

## **CARING FOR MAP COLLECTIONS**

**By Pierre-Yves Duchemin**

The answer to the question « how can I best preserve paper-based maps? » is not quite simple. In fact, there is not one « correct » answer to the problems of preservation of maps and other spatial documents. The final acceptable solution often has to be a kind of compromise between what is considered to be the « ideal », and what is really achievable, given the restraints of time, money, human resources, skills and storage space.

The environment also has to be considered. In fact, what might be suitable in temperate climatic conditions might not be possible in hot humid conditions in the tropics or in cold humid conditions around the polar circles. Even within one country such large as Russia, the solution of preservation needs in Crimea might be quite different from the solution adopted in Siberia.

The types of documents that are candidates for preservation are many and varied. Apart from books and newspapers which are the major part of the material being preserved in libraries, one has often to deal with engravings, printed music, coins, medals, manuscript sheets, photographs, recorded music, videos, audio-visual media and any other documents of sentimental value such as birth, marriage and death certificates or small imagery, postcards etc. Even if most of this report may also concern non-cartographic documents, we shall insist on maps, whatever manuscript, engraved or printed, atlases, globes, aerial photographs and non paper-based cartographic materials such as remote sensing imagery, magnetic tapes, CD-Roms or any other optical media, various objects and any document related to spatial information. Very often, we have to admit that these documents are unique and irreplaceable.

This idea entails to another one ; there is one factor that needs consideration when planning a preservation programme : the significance or importance of the items involved in this programme. Even if they all should be taken in account - (we cannot say today which document will be considered as important in two or three centuries) -, not all records can be preserved for ever. The restraints in time, money, storage are so important that we have to choose. The very first question to be answered is often « how important is this document? ». The main aim of any

preservation programme should be to maintain and preserve consistent collections with their identified values, whether they are financial, historic, informational or sentimental.

### **How can records be preserved**

Unfortunately, all materials are subject to change and decay. Nevertheless, some simple steps can be taken that will, with a minimum of trouble and expense, maintain paper based documents in good condition and prolong their life as long as possible.

There are three important factors to be considered about the preservation of paper materials:

- their composition
- their storage environment
- their handling

Good paper will last for centuries if given good storage and good handling. However, the poorest quality of paper can survive for quite a long time if it is stored appropriately and infrequently handled. But even good quality paper will not last long in a poor environment or when subjected to physical abuse.

### **What is good quality paper?**

Paper can be made from many different fibrous materials. Traditionally, most of the paper in the « Old World » civilisations was made from cotton or linen rags, which are composed of a chemical called cellulose. With the important social and economic changes in the nineteenth century, the demand for paper outstripped the supply of rag paper. By the mid-nineteenth century, more and more paper was being made out of wood pulp. Whereas cotton and linen fibres are almost pure cellulose, wood has a lower proportion of cellulose, and in addition contains around 20 to 30 % of a material called lignin. The cellulose fibres provide most of the strength in wood, while lignin is the cementing material that binds the fibres together.

The main consequence for libraries and archives is that the paper manufactured since the mid-nineteenth century contains chemicals which are largely responsible for the premature disintegration and self-destruction of the paper, as revealed in its discoloration and brittleness.

Before wood can be made into paper, it has to be converted into pulp. There are two main methods for generating pulp : mechanical and chemical.

- Mechanical (or ground wood) pulp is made by grinding up raw wood. Both lignin and cellulose are present in ground wood pulp.
- Chemical wood pulp is made by separating the cellulose and lignin by chemical action. Most of the lignin is removed by a cooking process, usually under pressure. Bleaching can be carried out on both mechanical and chemical pulps. It is used both to help remove the lignin, and to provide the white paper which is usually favoured by today's consumer.

Lignin is relatively unstable. It yellows when exposed to light, and readily breaks down into acidic decomposition products. Ground wood paper, which contains lignin, is not very long lasting. Modern newsprint contains a high proportion of ground wood pulp, and it is very unstable. Chemical wood pulps, with the lignin removed, can make rather good quality papers, as do rag papers which have no lignin in them. Many ancient documents and printed materials, including most of the newspapers produced before the mid-nineteenth century, were made from good quality paper, and, as a result, are usually quite stable and have survived in good condition until now. Cartographic documents, as a whole, belong to this category.

