry (taking five to seven days). Dried books were pressed between boards for an additional seven days following drying (See Picture 9, p. II.).

Vacuum Freeze Drying

At BELFOR, USA (Fort Worth, Texas, USA) frozen books were placed on rolling wire racks inside a commercial vacuum freeze drying chamber (See Picture 10 and 11, p. III.). The books were firmly packed together on the racks, spine

³ While vacuum freeze drying and thermal drying were part of this study, these techniques must not be confused with similarly-named thermal vacuum drying (TVD), in which bulk liquid water is boiled away at the intermediately-elevated temperatures permitted by a vacuum chamber, or thermal vacuum freeze drying (TVFD), in which a proprietary method of thermally-aided flattening is applied to vacuum freeze dried materials. TVD and TVFD were not considered for testing due to significant limitations but have been summarized in the work by Hilary A. Kaplan and Kathleen A. Ludwig, cited above.

⁴ VeloBind combs, developed by the General Binding Corporation (now merged with ACCO) are inserted into perforated leaf edges in a proprietary quick binding method. The combs – various called “spines” or “hot knife strips” – are available from office supply companies specializing in quick binding equipment.



down, to help maintain their shape during drying. Vapor pressure within the chamber was reduced below the triple point of water (4.57 torr/0.6092833 kilopascals). A slight amount of heat (40.5°C/105°F)⁵ was introduced intermittently to the chamber to stimulate sublimation (direct conversion from solid to vapor). Ice from the frozen books sublimed and was captured as ice on the unit's evaporator coils outside the chamber. The chamber contents were checked daily after the fourth day and thoroughly dry books removed until all books were finished (approximately seven days). Although the vendor provides more expensive services in which books are freeze dried while physically compressed to yield flatter text blocks, this option was not part of this study to reflect financial constraints typical of most post-disaster recoveries.

Thermal Drying

In a commercial wood drying kiln outside Prague (Czech Republic), staff of the National Library of the Czech Republic placed wet books on elevated wire racks (See Picture 12, p. III.). Books were then stacked vertically between pairs of unglazed ceramic tiles with 10-15 sheets of absorbent paper (printed newsprint) and sheets of Holytex⁶ placed between the unglazed tile surface and the book cover (See Picture 13, p. III.). These materials promoted diffusion of moisture from the books while preventing the wet bindings from sticking to the tiles due to adhesive migration or thermoplastic adhesion. Each stack of books was weighted on top (3.2 kg/7.0 lb) to produce constant pressure that reduced text block distortion during drying.

Air was circulated within the closed kiln and the temperature rose to 60°C/140°F with the relative humidity set at 70%. After two days the relative humidity was reduced to 40-50% while the temperature remained constant. Complete drying time took between seven and twenty days depending on the size and physical characteristics of each text block and cover. Books with plasticized covers took much longer to dry as moisture was eliminated only through the edges of the text. Interleaving was replaced daily during routine inspection for dampness. When the drying cycle was completed, the kiln was slowly returned to ambient conditions to allow books to equilibrate while still under mechanical restraint.

Vacuum Packing

At the British Library (London, United Kingdom) wet books were interleaved with sheets of printed newsprint

every 10-15 pages. If the wet binding felt slippery it was wrapped with Bondina⁷ to prevent the covering material from adhering to the polyester vacuum pouch (Archipress⁸). Placing the book inside the pouch, the edge was sealed with an Archipress vacuum packing machine and a vacuum pulled (See Picture 14, p. III.). After several days the pouch was opened and the interleaving exchanged for dry blotting paper to remove bulk water, and a new pouch used to re-seal the book. Drying took up to twenty exchanges of bag and blotter over sixty days.

Vacme Press with Zorbix

At Artifex Equipment, Inc. (Penn Grove, California, USA) wet books were interleaved with sheets of Zorbix⁹ every 10-15 pages (See Picture 15, p. III.). The covers were wrapped with Holytex to prevent binding materials from adhering to the inside of a proprietary, re-sealable vinyl bag integrated with a vacuum hose fitting (Artifex). The vinyl bag's re-sealable opening was rendered airtight with a Teflon folder while it was evacuated with a vacuum pump (Artifex). Saturated Zorbix interleaving was replaced at 48-hour intervals. Drying required approximately six exchanges of Zorbix over fourteen days.

Sterilization

Following wetting, molding and subsequent vacuum freeze drying, books were sterilized by licensed practitioners using either ethylene oxide (EtO) or gamma radiation. It should be noted that both sterilization methods required books to be free of liquid water before treatment as any moisture not chemically bound to the cellulose will otherwise react with the sterilizing agent.

Ethylene Oxide

In the Czech National Archives in Prague (Czech Republic), vacuum freeze dried moldy books were placed in a 6.4 m³ vacuum sterilization chamber (Matachana, type 3.100 LGE-2). The chamber was preheated to 30°C/86°F, air was evacuated to 0.069 bar and a calculated amount of water injected. The water was evaporated at 0.09 bar and the air evacuated a second time to reach 0.054 bar. At 1.125 torr (150 kilopascals) the tem-

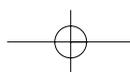
5. Temperature in vacuum freeze drying is critical. Heat is required to provide the energy for sublimation, but increasing the drying temperature causes cellulose damage. Some vendors refer to their product as "vacuum freeze drying", but introduce an excess of heat (TVD), e.g. 54°C (130°F), to accelerate the sublimation. While faster turnaround of treatment batches potentially increases profit for the service provider, it results in permanent damage to paper.

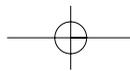
6. 100% polyester nonwoven polyolefin sheet.

7. Bondina is a proprietary non-woven polyester material with a smooth surface that facilitates release.

8. Details on Conservation By Design's Archipress vacuum packing machine retrieved from the World Wide Web 3 Sept 2007: <http://www.conservation-by-design.co.uk/equipment/archipress4.html>

9. The Vacme Press and Zorbix are available exclusively from: Artifex Equipment, Inc., Penn Grove, USA; artifex@pipeline.com; <http://www.artifex-equipment.com>. Designed by Artifex Equipment, Inc. and the United States Department of Agriculture's National Agricultural Library, Zorbix is a super absorbent polymer embedded in a sheet of blotting paper able to absorb 50 times its weight in water.





perature was held at 30°C/86°F and 80% relative humidity. Books were exposed to a 10% ethylene oxide/90% carbon dioxide mixture (trade name, Etoxen) for 6 hours at 1.5-2.5 bar (See Picture 16, p. III.). The chamber was then aerated, exhausted and refilled thirty times with the EtO gas incinerated in a plasma flame. At the end of the process books were transferred to a ventilation tunnel where they offgassed for six days.

Gamma Radiation

At Sterigenics, a licensed, commercial gamma irradiation facility in Fort Worth, Texas (USA), vacuum freeze dried moldy books were passed through an irradiation chamber where they received a calculated dosage in the range 12.6-18.8 kilogray (kGy). No pretreatment dehydration or post-treatment equilibration was required. See Picture 17, p. IV.

Analytical Testing

To evaluate treatment-associated loss of mechanical integrity, 24 leaves were removed at equal intervals from each dried or sterilized book and sent to one of two analytical labs. Each leaf was subjected to four internationally standardized mechanical tests: tensile strength, stretch-to-break, tearing resistance and MIT fold endurance¹⁰. See Picture 18, p. IV.

Discussion

Four drying methods (air drying, vacuum freeze drying, vacuum packing and drying in a Vacme press with Zorbix) and one sterilization technique (ethylene oxide) retained essentially all of the pre-treatment mechanical integrity of the book papers tested and were deemed non-damaging. By contrast, samples from the thermally dried and gamma-irradiated books lost 19% and 24%, respectively, of their mechanical integrity, and were determined to be inappropriate for treating water-damaged books.

Physical cockling in treated material was most successfully minimized when book paper was pressed as the moisture was removed (See Pictures 19-20, p. IV.). Vacuum packing and Vacme press drying best achieved this ideal but at different levels of fiscal investment. The initial cost of a vacuum packing machine may prove prohibitive for

many collecting institutions in addition to which numerous, disposable polyester vacuum pouches were required for each book dried¹¹. The Vacme press, conversely, is so inexpensive that even relatively poor libraries might consider acquiring one as a precautionary measure in the event a dry limited numbers of rare books ever require drying. Used in conjunction with Zorbix the Vacme press can significantly reduce drying time, but in trials conducted outside of this study the Vacme press also proved effective when readily available newsprint (printed or unprinted) was used as interleaving.

Air drying, which remains the most commonly applied book drying technique due to its low setup cost, produced far better results in terms of physical flatness when semi-dried books were pressed overnight, followed by further air drying the next day. Mold did not form inside the books given the limited duration of this damp pressing, but intermittent exposure to freely circulating air is requisite and, of course, this unrestrained period promotes further page cockling¹². A final long pressing as the book reaches its dry state helps reduce this recurring distortion.

Air drying, vacuum packing and drying in a Vacme press with Zorbix are all labor intensive methods best monitored by trained technicians handling relatively small batches of books (e.g. <100 volumes at a time). Given sufficient freezer capacity to forestall microbial growth, these three techniques can be applied to several hundred books by simply thawing manageable batches prior to treatment.

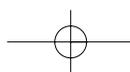
Vacuum freeze drying remains the most efficient method for drying large quantities of books (e.g. >500 volumes), especially for books printed on coated stock paper¹³. Unrestrained vacuum freeze drying, however, produced the greatest amount of cockling in the book papers tested. While not tested as part of this study, examples of vacuum freeze dried books pressed during sublimation were examined at the British Library and were shown to produce excellent results. The British Library's small vacuum freeze drying chamber has been modified with a mechanical jack inside the chamber that is used to manually squeeze books between thin steel plates. The chamber must be opened every two days and the jack's

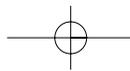
¹⁰. Paper samples were tested by or under the supervision of two of the authors (Miranda Bliss and Barry Knight) at their respective institutions. Tests included: tensile strength and stretch-to-break (ISO 1924-2) (machine direction and cross-machine direction: maximum load, strain %, and tensile energy absorption); tearing resistance (ISO 1974) (machine direction and cross-machine direction, mN/ply); and MIT folding endurance (ISO 5626) (machine direction and cross-machine direction).