The presence of acid or acid forming substances in paper causes, in time, the partial decomposition of the cellulose fibres, with the concurrent weakening of the paper structure. Besides lignin from the wood pulp, additives used in paper making also shorten the life of paper. In most cases, these also increase the acidity of paper. Many papers contain a sizing material such as resin, starch, glue or synthetic resin to improve their writing or printing qualities. This is the case of the modern nautical charts, intended to stand water and moisture. Some traditional sizes are acidic or are applied using acidic materials such as alum. It is much inconvenient to consider that, when exposed to moisture in the air, the alum produces sulphuric acid, and so causes the paper to deteriorate. Impurities in the atmosphere contribute to the acidity as well.

The ultimate life expectancy of paper can be increased by excluding acidic substances in manufacture. To counteract the effects of acidity from the environment, it is possible to buffer paper with various alkaline additives. Modern « permanent » paper is made from good quality pulp with the addition of alkaline fillers such as magnesium or calcium carbonate.

### **How does the environment affect paper?**

Some of the most important environmental enemies of paper are heat, humidity, light, air pollutants, animals, insects and natural disasters.

- Heat : high temperatures or wide fluctuations have an influence on the stability of paper : excessive heat causes a chemical decomposition that leads to hydrolysis and oxidation, then desiccation and embrittlement occur rapidly. Lower temperatures extend the life of paper. It is generally recommended that the temperature for library materials range between 18°C to 20°C. For this reason, it is often recommended that important documents be placed in « cold » storage.

If there is an air-conditioning system, the most effective method is to operate the equipment 24 hours a day during the entire year. In some institutions, it may be impossible to run the system for this length of time. Even 8 hours a day will be of value. If air-conditioning is unavailable, the desirable range can be maintained more readily by locating the storage place in the centre of the building or in its basement.

- Humidity : a significant factor to consider when preserving a map collection is humidity. In fact, humidity refers to the « dampness » of the air. Very high humidity encourages mould growth, and the control of mould is a particular problem in hot wet environments. Very low humidity causes paper to dry out and become brittle. Humidity is normally expressed as « relative humidity ». The best relative humidity for paper should be stable at around 40 to 50 % according to the temperature expressed in the previous paragraph. One has to keep in mind that heat and humidity are correlative and have to be considered as a couple : a temperature of 18°C deals with a dampness of 50 %, when a temperature of 21°C deals with a dampness of 55 %, and 24°C has to deal with a dampness of 65 %. However, in hot wet climates, it is very difficult to achieve this ideal, and compromise is often necessary.

Wide fluctuations in humidity are also bad for paper. As the humidity changes, the moisture content of the paper also changes, and the individual fibres within the paper expand and contract. A paper so much stressed deteriorates at a faster rate than paper kept at a constant humidity. When air-conditioning is available, the suggested relative humidity range is 45 to 55 %. If necessary, a dehumidifier will reduce high humidity to an acceptable level as long as windows are kept closed and doors opened infrequently.

In some areas in the world, one has to face the opposite situation : a lack of moisture which leads to desiccation, and ultimately, the ageing of cartographic materials. In such a situation, it may become necessary to use a humidifier to increase the rate of relative humidity for added moisture.

Both temperature and humidity need to be monitored daily. Various types of measuring these devices can be purchased. The ideal tool would be a hygrothermograph which records daily readings on chart paper.

- Light : exposure to light, particularly in the invisible ultraviolet regions of the spectrum can be highly damaging to paper, causing a reduction in strength, changes in paper colour, and fading of the text or image. Water-colours are particularly susceptible to fading. Although unfiltered sunlight is the most damaging process, prolonged exposure to artificial light can also be harmful. Therefore, methods can be implemented to reduce the exposure to light : if possible, lights in stock areas should be turned off when not in use ; it is recommended to use incandescent lighting because it gives out less ultraviolet rays than fluorescent lighting. However, in an existing fluorescent light environment, filter or, at least, plastic sleeves can be placed over the tubes to significantly reduce the damage caused by the ultraviolet rays. Window shades and curtains will help shield cartographic materials from the sun. Eventually, if possible, map cases and storing places should be located at distance from windows and exterior doors.

- Air pollutants : there are many air-borne gases and particles which can harm paper.

- Sulphur dioxide, produced from burning fossil fuels, and various oxides of nitrogen have the potential to damage paper. The air in a map library should be kept as free as possible of gaseous pollutants and abrasive dust particles. It is important that the air be filtered and circulates freely throughout the storage areas, with adequate space between maps and atlases. Even in not too hot climates, air fans may help in this regard by preventing stagnant air pockets where mildew can form.

-Fungi : fungi or mould develop in libraries when the relative humidity reaches 70 % and the ambient temperature is between 21°C and 25°C. As the humidity increases, the growth rate will rise and foxing brown spots caused by fungi may become apparent. In addition, spores from fungi float in the air until a suitable growth environment is present. Air-tight windows and doors will protect cartographic materials from fungi and moisture.

- Dust can be very abrasive and disfiguring, and can damage paper of maps and bindings of atlases.

- Smoke, from fires and cigarettes, is also a problem. Smoke leaves brown oily or tarry deposits on materials close by, while heat from fires can cause desiccation. In the drier tropical regions, dust can be a particular problem.
- Insects : paper is subject to attacks by many household and other pests including silverfish, bookworm, termites, moths, cockroaches. They can destroy paper by chewing and gnawing (even maps printed on thick paper), and their droppings leave stains and are often corrosive. Although these pests can be a nuisance in temperate climates, the problems of their control is far greater in hot wet conditions. The problem is that most of the products available to control the pests are often toxic to human beings and should be used carefully. Nevertheless, a book wax - such as Cire 212 elaborated by Centre National de la Recherche Scientifique and Bibliothèque nationale, existing in various colours - may be useful for dressing leather atlas bindings with the added benefit of repelling insects.
- Rodents : if rodents, especially rats and mice, invade the map library, the only thing to do is to contact an eliminator and try to eliminate which might attract them. A frequent and thorough cleaning of the storage places in the map library is vital if it is to be kept free of unwanted nuisances.
- Natural disasters : there is a number of natural disasters that can have a devastating effect on paper-based records ; the main ones are obviously floods, fires and hurricanes. If there is no need to be afraid of the third one in this country, the other two are « universal » ! Most of the time, the most severe damage is caused by water. Fire is obviously very dangerous but libraries, and especially map libraries, do not burn very easily.

### **Recommended environmental conditions**

To minimise damages caused by harmful environmental factors, the following guidelines should be followed:

1. Avoid extreme temperature and humidity, and protect the cartographic documents from natural disasters. The storage display area should, wherever possible, be at a moderate and stable temperature and humidity. Places to avoid are in the roof space, under the house or in the basement, garages or outhouses, over or near the fireplace, in wet places such as bathrooms or kitchens (do not smile... such storage places exist!), and on or along outer walls. Interior rooms are usually less subject to variations of temperature and humidity. In flood prone areas, it is particularly important that material be stored, where and when possible, out of the danger zone for risk of damage by water.

2. Reduce or eliminate as much as possible exposure to direct sunlight or prolonged exposure to strong artificial light. Keep curtain and blinds closed during the brightest part of the day. When art works such as ancient maps, portolan charts or aerial photographs hang on the wall, try to find a space out of direct sunlight radius.
3. Keep objects in a clean environment, far from dust and smoke, and free from animal and insect pests. The area should be regularly vacuumed, and looked for signs of animal or insect infestation. If necessary, shelves and cupboards can be sprayed with a residual insecticide after first removing your collections, and allowing the areas sprayed to dry before replacing it. Pest strips can also be used cautiously, as long as they do not come into direct contact with your objects. For total area fumigation, a reputable pest control company should be consulted. It is a good idea to discuss with the operator the chemicals to be used, choosing the ones which will not damage your collections.
4. Avoid the use of oil-based sprays, for they can leave a fine oily deposit on exposed surfaces. Good air circulation helps to avoid mould growth. Materials in boxes such as folded maps or flat sheets on shelves should not be so tightly packed in order to allow air circulation, especially in humid conditions. Periodic checking of mould or insect infestation is a good idea.

### **Preparation for storage**

Even when the environment and storage conditions are « ideal », some treatments might be necessary to put objects in a suitable condition for storage.

The storage of maps and atlases has an influence on their future condition. Equipment would need a special report, so a few comments here will be enough: steel horizontal cases, with shallow drawers, are recommended over wood since acid migrates from wood cases to the maps within. Acid-free paper folders are essential for maps. As a rule, ten sheet maps can be filed in a folder. A dust cover which fastens at the front of the drawer provides adequate protection.