¹¹. Conservation By Design Limited is the sole manufacturer of the Archipress vacuum packing machine and polyester vacuum pouches; retrieved from the World Wide Web 6 July 2007: <http://www.conservation-by-design.co.uk/equipment/archipress4.html>. Dissatisfaction has been reported by some who used a vacuum packing machine following the 2004 floods in the Czech Republic because of damage caused to fragile books by the significant pressure applied by the pouch, and mold that formed inside of incompletely sealed pouches.

¹². Pressing can only be applied to semi-dry books printed on uncoated paper. Books wholly or partially printed on coated stock must have every coated leaf separated with silicon release or waxed paper interleaving and allowed to thoroughly dry prior to pressing. Cockling is therefore maximized by air drying books of this type and alternative drying methods are suggested.

¹³. See: Søren Carlson, "Effects of Freeze Drying on Paper", cited above.





pressure increased to compensate for decreasing book thickness caused by sublimating ice crystals. While approximately doubling the drying time and significantly increasing labors costs, this approach to vacuum freeze drying produces far better results than when books are dried without constraint.

During the past three decades sterilization of cultural property has largely been downplayed as a technical option. Instead, conservators have learned to rely on environmental stabilization to return mold to a dormant state before removing the desiccated spores with a small vacuum aspirator or vacuum cleaner equipped with a HEPA filter¹⁴. The literature does a poor job, however, of identifying appropriate technical options when sterilization must seriously be considered. As noted by Fausta Gallo in 1978, sterilization should be reserved for "cases in which arresting infection and infestations is an unarguable necessity"¹⁵. This can occur, for example, when significant delays in a recovery cause wet collections to mold excessively, or when floodwaters contain contamination such as sewage or other biological hazards. Ignoring sterilization in such circumstances, even when dealing with irreplaceable collections, can pose potential health risks to future users and result in long-term liability issues for recovery specialists and collecting institutions.

Gamma irradiation continues to suggest a promising alternative to ethylene oxide sterilization, but as reported by Butterfield in 1987¹⁶ and confirmed in the present study, this approach damages book paper to an unacceptable degree. The mechanism by which ionizing gamma radiation kills microbes and renders spores non-viable simultaneously cleaves the cellulosic (and other polysaccharidic) chains from which paper derives its mechanical integrity. Lower levels of damage have been

reported in experimental settings where paper was treated with low levels of gamma radiation¹⁷, but it remains to be demonstrated that significant cellulose degradation can be avoided at doses that yield effective sterilization, or that this approach is commercially viable. Consequently, the authors cannot recommend gamma irradiation over ethylene oxide for sterilizing books of enduring cultural significance under any circumstances we can envision.

The use of ethylene oxide remains controversial in the U.S. Its detractors concede, however, that loss of lignocellulosic mechanical integrity as a result of ethylene oxide fumigation is not the issue. Objections focus instead on potential latent effects to book components other than paper such as plastics, adhesives, skin-derived materials, and media, as well as possible health risks associated with ethylene oxide off-gassing. The first concern has limited relevance in the context of a flooding incident whose scope and severity are so extreme that sterilization would need to be considered. Bindings in the recovery phase of such an event are quite often discarded, and the authors are unaware of any well-grounded studies reporting replicable findings of significant ethylene oxide-induced alteration of media likely to be encountered in books that would be considered for mass sterilization¹⁸. The present study corroborates the research of Flieder (1999)¹⁹ and Gallo that found that book paper thoroughly sterilized by a commercial dosage of ethylene oxide remains mechanically undamaged.

An influential study performed at the Library of Congress by Hengemihle, Weberg and Shahani (1995) determined that following sterilization, "off-gassing of ethylene

14. John H. Haines and Stuart A. Kohler, "An evaluation of ortho-phenyl phenol as a fungicidal fumigant for archives and libraries", *Journal of the American Institute for Conservation* 25/1 (1986): 49-55. Retrieved from the World Wide Web 6 July 2007: <http://aic.stanford.edu/jaic/articles/jaic25-01-005.html> and Northeast Document Conservation Center, "Preservation Leaflets: 7.5 Conservation Treatment for Works of Art and Unbound Artifacts on Paper", (n/d); Retrieved from the World Wide Web 6 July 2007: http://www.nedcc.org/resources/leaflets/7Conservation_Procedures/05ArtAndUnboundArtifacts.php

15. Fausta P. Gallo, "Methyl bromide, ethylene oxide and ethylene formaldehyde: biological and toxicological problems and problems related to treatment of library materials", *Nuovi annali d'igiene, f. microbiologia* 29/1 (1978): 51-82.

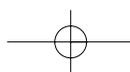
16. Fiona J. Butterfield, "The potential long-term effects of gamma irradiation on paper", *Studies in Conservation* 32 (1987): 181-191.

17. Manuela da Silva, A.M.L. Moraesb, M.M. Nishikawaa, M.J.A. Gattic, M.A. Vallim de Alencard, L.E. Brandão and A. Nóbregac, "Inactivation of fungi from deteriorated paper materials by radiation", *International Biodeterioration & Biodegradation* 57/3 (April 2006): 163-167; Giuseppe Magaadda, "The recovery of biodeteriorated books and archive documents through gamma radiation: some considerations on the results achieved", *Journal of Cultural Heritage* 5/1 (January-March 2004): 113-118; M. Adamo, M. Brizzi, G. Magaadda, G. Martinelli, M. Plossi-Zappalà, F. Rocchetti and F. Savagnone, "Gamma radiation treatment of paper in different environmental conditions", *Restaurator* 22 (2001): 107-131; M. Adamo, M. Giovannotti,

G. Magaadda, M. Plossi-Zappalà, F. Rocchetti, F. Savagnone and G. Rossi, "Effect of gamma rays on pure cellulose paper as a model for the study of a treatment of biological recovery of biodeteriorated books", *Restaurator* 19 (1998): 41-59; John Havermans, Katarzyna Ziba, Thomasz Lojewski, "New insights on disinfection of archival and library materials using gamma radiation", American Institute for Conservation of Historic and Artistic Works, 35th Annual Meeting 16-20 April 2007, Book and Paper Abstracts, retrieved from the World Wide Web 6 July 2007: http://aic.stanford.edu/meetings/abstracts/bpg_abstracts.html

18. Reports dealing with ethylene oxide induced damage include: Mary-Lou E. Florian, "Ethylene oxide fumigation: A literature review of the problems and interactions with materials and substances in artifacts", in L.A. Zyberman and J.R. Schrock (eds.), *A guide to museum pest control* (Washington, D.C.: American Institute for Conservation of Historic and Artistic Works and Association of Systematics Collections, 1988): 151-158. Mary-Lou Florian, "The effect on artifact materials of the fumigant ethylene oxide and freezing used in insect control", in K. Grimstad (ed.), *ICOM Committee for Conservation, 8th triennial meeting*, Sydney, Australia, 6-11 September, 1987, Preprints, vol. 1 (1987): 199-208; and, L. Green and V. Daniels, "Investigation of the residues formed in the fumigation of museum objects using ethylene oxide", in J. Black (comp.), *Recent advances in the conservation and analysis of artifacts*, (London: University of London, Institute of Archaeology, Summer Schools Press [for] University of London, 1987): 309-313.

19. Françoise Flieder and Christine Capderou, *Sauvegarde des Collections du Patrimoine* (Paris: CNRS Editions, 1999): 141-179. The authors gratefully acknowledge the kindness of Éléonore Kissel who translated this work for our use.



oxide by library materials is a reality"²⁰. This finding is often misconstrued to suggest that ethylene oxide is inappropriate for use in conservation, but in fact, the study simply concludes that "fumigated materials should be added to the collections only after the ethylene oxide concentration is decisively under 1 ppm"²¹. This conclusion mirrors U.S. workplace safety standards implemented nearly a decade before (in 1986) that mandate a 24-hour off-gassing period following sterilization to permit ethylene oxide concentrations to fall below 1 ppm²². This legal standard is adhered to by licensed U.S. contractors and is readily achieved because EtO is a volatile and reactive gas that dissipates quickly, reacting with atmospheric water molecules to yield more benign species.

Both gamma irradiated and ethylene oxide sterilized books contained a residual and, by consensus, objectionable odor. It is speculated this smell related to decomposing mold spores within the books. Whether this could be mitigated by surface vacuuming, followed aeration or exposure to absorbent media (e.g. activated carbon, potassium permanganate, or baking soda) in a confined space is outside the scope of the present study. Clearly, neither method is ideal. Further research into alternative mass sterilization techniques is desperately needed, including but not limited to an investigation into plasma fumigation²³.

Conclusion

Relying on surrogates to stand in for complex, real-world book collections, this study compared five drying and two sterilization techniques to determine the long-term affects of these recovery options on the permanence of handmade and machine-made book papers.

Mechanical testing revealed that air drying, vacuum freeze drying, vacuum packing and drying in a Vacme press with Zorbix had essentially no deleterious affect on handmade and machine-made book papers. Thermal

drying, however, was shown to reduce paper's mechanical strength by 15 percent. Similarly, sterilization with ethylene oxide caused no mechanical damage to moldy, water-damaged book paper while gamma radiation weakened comparable book paper by 25 percent. These findings indicate that thermal drying and gamma irradiation should be avoided when drying or sterilizing water-damaged books of permanent retention value.

Visual observation revealed that handmade papers dry with less distortion than machine-made papers treated by the same method. Books dried and pressed simultaneously (vacuum packed, Vacme press dried with Zorbix and thermal dried under weight) produce flatter results than books dried without constraint. Thermal drying is therefore deceptive, producing visually flat books that are molecularly damaged. Air dried books can be rendered reasonably flat if they are pressed overnight followed by further air drying the next day. Vacuum freeze drying produced the least flat books in this study but the technique can be modified so that books are pressed during sublimation

Cost factors for drying can vary considerably depending upon the availability and price of labor, or the initial outlay required for equipment such as a vacuum packing machine. Of the non-damaging techniques tested, air drying and drying with a Vacme press proved the least expensive, while vacuum freeze drying remains the most cost effective approach to drying large numbers of books. Multiple approaches can also be applied to the same recovery so it is reasonable to consider Vacme press drying, careful air drying and vacuum packing books of enduring cultural significance while less valuable parts of the collection were vacuum freeze dried. As mentioned above, books of permanent retention value can be pressed during sublimation. Lastly, freezing wet books remains essential for delaying mold formation and thereby improving the quality of the recovery by allowing the books to be dried in manageable batches.