Some steps to be considered for a good storage are:

1. Materials should be stored unfolded and flat wherever possible. Even if maps are made of a much stronger paper than books, folding and unfolding maps weakens the fibres in the paper, which eventually breaks apart along the foldlines. For any reasons, if it is not possible to store cartographic material unfolded, then it should have as few folds as possible : in order to avoid weakening a map, it is

recommended not to fold it more than once. Folds should be located wherever possible away from the areas of the map that contain important information.

Rolling of very large, flat maps onto suitable non-acid cardboard cores is sometimes recommended, but it may be difficult to flatten a large map that has been rolled for a long time. If a roll is used, its diameter should be sufficiently large in order to prevent the map from being rolled too tightly.

2. Extraneous objects - such as metal pins, staples, paper clips and rubber bands - should be removed carefully but only if the physical arrangement of the cartographic material is not interfered with or altered by such an action. They can be replaced with suitable materials such as plastic paper-clips or white non-acid cotton tape. Any other materials - plastic envelopes or sheets, wrapping paper, dried out and loose « sticky » tape - could also be removed if they are not integral parts of the cartographic material.

3. Loose dirt or powdery mould should be cautiously brushed off with a soft, dry brush such as a shaving or paint brush.

### **Storage methods and materials**

Most cartographic documents will benefit from some extra protection before being stored. This might be as simple as wrapping or interleaving with suitable non-acid wrapping paper or plastic such as « mylar », or placing in a suitable wrapper, folder, portfolio or box. Materials used for storage and display should, if possible, be of archival quality and should not harm the cartographic material being protected. Archival materials are generally considered to be stable, long lasting and free from contaminants.

The following materials are preferred for use with paper based maps if they can be obtained, and if their cost can be justified. However, even the provision of lower quality materials is usually better than leaving the cartographic materials totally unprotected.

- Paper : wherever possible, paper for primary protection should be made from rag or chemical wood pulp. It should not contain ground wood. Many archival papers are alkaline buffered. Archival papers have been made overseas for many years. Alkaline buffered papers can be used for almost all storage and display needs, although non-alkaline papers are recommended for older aerial photographic materials.

- Plastics : plastic materials should be relatively inert, and not give off harmful chemicals such as acids or plasticisers. Three suitable plastics are polyester,

polyethylene and polypropylene. In Europe, at least, many plastics used for storing food are made out of these materials. In particular, the ones identified as « microwave safe » do not contain plasticisers and so should be suitable for a storage use.

Plastic materials containing chlorine are to be avoided. The most common of these plastics is polyvinyl chloride, or PVC. It has the potential to harm the materials it is usually intended to protect, both through the migration of plasticisers, and by its degradation and breakdown into acidic gases.

There is a simple test for chlorine containing materials, based on a chemical procedure known as Beilstein test. It is based on the reaction of chlorine with copper compounds at high temperatures in a flame to give a greenish colour to the flame. At its simplest, this test needs a piece of copper wire, a cork, a source of flame such as a candle or a lighter and a sample of the plastic material to be tested.. To proceed to the test, insert the wire into the cork, which becomes an insulating handle. Then, hold the wire in the flame to burn off any impurities, the flame should be colourless or very slightly blue. Then touch the hot wire onto a small sample of the plastic material to be tested, and immediately return the wire to the flame. A green colour in the flame is a positive indication that chlorine is in the material being tested, and so it should not be used for your cartographic materials.

The use of plastic materials for storage of cartographic materials has been commonly carried out in temperate climates for many years. Its use in wet regions is rather more problematic : cartographic material stored in plastic, if it has already active mould growth, might be further damaged by such a storage. Cartographic material stored in plastic should be periodically inspected to ensure that mould growth does not occurs.

« Encapsulation » is an efficient way to protect cartographic documents. It is generally a recommended technique which provides a physical support for maps, especially those in a fragile state : the map is placed between two sheets of polyester film. Static electricity holds the map between the polyester sheets. The main advantage of this process is its reversibility. Encapsulation protects the maps against tearing and exposure to dust and dirt. It is still possible to photocopy and to microfilm them through the polyester film.

One has to pay attention to the fact that encapsulation is not appropriate for maps which have inks and colours subjected to flaking. The static electricity may lift the particles of ink and colour from their surfaces.