It is hoped this study's findings help clarify for disaster responders the implications for permanence of specifying one drying or sterilization technique over another when treating water-damaged books.

20. Frank H. Hengemihle, Norman Weberg and Chandru J. Shahani, "Desorption of residual ethylene oxide from fumigated library materials", *Preservation Research and Testing Series* No. 9502, Preservation Research and Testing Office, Library of Congress (November 1995): n/p. Retrieved from the World Wide Web 6 July 2007:
<http://www.loc.gov/preserv/rt/fumigate/fume.html>

21. Hengemihle, Weberg and Shahani, *Ibid*.

22. U.S. Department of Labor, Occupational Safety & Health Administration (OSHA). Retrieved from the World Wide Web 6 July 2007:
http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=standards&p_id=10070

23. Plasma fumigation relies on radio waves. Wet, moldy books are placed inside a vacuum chamber, a vacuum is pulled, and the chamber is backfilled with an inert gas. Radio waves directed within the chamber convert the inert gas to argon, nitrogen and helium and draw hydrogen molecules from all water within the vacuum. Creating plasma energy in this way damages the DNA of mold, destroying its viability. More on the application of plasma fumigation to sterilization of library material can be found at Midwest Freeze Dry Ltd.: <http://www.midwestfreezedry.com/pestinfestation.html>

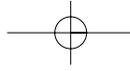
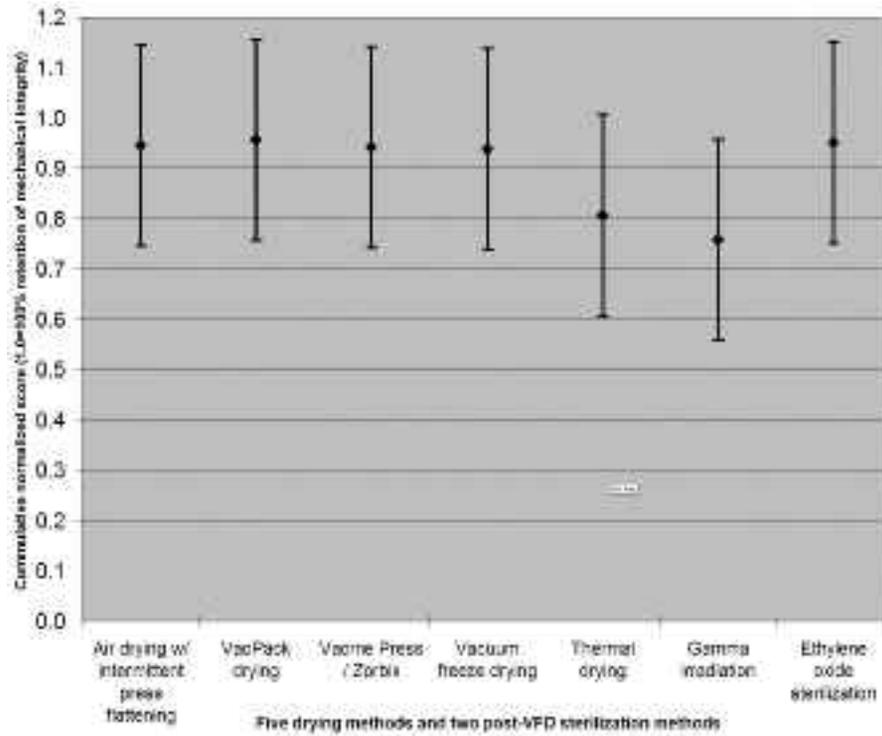


Chart 1: Comparison of mechanical integrity in five drying and two sterilization techniques



Le point sur les méthodes de séchage et de stérilisation de masse

Cette étude a permis de comparer cinq techniques de séchage et deux méthodes de stérilisation pour déterminer leurs effets à long terme sur la permanence du papier.

Des tests ont révélé que le séchage à l'air, la lyophilisation, l'emballage sous vide et l'utilisation de la presse Vacme (Artifex Equipment, Inc.) combinée avec du papier absorbant Zorbix n'avaient aucun effet délétère, alors que le séchage thermique réduit la résistance mécanique du papier de 15%.

Quant aux méthodes de stérilisation, les résultats de l'étude ont montré que l'oxyde d'éthylène ne détériore pas les livres traités, contrairement aux rayonnements gamma, qui en réduisent la résistance de 25%.

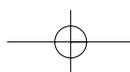
Il est donc déconseillé d'utiliser le séchage thermique et les rayonnements gamma pour sécher ou stériliser des livres de valeur endommagés par l'eau.

Comparación de los protocolos de secado y esterilización en masa de libros dañados por agua

En este estudio se realizó la comparación de cinco técnicas de secado y dos de esterilización para determinar los efectos a largo plazo de estas opciones de recuperación sobre la permanencia de los papeles.

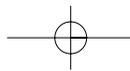
Las pruebas mecánicas revelaron que el secado al aire, el secado por congelamiento al vacío, el empacado al vacío y el secado en una prensa Vacme con Zorbix básicamente no producen ningún efecto nocivo sobre el papel. No obstante, el secado térmico produce una reducción de la resistencia mecánica de un 15%.

La esterilización con óxido de etileno no causó ningún daño mecánico al papel, mientras que la radiación gamma debilitó un papel similar en un 25%. Estos hallazgos indican que se deben evitar el secado térmico y la radiación gamma cuando se realiza el secado o la esterilización de libros dañados por agua que se deben retener de manera permanente.



Summary of Conclusions

Technique	Treatment Capacity in Volumes	Historic / Monetary Value	Equipment Cost	On-site Labor Required	Considerations and Concerns
Air Drying	1-200 comfortably / 200-500 with freezer	rare / non-rare books	low	medium	Extremely labor intensive if pressed as described in this paper. Low-tech; can be attempted under difficult circumstances without power for fans. Produces relatively flat books with frequent pressing during final drying stages. Coated stock paper requires page-by-page interleaving.
Vacuum Packing	1-200 comfortably / 200-500 with freezer	rare / non-rare books	high	high	Labor intensive. Machine cost is rather high and up to 20 proprietary, non-reusable bags may be needed per book. Produces flat books. Incomplete vacuum may result in mold formation within bags. Needs power supply. Coated stock paper requires page-by-page interleaving.
Vacme Press and Zorbix	1-200 comfortably / 200-500 with freezer	rare / non-rare books	low	high	Labor intensive and low-tech. Produces flat books. Coated stock paper requires page-by-page interleaving. Needs power supply. Press and a supply of reusable bags is sufficiently low cost that even tightly-budgeted institutions could afford one as a precautionary measure.
Vacuum Freeze Dry	500-500,000 with freezer	non-rare books / rare with in situ pressing	very high, but usually purchased as service	low	A non-damaging, mass drying technique. Drying books under compression doubles drying time and labor cost but yields improved outcome for rare books. Most coated stock papers successfully dry without blocking. Should not be confused with (1) thermal vacuum drying (TVD), which boils liquid-state water from books at elevated temperature (recommended only for books of low-intrinsic value); or with (2) thermal vacuum freeze drying (TVFD), a "premium" service that combines a proprietary heat-aided flattening with traditional vacuum freeze drying (consequences of heat-aided flattening for paper permanence are not yet established, but outcome discussed by Kaplan and Ludwig).
Thermal Drying	500-500,000	non-rare books	very high, but usually rent space	low	Not recommended except under extenuating circumstances. Degrades paper's structural integrity (broadly defined) on the order of 15-25%. Needs access to wood drying kilns. Availability is regional. Coated stock paper requires page-by-page interleaving.
Ethylene Oxide	500-500,000	rare / non-rare books	high, but usually purchased	low	EtO requires application by licensed contractor due to transient health risks: despite controversy, a non-damaging technique. Vacuuming dead mold spores may still be required. Short-term non-EtO odor may require exposure to odor-absorbent media in a non-circulating environment for some interval (weeks / months).
Gamma Radiation	500-500,000	non-rare books	very high, but usually purchased as service	low	Not recommended at irradiation dosages currently known to provide effective sterilization. Currently accepted dosage degrades paper's structural integrity (broadly defined) on the order of 20-30%. Vacuuming dead mold spores may still be required. Short-term non-gamma odor may require exposure to odor-absorbent media in a non-circulating environment for some interval (weeks / months). Research ongoing to determine if parameters exist to effectively sterilize paper without substantially damaging its permanence.



Development of the Multifunctional Vacuum Chamber

by Jiří Polišínský,

Director of the Collection Management
and Preservation Department,
National Library of the Czech Republic

The multifunctional vacuum chamber was developed and installed as a reaction to the floods which occurred in 2002. The former experiences obtained from the book drying in wood drying chambers and vacuum packing were then evaluated. The chamber enables to dry thanks to three drying methods: vacuum freezing, vacuum drying and air drying with temperature and humidity control. In the course of drying, special heating non glazed ceramic tiles and supporting construction with steel columns inside the chamber are used for book fixation. The steel plates on the top of columns serve as loading and prevent the books deformation. Independent measurement system checks the limits of the drying parameters.

Floods and aftereffects

Great floods in 1997 in Moravia and 2002 in Bohemia came about hundred years after the last great flood which affected Prague. Nobody remembered this event and people didn't believe that it could have happened. The long period without disasters caused that memory institutions had not been prepared to this event of such an extent. In Moravia, several tens of libraries were affected, and we estimate that more than hundred of thousands books were damaged in that time. No books were frozen, and several tens of rare volumes were dried by quite unsophisticated ways.