If it is possible to deacidify and alkalis prior to encapsulating, one may prevent or retard further deterioration. If deacidification cannot be performed, encapsulation in polyester film is still recommended because increased protection is obtained through this method.

The use of polymers should be studied very carefully : the problem with this technique is its irreversibility. The principle is quite different from encapsulation (a map sheet between two polyester films) : polymers and paper form a new material that is no longer neither polymers nor paper but a composite that you cannot change forever. It is generally not recommended to use polymers with coloured cartographic documents.

- Cardboard boxes : there is a range of archival boards and boxes that are generally expensive. A satisfactory alternative is to use ordinary boxes as outer containers, and to line the box or to wrap your cartographic objects in archival paper or plastic before storing them in the box.

### **How does handling and display affect paper?**

A correct storage will reduce the chance of a future damage. However, it is but natural to wish to look at, to examine or to display some cartographic documents from time to time. But one should never forget that one of the best ways to reduce handling of maps is to implement effective complete cataloguing, indexing and classification schemes. So, by looking at the catalogue cards or the computer screen, the user will be able to determine which maps will be most pertinent before examining the maps themselves.

- Handling causes physical damage to the objects : tears, abrasion, formation of dirt and grease.

- Display of the unprotected cartographic material in particular can cause the nuisances cited above, and in addition harms the object because of the excessive exposure to light.

The following guidelines should help to reduce the chance of damage when cartographic items are handled or on display:

1. Always have clean, dry hands when handling cartographic materials.

Keep food and drink far away.(once again, do not smile...)

Do not touch the actual image area with your fingers ; this is specially important when handling aerial photographic negatives and transparencies. It is sometimes recommended that clean white cotton gloves be worn when

handling cartographic materials. These can be useful for the object could be soiled by fingerprints, but sometimes gloves put the object at more risk of damage because of the added clumsiness they impose on the wearer.

2. Provide some form of extra protection to the cartographic material, for example a suitable plastic bag such as mylar, or an archival folder, cardboard box or mount.

Ensure that the cartographic material is fully supported while it is being looked at. Maps and other large paper objects need to be laid out on a clean and cleared flat surface. Large books such as atlases should also be well supported during use.

3. If atlases, aerial photographs, drawings, engraved maps and similar materials are to be displayed, it may be a good idea to rotate them from storage to display on a regular basis so that they are not exposed to light for long periods of time. It is generally best to display cartographic materials - especially ancient maps - behind ultraviolet absorbing acrylic sheets to reduce the harmful components of light.

In certain conditions, it is recommended to turn the pages of a rare atlas on exhibition every two days.

4. Cartographic materials to be displayed in frames should be suitably mounted. Plastic acrylic sheets, rather than glass is preferred with the glazing material. It is recommended that the cartographic object is not directly in contact with the glazing material. A good quality framer should use archival materials if requested. Alternatively, there are many books which describe the procedures to be followed, and, in some cities, you can find « do-it-yourself » framing shops where you can use and choose your own materials.
5. If the cartographic material used is very fragile, it is better to make a copy for use (photograph, transparency, microform, scanned file, etc.) and store the original in a safe environment. For printed material, good quality dry-process photocopying is recommended. You can now find machines using « cold » light that does not harm the cartographic document. But one should pay special attention to photocopying : without any doubt, photocopying of cartographic materials is responsible for serious physical damage. When atlases are wide opened and strong pressure is applied to the spine area, the spine can be affected for ever. Photocopy also affects hand coloured maps and acid paper based cartographic materials. In this case, it is generally recommended to provide microfiches, microfilms or fac-similes instead of rare

originals. An alternative is to photograph your objects in black and white. Colour photographs are much more expensive and are not as long lasting as black and white, although they might be useful in the short term for multicoloured cartographic materials.

6. If notes or annotations need to be made onto any item, it is recommended to use a soft lead pencil. Try and find an obscure spot to make these notes. If possible, however, make notes on a separate sheet of paper.