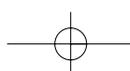
The situation before the flood in 2002 in Bohemia was only a little bit better. Several specialists who were sleeping were awaked. They sent warning signals against disaster on the Vltava River in Bohemia which could cause a similar large damage. Prague representatives agreed financial resources to build moveable barriers against the great water on the right bank of the river, which protected the whole right part of the town. But the situation was unsatisfactory in libraries, archives and other institutions. Disaster plans did not exist and preparedness of institutions to these events was on a very low level. Losses after flood were huge. More than 40 libraries were affected and 800 000 of volumes were damaged. Approximately 140 000 volumes were then frozen. Moreover, many hundreds of thousands of archival do-

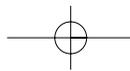
cuments and museum objects were damaged or soaked too. In the whole, nearly 2 000m³ of paper documents of different types were placed in freezing plants.

Activities after floods

Shortly after floods it was clear that the use of several drying methods would be required. Among paper documents were old prints, newspapers, magazines, and several types of paper like historical paper, wood-pulp paper, coated paper, tracing paper, etc. The worst damages were in Prague Municipal Library (old prints, rare documents, newspapers and monographs of 19th and 20th century), in the National Technical Museum (technical drawings, archival documents, etc.) and in the Czech Museum of Music (historical autographs, music scores, rare publications). For freezing was very expensive it was decided that modern publications cannot stay there for a long time. The National Library together with the National Archives implemented a set of drying tests at the end of 2002 and their results served for decision-making¹. Tests of drying methods showed that the best results were received with vacuum method. But we needed to find out the drying mass or industrial method too, because of large amount of modern publications contained in freezing plants. The first drying method that we had at our disposal was based on the use of vacuum packing machines. This method was developed by British conservators several years ago. The books incased by non-woven and absorbent paper were wrapped in plastic bag in vacuum packing machine. Then, the wrapped books stayed in shelves for several days and after they were repacked. The soaked absorbent paper was replaced in the course of repacking. Vacuum packing was used for historical and rare books only. Disadvantages of this method were the long time of drying, the danger of book deformations (high pressure) and the imprinting of ink text or color picture to the opposite side.

¹ Study of the effects of drying methods on the physical chemical and microbiological properties of various kinds of paper, National Library of the Czech Republic, Prague, 2003. www.nkp.cz/povodne/e_suseni.htm





The large amount of modern publications had to be dried by another method. We used two wood drying chambers and the books were dried here in special vehicles, between no glazed ceramic tiles. Each book was incased with non-woven and newspapers to prevent the porous tiles from filling. The books between the tiles were piled up in columns and each column was burdened by concrete block (to prevent book deformations). The books were dried by circulated air which was warmed up and humidified or dehumidified as necessary. The drying processes control was adapted to our requirements and special mobile phone was used for drying data parameters transmission to PC in the library. To prevent mold from growing, we used at the beginning higher temperature of about 60°C. Around 65 000 volumes have been dried in these chambers for several months.

For limited time some institutions obtained vacuum chambers for both vacuum drying methods: vacuum freezing and vacuum drying. All chambers were equipped by heating iron shelves and were able to dry only several tens of volumes. Their main disadvantages were the bad book fixation and sometimes de-frosting of paper documents in the course of drying in freeze-drying chamber without the operator knowing it. It was not acceptable for us. The Institute of Chemical Process Fundamentals had built up a drying workshop using microwaves.

Vacuum chamber development, its compartments and features

Disadvantages of vacuum packing method and unsatisfied outcomes of drying in vacuum chambers that were at our disposal at that time led to the development of a special vacuum chamber adapted for books and other paper documents drying. We specified the following functions before vacuum chamber development (See picture 21 and 22, p. IV.):

- three drying methods (vacuum freezing, vacuum drying, air drying with temperature and humidity control);
- disinfection;
- reconditioning;
- book fixation and loading in the course of drying.

We can evaluate the recently required experience during the chamber development. Especially, we wanted to use ceramic tiles inside the chamber. Books have been inserted between the tiles in columns and loaded in the course of drying; tiles have been heated and by this way the heating could have been transmitted to books. These were our main requirements which were to ensure the best results of drying. Development was provided by team of specialists compounded of several librarians and externalists. The Andrew W. Mellon Foundation granted

the financial resources for development and design creation, manufacturing, installation. Putting into service was financed by Ministry of Culture. We had to implement some construction works in the room dedicated to the chamber before its installation.

Main compartments of vacuum chamber are following:

a) Chamber and bearing construction.

The chamber is a cylinder made from stainless steel equipped with two doors with tamping on both sides. Bearing construction serves for the weight distribution on the floor and for installation of all compartments.

b) Book fixation system.

The system consists of removable supporting steel construction, columns for book fixation, heating tiles and connectors. Books are putting inside columns between the pairs of heating tiles. The steel plates are put on the top of each column on the last pair of tiles as a loading. Each column has small wheels which enable their moving in supporting construction.

c) Vacuum pump.

Vacuum pump is adapted for permanent operation. It can evacuate atmosphere from the chamber directly or through the freezer.

d) Freezing system.

The freezing system is composed of freezer (freezing chamber) and source of freeze. The system serves for freezing out water vapors. Temperature inside the freezer reaches from -60°C to +20°C, pressure 0,5 mbar or higher.

e) Acclimatization system.

Acclimatization system is used for air drying with temperature and humidity control and for reconditioning. It is adapted for air heating, cooling, humidifying and dehumidifying.

f) Nitrogen supply system.

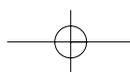
The system serves for nitrogen supply inside the chamber in the course of disinfection by butanol to prevent creation of the explosive mixture. It consists of two nitrogen bombs and special cocks adapted against freezing up.

g) Vaporizer.

The vaporizer is the glass container resistant against vacuum and equipped with heating which serves for butyl alcohol (or other liquid) evaporation into the chamber.

h) System for waste-water gathering.

This system allows proving the waste-water gathered in a special glass container.



i) Control system and software.

The control system enables to set up drying parameters, to combine drying method, takes control of chamber running and checks limits exceeding. The most important parts of it are the sensors for parameters measuring inside the chamber and on its surface, switch board, control PC and software.

j) Independent measurement system.

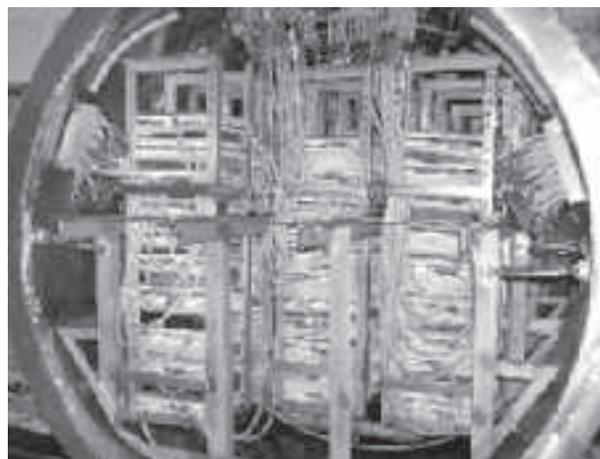
Good drying results depend on accuracy of drying parameters above all on pressure, temperature and RH. We decided from this reason to build up additional independent measurement system based on the use of special sensors in the signal book and on several places inside the chamber and tensiometer for weight shortage recognition. Data obtained from this system are accessible on control PC and their selection is at disposal on dedicated remote PCs of responsible persons by the way of Internet. We take control of the books humidity after drying manually. We also keep a check on the space around the chamber by two digital cameras.

The main chamber's parameters are specified in the following table.

Chamber's parameters	
Outer dimensions (length x width x high) in cm	245x156x220
Content (in liters)	3 230
Temperature	-5 up to +60°C
Temperature inside the freezer	up to -60°C
The lowest pressure	0,5 mbar
Output of vacuum pump	40m ³ /hod.
Dried books	1 up to 216
Average drying duration	14 days
Drying costs per volume	5 up to 15 USD
Average energy consumption	675 kWh



Books in columns.



Chamber prepared for drying.

Drying techniques

Frozen or wet books are incased by non-woven and filter-paper and inserted in steel column between pairs of heating tiles. The steel plate is put on the top of each column and tiles are interconnected by cables with connectors on the top or on sides of the chamber (See picture 23, p. IV.).

The signal book is put on tensiometer and the sensors of independent measurement system are dislocated. The temperature of tiles is set up on switch board and the drying method chosen is set up and started up on PC. Each drying method is running automatically.

Vacuum freezing

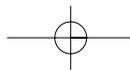
Frozen books are dried under triple point in vacuum 1-5 mbar and with a temperature under freezing point. The books must not melt in the course of drying. The tiles are warming up and vapors are drained away by vacuum pump through the freezer. It needs to be defrosted each 6 or 8 hours at the beginning of the process. The vapors are drained from the chamber directly in this time.

Vacuum drying

Wet books are dried over triple point in vacuum about 20 mbar and with a temperature over freezing point. Control system prevents water in books from boiling or freezing. The tiles are warming up and vapors are drained away by vacuum pump directly or through the freezer.

Air drying with temperature and humidity control

Frozen or wet books are dried under normal pressure by flowing air. Air temperature and humidity are adjusted by the acclimatization system. The temperature needs to be ca. 60°C (to prevent mold from growing) at the beginning of drying. The tiles are not warming up and the vacuum pump and freezer are out of operation.



Since there is a risk of water condensation on relatively colder surfaces, the control system needs to be carefully set up.

Reconditioning

Reconditioning is needed after vacuum freezing and vacuum drying (documents are over-dried). It is the similar process as air drying

Disinfection

Our intention was to use butyl-alcohol for book disinfection especially as mold growing prevention. Butyl-alcohol is effective against mold and other microbiological agents and it is used for this purpose in special disinfection boxes, it is non aggressive for books and operators. The main disadvantages are explosiveness in contact with air and effectiveness on book surface only. Vacuum was expected to help us to get butyl-alcohol more deeply in the paper.

The inner atmosphere is evacuated from the chamber at the beginning of disinfection and butyl-alcohol is evaporated from vaporizer. Then, the chamber is slowly filled up by nitrogen, to avoid creating an explosive mixture. The first tests were not successful; we had used rather little amount of butyl-alcohol which was not effective. For the following tests, we must change the present fan on the roof for another adapted for explosive matters. In the next step we would like to test other materials for disinfection.