### **How to treat damaged cartographic materials**

Some common problems which can be simply treated are:

- Mould : brush off cautiously loose surface mould in a well ventilated area, thus avoiding inhalation of the dust. If some stains remain, mould may be removed by wiping the contaminated area with a cloth slightly dampened with alcohol. In some cases, it may be necessary to fumigate in order to prevent cartographic materials from a recurrence of mould. Exposure to sunlight for an hour or so will help to inactivate the mould, but care should be taken with water painted hand coloured cartographic contours. Keep the storage environment dry to prevent regrowth.
- Dust and dirt : loose dust or dirt can be removed by carefully brushing or vacuuming. A soft, white eraser, used with very gentle pressure can be used to remove some surface dirt. Be very careful, however, in areas where there is writing or cartographic drawings.
- Crumpled, rolled or folded material : before flattening, these might need relaxing in high humidity for a short time. It is possible to make an improvised humidity chamber out of a clean, lidded plastic container : place about half a centimetre of water in the bottom, then place the cartographic objects to be relaxed on a rigid support suspended above the water level. Be sure not to allow your objects to come in contact with the water. Put on the lid, and leave the objects in the « chamber » until they seem more flexible, preferably for no longer than 24 hours. There is the risk of a mould growth if material is kept in a very wet environment for too long a time. When the objects are removed, they should be carefully straightened or unrolled and pressed between clean white blotting paper under a light weight for several days.
- Brittle material : some modern ground wood papers deteriorate and become brittle when getting old. If the paper has become brown, there is very little that can be done for such material. The best alternatives are either to copy the

information - by photography (photocopy will increase the damage) - or to encapsulate flat cartographic objects in clear plastic pockets. Polyester is usually recommended for this purpose, since it has excellent clarity and can be obtained in thickness which have good rigidity.

It is also possible to buy pre-made polyester pockets, open along one or two sides. These are an excellent protection.

It is sometimes possible to buy sheets of polyester. These can be custom-made into pockets by sealing the edges not with double sided adhesive tapes but either by warmth or by sewing.

But, in fact, the only efficient treatment for brittle cartographic materials is mass deacidification. Whatever the method, it is rather expensive but the process gives good results. The basic principle is rather simple : the aim is to neutralise the acids in the paper. In most cases, an alkaline reserve (often calcium carbonate or magnesium carbonate) is added to the paper to neutralise acids subsequently regenerated by natural ageing and air pollution. In practice, deacidification does not completely stop paper degradation but slows it down to a minor proportion. Acidity still exists in a macromolecular form and regenerates itself as long as cellulose is left. Nevertheless, studies have been carried out over many decades and show that deacidification using mainly calcium or magnesium salts does have a stabilising effect on the cellulose.

The first deacidification methods consisted in the individual treatment of each document and required the atlas to be unbound prior to treatment.

Today, one of the best compromises is to use of a vapour phase process. The penetrative properties of vapour seem to make it particularly suitable for mass deacidification : many atlases may be treated at a time and books do not need to be unbound for treatment. The process itself consists in placing the atlases or the map sheets in an autoclave containing a pressurised solution of methoxy magnesium methyl carbonate (WEI T'O process). It has been used in the Centre de Conservation du Livre de la Bibliothèque Nationale in Sablé-sur-Sarthe since 1987.

- Tears : Even if the cartographic document is produced in many copies and it is intended for a short life span, do not use pressure sensitive tape (« sticky tape ») for any cartographic material. The tape changes colour and becomes brittle with time. The adhesive is acidic and therefore, contributes to the deterioration of the map. In addition, the process is not reversible : once the tape is applied, it cannot be removed without causing serious damage to the paper.

Encapsulation of sheet cartographic materials in polyester pockets or folders will hold the objects together even if they are torn.

Minor tears can be repaired with mending a paper that is transparent and reversible with water. As an alternative, it is possible to use a technique requiring Japanese tissue and methyl cellulose adhesive or wheat starch paste.

- Damaged bindings : it is possible to have atlases bindings repaired or replaced by a specialist conservation binder. Such treatments can often be very expensive. A cheap alternative is to box the damaged atlas, without treating the binding itself. It is possible to have a variety of different styles of box custom-made by a commercial binder, or it is possible to adapt any available box with inserts or lining. Many old leather bindings suffer from the condition known as « red rot » (a powdering of the leather), often along the spine. Almost nothing can be done to treat it cheaply. In general, the use of leather dressing requires several treatments and regular inspections to be held in good condition. To achieve this aim, it is recommended to use a special wax for bindings against fungi and dampness.

- Wet materials : for wet paper cartographic materials, the best approach is to remove wetness with a blotting, and then by air drying with a cool fan and not a hair dryer!