Advantages and disadvantages of drying methods

Vacuum freezing is the most convenient method for documents containing ink and color paintings because it does not cause bleeding. Vacuum drying is the most suitable for other printed documents. Both vacuum methods make paper over drying and documents need to be conditioned. The interrupted inter-fiber bonds do not recover themselves in the course of vacuum freezing whereas in other two methods they do. In vacuum freezing the tracing paper loses its transparency. The drying in controlled air is the cheapest method convenient for documents which need not to be preserved for a long time. Mechanical properties deteriorate about 10 or 20% (it depends on the time of drying) because of higher temperature at the beginning of this process.

2. More detailed results of drying are available in: Neuvirt J., *Universal drying chamber*, The National Library of the Czech Republic, Prague, 2006. www.nkp.cz/files/universal_drying_chamber.pdf

Large format documents drying

The chamber is also adapted for drying large format documents like maps, technical drawings, etc. We use a large wood desk (100cm x 200cm) for this purpose which we lay down on the supporting construction. We can dry several flat documents between filter-paper layers. The ceramic tiles are put on the last layer of the filter-paper on the top as a weight and for heating.

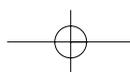
Conclusion

Vacuum chamber was developed, manufactured and installed between September 2003 and July 2005. Testing operation took nearly one year up to August 2006 and standard operation started in August 2006. 1 077 old prints and rare publications from the Municipal Library Collections were wholly dried in 2006 and 2007. From February 2007, the special paper documents of the National Technical Museum have been dried² too.

As the next step, we would like to exploit the chambers properties. Nitrogen, vacuum and changes of temperature and relative humidity could be used as insecticide for books or wood artifacts. The chamber allows implementing diverse tests and research. First of all, however, the chamber will be at our disposal for facing future disasters.

For more information on the multifunctional vacuum chamber, please contact:

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News

■ IFLA Elections Results

Philippe Vallas, Director Assistant of the BnF Conservation Department, has been elected in the IFLA Preservation and Conservation section for 2007-2009.

Danielle Mincio, Head of Preservation at the BCU of Lausanne, Switzerland, has been elected for the position of IFLA Governing Board member for 2007-2009. The Governing Board appoints her to serve as its representative into the PAC Advisory Board.

Per Cullhed, Director of the Cultural Heritage Group, Uppsala University Library, has been appointed as chair of the Preservation and Conversation section.

■ National library flooded

Scotland's National Library was flooded after a sprinkler system broke down around 11:30pm, on September 10th. A crew worked through the night to salvage the historic collection at the National Library of Scotland in Edinburgh. Five floors of the library had been affected by water. Staff was unable to give a definitive account of the extent of the damage, but insisted it was minimal and involved modern books rather than the greatest treasures. Fortunately, many of the library's most valuable books had been wrapped up ahead of the flooding incident because of construction work. The National Library of Scotland is located on the capital's George IV Bridge. It is home to the world-renowned John McMurray Archive, which contains the writings of Jane Austen, Charles Darwin and David Livingstone among others.

This article can be found at:
<http://news.scotsman.com/scotland.cfm?id=1453732007>

■ Conservation Awards

The winners of the 2007 Conservation Awards were announced at a ceremony at the British Museum on Thursday 27 September 2007.

The Winner of the Award for Conservation 2007 is the Scottish Conservation Studio for Perth Museum & Art Gallery, for the conservation treatment of a rare silk early 17th-century doublet.

The Winner of the Award for Care of Collections 2007 is the Durham University Library for its North East Collections Care Scheme.

The Winner of the Student Conservator of the Year Award 2007 is Rachel Morrison and The Courtauld Institute of Art for a study investigating the surface cleaning of unvarnished paintings.

The Winner of the Digital Preservation Award 2007 is the National Archives of the UK for the development of PRONOM (online service including a knowledge base of technical information about over 600 file formats and 250 software tools) and DROID (Digital Record Object Identification).

The Winner of the Anna Plowden Trust Award for Research and Innovation 2007 is Professor Norman Tennent, Fyne Conservation Services, and Dr Jim Nobbs, University of Leeds, for their study about colour-matching for ceramic conservation.

Update on BiblioPat: A French Association for Special Collections Librarians

By Aurélie Bosc, Senior librarian,
France

Bibliopat Historical background and purpose

In 2006, a group of librarians involved in special collections management pointed out the need for a forum for sharing views and expertise. In May 2006, they set up a not-for-profit organization, BiblioPat, to encourage open discourse about topics of interest to members, to promote information sharing and activities related to special collections management, and to enhance the professional community's skills in areas such as conservation and preservation, processing and highlighting collections. One month later, a discussion group was opened on the web.

Bibliopat Discussion group

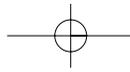
Since June 2006, almost 700 messages have been posted by 422 members, of

whom half work in public libraries, a quarter in university libraries and a tenth at the National Library of France; others are students or come from regional cooperative agencies and foreign libraries. (Suppliers, consultants, vendors and any type of commercial activities are not accepted for membership.) This wide range of institutions and job descriptions increases the span of professional capacities available on line. New members are registered every month, as the group gains more visibility among the not-so-small world of special collections librarians. The discussion group provides an environment for consideration, information, questions, surveys, debates and mutual help. There are no stupid questions and all subjects are welcome (as long as they concern the special collections area). The group is the place where you can ask any question, from elementary to academic level. The latest queries and related answers include: "What are the administrative formalities with a donor?" "Could I get help identifying one of Calepino's dictionary editions?" "Have you any experience in outsourcing dusting?" Typical topics deal with preservation and conservation, disaster planning, digitization, bibliography, copyright and intellectual property, information about websites, events, exhibits, conferences, training programs, job announcements and institutional announcements. Even politics (feedback about the newly adopted law on universities) and humor (yes, some French librarians liked "Mr. Bean at the Library") have their place on the list as long as they are pertinent to the list's interests. Messages pertaining to special collections librarianship posted on other lists are forwarded to the BiblioPat discussion group. Contributions and documents sent to the list are automatically archived on the discussion group website.

In my opinion, as a supporter and member, there are two main benefits from the group: to profit from colleagues' experiences, readings and web browsing, and to benefit from the high responsiveness of the group – one would say it's sometimes like a hotline!

Other activities

BiblioPat Association has been mandated by Enssib, the French National School for Library and Information Sciences (whose server, by the way, hosts the discussion group) to organize regular talks and meetings for librarians dealing with special collections. The *Rencontres Henri-Jean Martin* -named after the late librarian, historian of the book and supporter of special collections - will be



launched on 22-23 October 2007, and will focus on three topics: collaborative projects, special collections versus general collections, and building special collections for the future.

Collaboration with the French Library Association (Association des bibliothécaires de France, ABF) is on the agenda

for the coming months.

Join now! The network value increases as the community of users grows!

Read BiblioPat mission and vision: <http://listes.enssib.fr/wws/info/bibliopat>

Contact BiblioPat and subscribe: bibliopat-asso@no-log.org.

Subscription for BiblioPat discussion

group is free of charge. It should be noted that messages are mostly in French. They are moderated and the group is only open to individuals and not to institutional entities.

Membership in BiblioPat association is 10 €.

Publications

Preserving the digital heritage: Principles and policies

By Yola de Lusenet and Vincent Wintermans (eds)

Selected papers of the conference of 4-5 November 2005 in The Hague, organized by the Netherlands National Commission for UNESCO and the Koninklijke Bibliotheek, as a follow-up activity to the Charter on the Preservation of the Digital Heritage.

Copies can be ordered from the ECPA Secretariat at the address below or through the ECPA website.

The price is 40 euros, exclusive of postage and handling.
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<http://www.knaw.nl/ecpa> and

http://www.unesco.nl/main_6-3.php

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Archiver, et après ?

Par Marie-Anne Chabin

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Preservation in the Age of Large-Scale Digitization A White Paper

By Oya Y. Rieger

Council on Library and Information Resources, September 2007.

Available at: <http://www.clir.org/activities/details/mdpres.html>

Events and Training

Announcements

"Communities and memories: a global perspective"

The third UNESCO International Memory of the World Conference

19-22 February 2008, Canberra, Australia

The Memory of the World Programme was established by UNESCO in 1992 to protect and promote the documentary heritage in all its forms by raising aware-

ness of the problems associated with its preservation and ensuring access.

In the 15 years since the UNESCO Memory of the World programme was established much has been achieved. The time is now ripe to celebrate its many successes, to identify its shortcomings and to propose potential improvements. The conference will be held at the National Library of Australia, in association with representatives from the Intangible Cultural Heritage sector, under the auspices of the Australian National Commission for UNESCO. It will be preceded by a meeting of the Regional Memory of the World Committee for the Asia-Pacific Region (MOWCAP) on 17-18 February.

The conference programme is now being planned around five key topics:

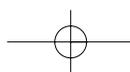
- Memory of the World in the UNESCO framework: examining its relationship to other relevant UNESCO activities;
- Unravelling the Registers: how effec-

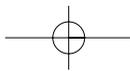
tively international, national and regional registers fulfil the aims of the Programme;

- Preservation and access: taking a fresh look at technical and practical issues;
- Sustaining the Programme: ideas, strategies and experiences helping Memory of the World to grow;
- Evaluating success: identifying gaps, inconsistencies and inequities in the programme and proposing solutions.

Eminent invited speakers will deliver keynote papers to open up these topics, and ample discussion time will allow active contributions from all conference participants. The final day will be dedicated to workshops examining other issues such as determining significance, submitting nominations and establishing and developing national committees.

Preliminary information is available at: <http://www.amw.org.au>, where you may register your interest and receive updates as the conference programme develops.





Read the interview of Abdelaziz Abid, Senior Memory of the World Programme Specialist at: http://portal.unesco.org/fr/ev.php-URL_ID=37902&URL_DO=DO_TOPIC&URL_SECTION=201.html

Mid-term meeting of the PAC Section

26-27 March 2008,
University of Lausanne, Switzerland

COSADOCA (*Consortium de sauvetage des documents en cas de catastrophe*) and *Bibliothèque cantonale et universitaire de Lausanne* coorganize at the University of Lausanne, Switzerland, the mid-term meeting of the PAC Section in March 2008, focused on "Salvage in case of disaster in library and archives: how RFID and regular practice training can help to be efficient".

Programme

Wednesday 26 March
RFID and disaster salvage

Thursday 27 March
Utility of regular practice training to save our collections

Friday 28 March
Excursions

Place

University of Lausanne, Switzerland - Amphimax room 415

Registration fee

200 CHF including coffee break, lunch and cultural evening.

Hotel facilities

16 hotels in Lausanne
Single between 100 CHF to 233 CHF per night.
Double between 140 CHF to 264.40 CHF per night.

More information at:
<http://www.cosado.ca/>

IFLA International Newspaper Conference 2008 "Old Issues, New Issues: Impact of Digital Technology upon Contemporary and Historic Newspapers"

1-3 April 2008, Singapore

The IFLA International Newspaper Conference 2008 will be held from 1 to 3 April 2008 at the National Library of Singapore.

Libraries in the world are facing dual challenges of preserving printed news-

papers and responding to the changes that new technologies bring on to managing both printed and online (born digital) newspapers.

Jointly organised by IFLA and the National Library of Singapore, the IFLA International Newspaper Conference 2008 will focus on the rapid advancements of digital technologies affecting the various aspects relating to newspapers in libraries and archives.

Who should attend?

- Library administrators, librarians, information specialists/managers in the public, national or academic libraries who are working or interested in the aspects of newspaper librarianship.

- Service providers who are interested in new projects/initiatives and approaches in newspaper librarianship.

Why you should attend?

The purpose of this conference aims at not only sharing of collective knowledge about how libraries can tackle these challenges but also to open up opportunities for libraries, librarians and associated industry players to interact with one another and work out suitable partnerships that will help to improve the provision of newspaper services at libraries.

Call for papers

We invite you to submit a short proposal for a presentation on the conference theme, "Old Issues, New Issues: Impact of Digital Technology upon Contemporary and Historic Newspapers".

There will be 3 tracks of presentations that highlight a particular aspect or issue related to newspapers:

- Physical and Digital Preservation of Newspapers
- Service and Access Models of Southeast Asian Newspapers
- Online Newspapers

Abstract submission deadline:
30 September 2007.

Full paper submission deadline:
31 December 2007.

To register

Download registration form and submit to: Ms Winnie Yeong
Email: winnie_yeong@nlb.gov.sg
Fax: (+65) 6333 7968
Tel: (+65) 6333 7923

Early bird conference fee (before and on 31 December 2007): \$100.00
Conference fee (after 31 December 2007): \$120.00

For more information on the conference, visit:

http://blogs.nlb.gov.sg/newspaper_conf08

For general enquiries email:
IFLA_newspaper@nlb.gov.sg

First announcement and call for abstracts 8th Indoor Air Quality 2008 Meeting

17-19 April 2008, Kunsthistorisches Museum, Vienna, Austria

Indoor Air Quality (IAQ) is a workshop series that is devoted to reporting and discussing the progress in the field of indoor air quality related research in museums, archives and collections. The meetings provide an informal, yet highlevel, trans-disciplinary forum for the discussion of new scientific results on corrosion and degradation mechanisms due to indoor air pollution as well as strategies for air quality monitoring and mitigation - with particular emphasis on novel dosimeter or sensor systems. We cordially invite you to participate in this highly stimulating and practically oriented meeting and would be pleased to welcome you to the IAQ2008 workshop in Vienna coming Spring!

Organising Committee:

- Martina Griesser, Kunsthistorisches Museum Vienna, Conservation Science Department;
- Valentina Ljubic, Technisches Museum Wien, Restoration Department;
- Erwin Rosenberg, Vienna University of Technology, Institute of Chemical Technologies and Analytics;
- Manfred Schreiner, Academy of Fine Arts Vienna, Institute of Science and Technology in Art.

General Topics:

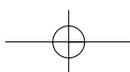
- Chemical Analysis
- Interaction of Air Pollutants and Objects (*e.g.* Corrosion) Problems
- Applications in Practice Preventive Measures

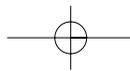
Fees:

Regular participants: EUR 200
Students: EUR 150

Deadline for submission of abstracts:
15th November 2007.

For further information see the conference website:
www.khm.at/IAQ2008
Contact: iaq2008@khm.at.





Reports

"LIBER Think Tank on the future value of the book as artefact and the future value of digital documentary heritage",

24-25 May 2007, the National Library of Sweden, Stockholm,
By Ingeborg Verheul,
Programme Manager,
Memory of the Netherlands,
Koninklijke Bibliotheek

The future of the book is in question. The future of the digital cultural heritage is under debate. The role of the printed text as the physical carrier of information and human thought is being challenged by digital technology. Concepts such as value and authenticity are traditionally based on physical objects and collections. Has the artefactual value increased or decreased with digital developments? The value and authenticity of virtual information carriers are increasingly being discussed. Has the critical mass of "born digital" and digitized material created a new digital cultural documentary heritage?

These and other questions were topic of discussion during a two-day meeting, called the "LIBER Think Tank on the future value of the book as artefact and the future value of digital documentary heritage". This meeting was held at the National Library of Sweden in Stockholm on 24-25 May 2007. It was organized by the Preservation & Conservation Division and the Collection Development Division of LIBER (*Ligue des Bibliothèques Européennes de Recherche*), and was attended by an international audience of 80 people, representing libraries, archives, museums and the academic sector.

The aim of this two-day Think Tank was to examine and discuss whether it was possible to arrive at a common understanding of the concepts, regardless of whether the format is physical or virtual.

Ten speakers tried to find answers to the questions concerning the value of the book and the digital object from different angles and their talks gave input for a broad participatory debate with an international expert panel, which closed the session. The Think Tank was co-chaired by Helen Shenton, Head of Collection Care of the British Library, also chair of the

LIBER Preservation & Conservation Division and Lars Björk, preservation coordinator of the National Library of Sweden, and member of the LIBER Preservation & Conservation Division.

After a world of welcome of Gunnar Sahlin, the national librarian of Sweden, the Think Tank concentrated on three topics: the future of the book; what to preserve; and the existence or non-existence of a digital cultural heritage.

First session

The first session on the future of the book was opened by Helen Shenton, who talked about the changing role of the physical book as carrier of information. She referred to a similar discussion on the future of the book in the digital age, that took place at the London Book Fair in April this year. In this discussion, called "Digitize or Die", the famous British author Margaret Atwood held a firm plea against e-books, which are less convenient to read, when compared to a paper version. H. Shenton posed several intriguing questions as: do the concepts of value and authenticity, based on physical objects, still have a meaning? Does digitization decrease or increase the value of the book as an artefact? And do all the digitized and born digital objects together form a new digital cultural heritage?

Second speaker was Stephen Nichols of the John Hopkins University. S. Nichols, who is also Chairman of the CLIR Task Force on the Artifact in Library Collections, gave his view on what pieces are important to keep. He talked on the drivers for preservation assumptions and stated that in fact, no one makes neutral choices, and that there always is some selfishness in what people want to keep. One of the conclusions the CLIR Task Force on the Artifact made was that it is important for libraries to cooperate with the user community to decide what to keep. He also made notice of the fact that libraries don't have the resources to keep everything, and that libraries need to form consortia to share collection and preservation programs, focusing on specific topics.

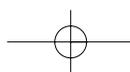
Per S. Ridderstad, Professor in book history at the University of Lund, discussed the differences and the similarities of physical and virtual carriers of information. He talked about the future of existing books and that of

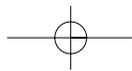
future books. He spoke on people's perceptions on the reliability of the physical book and the value of digitized collections. He stated that the value that we need to preserve, whatever form the document has, is the communication. When digitizing cultural heritage and making it accessible on the Internet a library can show off with its cultural collections; it can take care of preservation, although substitutes will always be a point of concern for scientists; and thirdly the library meets, through digitization, the citizen's rights to have access to collections. S. Ritterstad stated that it is necessary to preserve the digital of today to be able to write history in the future, but also commented on the need to consider the life cycle of collections management for various versions of an item, whether in a printed form, as a microfilm, or digital. Pairing the physical and the virtual in the libraries life cycle is essential to get funding for collection development and collection care.

Last speaker in the first session was Pentti Vattulainen, Director of the National Repository Library in Helsinki and Chair of the IFLA Acquisition and Development Section. P. Vattulainen discussed the Last Copy Approach, its impact and its implications. He spoke on the concept of the three service layers, as formulated by Brian Schottlaender, making a distinction between bright storage (access and circulation), dim storage (limited services to participating libraries and patrons) and dark storage (no service to patrons and only an emergency service for the participating libraries). He combined it with a theory on how the Long-Tail concept of Baden Hughes which describes the demand side of an economic market, for the library world often turns in a Wag Tail (with demand and funding going up and down). P. Vattulainen also stressed the necessity of international cooperation for long-term storage of and access to digital materials.

Second session

The second session concentrated on the question: What to preserve? All three speakers in this session held a practical presentation, based on their own preservation experiences. First speaker, Carla Montori, Preservation Projects Librarian of the University of Michigan, spoke on the Google experience at the University of Michigan, and compared the Google project with





earlier experiences the Michigan University had with in house digital reformatting in 1993. In the 1993 project costs for digitizing a film were ca. \$100 per film (340 pages), where a Google reformatting now costs \$10 per item. In the 1993 project the library also involved subject cataloguers and preservation people in the digitizing project, which caused expenses for bibliographic search, examination of different copies to choose the right copy to digitize, decision making, quality control and training of staff, to count in. Google digitizes 250 books per week (50 books a day in 8hrs shifts, 70.000 images a day, 85.000 images a week). This means each operator handles 1200 volumes a year, which is twice as much as in the 1993 reformatting program. The only method of 'quality control' Google uses is the OCR. If the OCR is ok, the digital product is good enough for Google.

One of the results of involving Google in the digitization process was that reformatting at the Michigan University removed from preservation and became more technology oriented than collection oriented. As a result of this, physical treatments became subject of the Collection Development, and the preservation department was abolished.

C. Montori also brought up the fact that it is a fairy tale to believe that digitizing protects the original because of decreasing use. After a year of experimenting with Google digitization, it turned out that awareness and use of the digital version of an item, created a new demand for the physical item at the same time.

The second speaker, Jan Paris, Conservator of the University of North Carolina at Chapel Hill (USA), discussed the conservator's role in digital projects and spoke on the decision-making process for digital projects and the fact that selection for conservation and digitization have much in common. To decide on the suitability of an object for scanning, J. Paris uses the same set of general questions that are asked when taking a conservation decision: What, Why, Which, Who, How and When, and the additional questions: How much will it cost, How do we pay for it, and How do we do this technically. She emphasized that institutions should never sacrifice originals or impact the research value of originals in order to achieve production goals. She also stressed the importance

of involving conservators in the digitization process in an early stage, and always involving conservators in the contracts with the vendors.

Lars Björk, Preservation Coordinator of the National Library of Sweden and co-chair of the Think Tank, spoke on authenticity and the role of the original visual. He provided a visual representation of the need to digitally capture the entire book to provide context and legitimacy. He referred to Ivan Marcovics theory of Cultural Heritage, which describes cultural heritage objects by their significance, material and form and shows the different stages of importance of the components of a cultural heritage objects. In a museum collection the material, significance and form of an object are equally important; in an archival collection the form of an object is less important. In a library collection the significance is most important aspect of an object. This difference between the cultural heritage sectors makes it difficult to define the concept of "authenticity".

L. Björk underlined the importance of choosing between presenting only the content of an object or presenting it in its original context, showing all characteristics of the artifact. The underlying question always is: is a book just a carrier of information or is it more than that?

He finally stressed that in order to bridge the language difference between preservation and digitization, it is important to bring together different groups within the digitization process, which normally don't work together: the conservators, the photographers and the cataloguers.

Third session

The third and last session focused on the more philosophical question: if there is something like a Digital Cultural Heritage.

Yola de Lusenet (Director, European Commission on Preservation and Access) discussed possible strategies for preserving and accessing the documentary heritage in a digital age and spoke on how organizations are applying their structures and practices to the new environment, and the need to understand heritage in new ways.

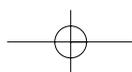
She posed interesting questions such as: does digital cultural heritage exist and if so, how can it be defined? In 2003 UNESCO has published the UNESCO Charter on Preservation of Digital Heritage. But the enormous

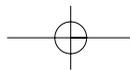
quantities of digital information libraries have to deal with, including all the new Web 2.0 tools and applications, ask for choices to be made. How to decide what is important to preserve for future generations? Are blogs, flickr and youtube part of our digital cultural heritage? If we see these Web 2.0 applications as part of a new social and cultural process, the answer is yes. In preserving Web 2.0 applications it will be important not only to preserve the end results, but also the way they were developed.

Y. De Lusenet also stressed the need to move efforts from individual organizations into systematic efforts, and emphasized the need for heritage organizations to develop their skills, resources and understanding of the Internet.

Second speaker was Lorcan Dempsey, vice president and chief strategist of OCLC. He spoke on trends and developments with virtual cultural heritage. He talked about the pioneer efforts of digital scholarship and considered how to move this into stewardship. He spoke on the increased emphasis on collection management, preservation, storage, resource-sharing and digitization in the day-to-day library. In his opinion, libraries were built and optimized for a different time, and now have to be adjusted to function in a network-environment, in which also freely-accessible Web resources and research, learning and administrative materials become a part of the libraries special collections. L. Dempsey stated that libraries have to look in alternative institutional models and have to become aware of the need of converting owned materials into licensable materials.

The two last speakers, Sven Öhman and Ola Larsmo, both presented a future perspective on the survival of the book and literacy in general, that formed a nice bridge to the final panel discussion. Öhman, emeritus professor in the Linguistics and Philology of the Uppsala University, spoke on preparing for a future of analphabetism, and the cultural consequences of technological change. He spoke on the loss of writing and reading skills and the increase in communication through speech rather than text, caused by the emerging use of mobile phones and the habit of sending text messages by phone. As final question he posed that perhaps our fondness for text is over-developed.





Finally, Ola Larsmo tried to answer the question if the future of the book is really challenged. He used the dinosaur theory, arguing that one never sees a pattern of new media totally replacing old media, but that new media are just added to the existing repertoire, always adding something extra. Larsmo concluded that the book in its present form will be with us for many years to come. And if there will be a replacement of the book, he, as a writer of escapism, expected the replacement to look very much like a book.

The Think Tank closed with a panel discussion with all speakers, in which the questions raised earlier were asked again. As a starting point for the discussion, the panel members were provided with a set of quoted statements from several writers and researchers, which related to the future of the book and the printed cultural heritage. Some lively discussion took place during and after the panel, with summarizing made by Helen Shenton and Lars Björk.

The conference was closed by Martyn Wade, the national librarian of Scotland. He summarized that the Think Tank had given plenty of food for thought concerning the future of the book, and that the Think Tank now had to transform itself into a Do Tank.

The general conclusion was that digitizing and bringing all material to the Web for free is good for all people all over the world. Libraries have the responsibility to provide access for the material they have to take care of, whether in paper or in digital form. For every one, now and for generations to come.

For libraries quality always remains an important issue. But since access to information is so wanted, it is necessary to give access not only the special collections, but also to the unattractive information. The value of the artifact in fact lies in the value of the information.

Libraries also play an important role as expert centers and can help other heritage institutions to digitize collections and bring them accessible. Cooperation in digitization, digital preservation and access is an important factor.

The Think Tank proceedings will be published - in paper and in digital form - by the National Library of Sweden and LIBER in 2008.

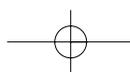


Dennis Schouten, Koninklijke Bibliotheek

Panel Discussion: Yola de Lusenet, Ola Larsmo, Carla Montori. Moderating: Helen Shenton, standing at the left side.

Interesting links (checked on validity on October 1st 2007)

- Margaret Atwood on Books versus Digital:
<http://nl.youtube.com/watch?v=5GUJ4uA7G2w>
- CLIR Task Force on the Artifact in Library Collections:
<http://www.clir.org/PUBS/reports/pub103/contents.html>
- Brian Schottlaenders theory of the three service layers:
<http://www.crl.edu/PAPR/Schottlaender%20unedited.pdf>
- The Long Tail Concept: Chris Anderson in Wired 2004:
<http://www.wired.com/wired/archive/12.10/tail.html>
- Google books:
<http://books.google.com/books>
- Ivan Macovics theory of cultural heritage:
"The phenomenon of cultural heritage and the definition of a unit of material", in *The Journal of Nordic Museums and Museology*, 1998, p. 135-142
- UNESCO Charter on Preservation of Digital Heritage:
http://portal.unesco.org/ci/en/ev.php-URL_ID=13366&URL_DO=DO_TOPIC&URL_SECTION=201.html
- Lorcan Dempseys web log on libraries:
<http://orweblog.oclc.org/>
- Sven Öhmans website:
<http://www.amancay.net/sven/>
- The Dinosaur theory:
<http://www.eurozine.com/articles/2007-08-03-larsmo-en.html>
- Introducing the book on youtube:
<http://www.youtube.com/watch?v=xFAWR6hzZek>



"Mold, Pests and Dust: Preservation Policies and Management"

15-16 August 2007, Durban, South Africa

By Jeanne Drewes, Chief Binding and Collections Care Division, Library of Congress

Sponsored by: Preservation and Conservation Section
Co-Sponsors: PAC Core Activity, Rare Books and Manuscripts Section, Newspapers Section

This two-day satellite meeting focused on Dust and Pests the first day and Mold on the second morning, ending with a panel of speakers from varying institutions to provide institutional situations and solutions to the issues.



Johann Maree, in charge of the organization of the satellite meeting.

The speakers for the satellite meeting were international coming from France, Great Britain, the United States and the African continent, providing the attendees with a broad range of problem/solution scenarios as well as hands-on examination and identification. The setting for the meeting was a hotel complex that offered opportunity for conversation during meals, breaks and evening events. The lovely weather afforded various opportunities for conversation in outdoor settings so that attendees could meet and interact with each other and the presenters. As an attendee I came away with an arsenal of ideas to combat the threefold issues of dust, pests and mold.

The first step in prevention and solution is identification. Identifying the problem provides the most appropriate solution with a minimum of waste. Identification and quantification were an overarching theme for the two days with various tools to help identify, quantify and then address and solve any of the issues from the three "silent attackers", according to the description by Molly Bothlole from Botswana, who presented case studies for several institutions. Since 1999, the National Trust has

been undertaking scientific research into how dust affects historic surfaces in houses. Helen Lloyd from the National Trust, Great Britain, provided research to support housekeeping policy and practice on how to evaluate cleanliness in a historic house and library and also presented how and why dust can be a problem. Dust is a matter of being out of place like weeds in a garden, but culturally significant residues, patina, show the history of use, making dust and dirt significant on some objects, while also requiring protection of materials against the accumulation of contemporary dust which can spoil appearance and can lower standards of presentation even with resistant surfaces such as porcelain which gradually become dull from either accumulation or too frequent cleaning. The question becomes "To Dust or not to Dust" because to let too long dust can stick and become difficult to remove which can cause damage in the effort to clean. The identification of when to clean became the focus of the research which has been continuing at the National Trust in various locations with a low tech process, but a scientific method of placement and recording of findings.

The first step was to find the source and establish the type of dust and this was done through a research method. Low-tech equipment of Tiddlywinks or SEM stubs + Teflon labels + Blue-Tak was used to gather dust in various areas and at various heights in order to establish what the make up of the dust particles was. What was found was organic materials, clothing fibers, plants, insects, hair & skin, food, paint, ash & soot and carbon-based products about shoulder height above the floor and inorganic matter: silica, street or soil dust, salt crystals, clay and sand, plaster, stone closer to the floor. Implications are that visitors generated dust as coarse clothes fibers at the higher height, which increases with visitor numbers. This information provides decision-making for routing of visitors, placement of delicate objects as well as cleaning schedules. For historic libraries Lloyd found that the use of traditional dust falls, a protective devise for books, are effective, but may increase risks of mold on outer and cold walls.

Cementation was another interesting finding of this research. The cause of the cementation was a result of humidity and pollutants, which bind dust to

underlying surfaces. A low-tech dust monitoring kit containing instruction book, supplies and a hand lens are now provided in various locations to continue the evaluation.

Important points include: remember to describe the details correctly on the samples, *i.e.* property, location, start date and finish date. Careful selection of exposure site to determine the sources of dust in individual places helps to determine frequency of cleaning for different areas of a room, or individual objects. Use one or more samples per room, during open and closed seasons. Prevent direct sunlight falling on the surface, and don't place above heaters. Be careful of storage of exposed samples when collecting samplers, avoid contamination. Do not treat the slides in a clean area to avoid contamination shed from your clothes, hair etc., and store them in the cassette case. Ask yourself the following questions as you examine the samples under magnification: how frequent are the fibers? What color? Straight or crinkly, different thickness? How long? Do these relate to furnishings in the room, staff uniforms, other textiles (*e.g.* tablecloths, dustsheets), or visitor clothing? Are the fragments of insect, plant, wood, leather binding, or other identifiable particles? Is the surface covered with tiny specks or general graying as distinct from the textured surface of the sticky label? Compare with a clean label to be sure. Can you make any policy decisions based on what you can see? What actions do you want to take? If most dust comes from visitors, unless you can change visitor route, you might want to move objects with fragile surfaces away from areas of heaviest coverage.

Using research to support housekeeping policy and practice allows for decisions such as closing windows and entrance doors except while open to visitors.

For more information see at: <http://www.nationaltrust.org.uk/main/w-collections-dust>

The National Trust Manual of Housekeeping is published by Elsevier at £49.99.

Hardback format, 954 pages.
ISBN: 0750655291

David Pinniger is a British entomologist providing independent consultancy and training on pest management who presented on the topic of pests and IPM.



David Pinniger with his students.

Integrated pest management (IPM) is using non-invasive methods to prevent or at least minimize the risk of pest infection. The main principles of IMP – monitoring, discouraging pest, modifying the environment and targeting treatments – have been adapted for use in cultural institutions. The approach has considerable advantages being less harmful to both humans and the environment, and once established is likely to be more cost-effective than a passive or reactive approach.

Developing an IPM strategy should use as much local information and expertise as possible, and needs to be practical and achievable. With the full involvement of staff at all levels, an IPM program has a much surer chance of success. Pinniger emphasized that the key to successful pest control is by denying them safe havens where they can live and reproduce (commonly referred to as harbourage). Key points include: prevent pests – by blocking their access to the building and collections. Identify pests through signs of their presence. Assess the problem based on inspection and trapping, and identify the high-risk parts of the collection and building. It is also essential to understand the life cycle of pests, especially insects.

Solving pest problems by improving the environment to discourage the pests is the best means to avoid problems. The most common damage is holes or “grazing” on the surface. An object’s value for display can be lost

and important decorative or aesthetic features destroyed from such exposure.

Quarantine is an essential part of any pest prevention policy to keep pests out of collections. Insects can be introduced from many sources including new acquisitions, objects on loan or returned from loan. Many modern buildings successfully prevent the entry of pests by careful design and detailing of potential entry points such as doors, windows and vents. Building standards and the improvements to heating and ventilation systems have also played a part in creating environments that are generally less attractive to insect pests. It is worthwhile cutting back vegetation for at least three meters around the perimeter of buildings and overhanging branches, as these are often home to many potential pests. Rodents can be excluded using wire mesh screens and grills fitted to louvers and vents and inserting mesh into gaps around pipes. Insects, once in the building, can penetrate small cracks and crevices, but display and storage furniture can act as a further barrier to pest attack.

A good magnifier (x5 or x10) and light are essential tools when trying to identify insects. A program of trapping can supplement this information. The results of all surveys and trapping should be documented in a central log-book, together with a record of pest control treatment to spaces. The most effective pest control measures are preventive; the avoidance and exclusion

methods described should be the priority. Low temperature, elevated temperature, carbon dioxide, and nitrogen are options for treatment.

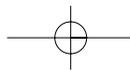
See Pinniger, D.B., *Integrated Pest Management in Museums, Archives and Historic Houses London*, Archetype Press, 2001. ISBN 978-1873132869

For more information see at: <http://www.pestcontrolportal.com/Industry/Whoswho/showWhosWho.asp?id=42>

Diane Vogt-O’Connor, Chief of Conservation at the Library of Congress, United States, presented issues on Mold. While many of the prevention steps are similar to IPM and many of the identification steps are similar to the information on dust, Diane provided very important steps to protect staff from mold spores thanks to appropriate protective clothing and most importantly respirators to filter mold spores out of the air one is breathing. Many of the same processes to protect materials from pests such as isolating new materials until you are assured they will not contaminate collections holds true for mold as well as pests. Just as freezing is a good option to stop pest infestation, it also works for mold as a method of controlling actively growing mold. Another difference in the treatment of mold is the need for identification, which in general is not required to eradicate. The importance of controlling mold to avoid spread to other parts of a building was reinforced. HEPA vacuum cleaners were recommended for cleaning and to avoid adding spores into the air. Diane emphasized the importance of an initial response procedure to assure that treatment of mold happened in a timely and careful manner. Negative air flow is a good means to control a mold infestation. Removing items from transport boxes may prevent mold from spreading.

The very useful bibliography will be available on the Library of Congress website from <http://www.loc.gov/preserv/>

The afternoon panel discussion continued with case studies. Molly Bothlolle from Botswana presented a paper on “Silent Attack”. She supported the idea that a variety of preventive preservation measures and techniques can be put in place to protect records



physically and ensure their stability and security. These measures are a sound investment in time and money, and usually much more cost-effective than interventive measures taken to remedy damage after deterioration has taken place. Silent attack or onslaught from dust, mold and pests, is silent in the sense that these agents do not sound a warning before attacking. It is thus imperative that regular detailed assessments of our institutions are conducted. The institutions she examined included the Botswana National Archives and Records Services, the National Museum and the University of Botswana Library and Archives.

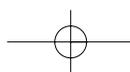
Philippe Vallas, Deputy Director of the Conservation Department, at the BnF (*Bibliothèque nationale de France*) presented the latest procedures in France to control pests, mold and dust. He pointed out that new documents are daily added to collections; some of them are private donations or docu-

ments coming from tropical or equatorial countries. New materials are isolated and cleaned or treated as needed before bringing into collection departments. For over twenty years the BnF has run a technical laboratory and conducted research in this area. Now with the recent Tolbiac building better control is possible with a remote computerized thermohygrometric control systems, covering 180 storage rooms and their collections. Sampling of air and insect traps are used to monitor problem areas in all buildings. Ethylene oxide treatment is used in the case of large-scale infestations. The BnF resorts to an anoxia treatment (by private companies) against insects attacks, or, in case of moth infestation, to a freezing system. While the conservation laboratory mainly takes care of BnF collections, French libraries and archives are also regular partners in research areas, and recently the laboratory provided assistance to the National Archives and Library of Ethiopia.

For more information see at:
<http://www.bnf.fr>

Peter Coates, contract conservator, South Africa, talked about the Town Archives Repository and his work in treating materials with mold infestation. Again the treatment was much as spoken of earlier but with a more personal touch in the description. Peter also reminded the audience of the blessings of mold as the source of wonder drugs like Penicillin and other antibiotics. Peter's primary warning was of unventilated storage boxes where in his experience the most damaging mold infestation occurs.

In two days a great deal of information was conveyed to participants with practice in examination of pests and dust slides as well as discussion and question answer sessions.



COSADOCA practice exercises for the salvage of collections in case of disaster

28-29 August 2007, Ecole Polytechnique, Lausanne, Switzerland

By Danielle Mincio,
President of COSADOCA

COSADOCA is a consortium of salvage of the documentary heritage in case of disaster on the site of Lausanne higher education institutes including the cantonal and university Library (BCU), the cantonal Archives (ACV) and the Library of the federal Ecole polytechnique (BCEPFL).

Launched in 2004, its objectives are the following ones:

- Implementation of an inter-institutional collaboration for the rescue of the documentary heritage in case of disaster on the western sites of Lausanne (Dorigny and federal Ecole polytechnique).
- Mutualization of resources.
- Think tank on how to guarantee post-disaster access to documents, research and education tools.
- Source of practical and technical information in the field of the disasters management in documentation centres of different types (archives and libraries).

COSADOCA action is structured around 3 axes:

- Organization of annual conferences of practice training in disaster intervention.
- Information platform: website realized within the framework of a tutorial of HESGE (higher education institutes of Geneva) and updated continuously.
- Advice for implementing similar structures in Switzerland and abroad.

Since 2005, the COSADOCA has organized a 2-day practice exercise every year simulating a disaster on every site alternately. This year, it was

the central library of the federal Ecole polytechnique's turn.

For the first time, we left the comforting frame of the disaster and emergency services training place to go out into the field and face its constraints. On August 28th, the exercise focused on the flood of an underground store with the problems it raises in terms of evacuation.

On August 29th it was fire's turn. As there is no question of us setting fire to the building, shelves were assembled on a grassy zone near the library.



Practice training in real conditions: fire.

Every day the training monopolized 40 librarians and archivists of 3 institutions, 40 members of the disaster and emergency services and 4 professional firefighters.



Briefing of librarians and archivists.

Without the partnership between COSADOCA and the disaster and emergency services of the Canton and Western Lausanne, we would neither have the strengths nor the logistic means to realize every year such an exercise in real conditions.

Working with a plan finalized with the

disaster and emergency services, we have every year the possibility of improving it. The staff of 3 institutions can put into practice every stage of the disaster recovery plan, at least once every year for the people in charge of that sector and once every five years for the other colleagues without particular responsibility in the salvage process.

The presence of observers allows us to refine the scenario, to find solutions to improve evacuation time and the follow-up of the evacuated documents while giving them the opportunity to think about similar exercises in their region.



Air drying.

Next year, on March 26th and 27th, COSADOCA will organize in Lausanne for the IFLA PAC Section a two-day conference on the use of RFID (radio frequency identification) in the salvage of collections and on the contribution of the practical exercises in real conditions. During the second day, the participants will have the possibility of seeing and practicing the different stages of our plan on the Vaud disaster and emergency services training place.

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