Glossy paper atlas sheets needs to be carefully separated before they are dry, or else pages can be irretrievably stuck together. Once the cartographic material is dry, it can be pressed flat under light weights. If there is a large or varied amount of cartographic materials involved, it is better to call in an expert help. They will probably advise freezing the bulk of the material to stabilise it, prevent mould growth, and allow time to analyse the situation so that recovery can be proceeded cautiously.

### **Some particular problems of spatial documents**

There are no easy solutions to the treatment of some materials. Sometimes, items are a composite of many different materials - such as scrapbooks; sometimes, they use a technology which is either ephemeral, or which relies on proper processing at the time of manufacture to maintain a long life - such as photographs; sometimes the very large size of the cartographic document creates problems - such as outsize posters, planispheres or mapamundi, or very large atlases; sometimes the total amount of cartographic material in the collection is a problem itself (in France, we have more than 1 000 000 maps in the Département des Cartes et Plans de la Bibliothèque nationale de France and we are considered as

the third map collection in the world). Some solutions to these problems are discussed below.

- Scrapbooks : these can include a wide variety of materials on a wide variety of papers - clippings, drawings, photographs, souvenirs, botanical or geological specimens, etc. all find their way into scrapbooks. There is very little that can be done in the way of treating a scrapbook without totally altering the original concept : copying the images, remounting good quality paper, rehousing into an archival album, etc., all destroy the integrity of the original document. The least invasive treatment is to interleave the pages with suitable paper, box the album and store it correctly in good conditions.

- Photographs : properly processed black and white aerial photographs stored and handled correctly can be expected to last for centuries. Poor quality or poorly processed aerial photographs, especially many varieties of colour prints begin to degrade, fade or change colour only after a few years. If older photographs are fading or getting a silvery, or sometimes brown, tinge, the best solution is to have them copied by someone of the photographic service of the institution, used to handle fragile materials or, if not, by a reputable commercial photographer. Coloured aerial photographs and slides, however, present great problems : it is very difficult to restore the colour once it has faded. Scanning the images on a CD-Rom or any other optical medium is at evidence the best way to keep spatial information available for centuries but it is also the most expensive... Copying onto black and white films may well be the best compromise to preserve the information the aerial photograph contains. All aerial photographic materials benefit by being stored at very low temperatures and in the dark. Albums and other materials used for the storage of aerial photographs can often harm the image. Paper should not contain lignin, and plastics should be inert. The so-called « magic » or self-adhesive albums are not recommended at all. The adhesive used can cause severe problems, and the plastic covering sheets are usually PVC.

- Outsize documents : wall maps raise special storage questions : due to the fact that they will deteriorate if they are stored hanging on a wall, it is recommended to store them in loose rolls including a non-acid paper sheet.

Very large atlases should be considered as portfolios and always shelved horizontally on a double-width steel shelving. The consultation of this type of cartographic document requires a desk reading slope which allows the reader to see an entire page without rubbing the volume against the edge of the table.

Smaller atlases may be shelved upright, but not on the fore edges since the hinges will weaken from the weight of the book.

- Large collections : for large collections, often belonging to national organisations, photographs, microfilms and microfiches might well be a viable alternative to restoring or preserving original cartographic materials. The best way would be to use the photographic service of the institution but reputable commercial microfilm companies should be able to provide advice and costing. Good quality silver halide microfilm will last in the same way as black and white photographs.

Usual 24 x 36 slides might be a relatively cheap solution, with the risk of colour fading as time pass ; it is also possible to provide microfilms but this solution is not quite adapted to large size documents ; the microfiche could be a satisfactory compromise if, apart from money restrictions, it is possible to have one map on one microfiche ; at last, a better but expensive solution is to copy the documents on large size transparencies that could be used for reproduction. These substitutes could eventually be used for the preparation of an analogic videodisk.

Although still expensive, digitalisation seems to be a very good solution for preservation of cartographic materials : the cartographic document is scanned point by point at any required definition and may be published on a floppy disc, a magnetic tape, an optical cartridge or a CD-Rom. The data may eventually be sent out of the institution through a telecommunication network.

### **Other sources of advice**

Many books have been written on the care of paper based materials. Some are good... but none has been written especially about maps or spatial information documents in general. It is best to avoid old books, since preservation practices are dependent of the knowledge on the behaviour of materials. Although written in English, there is one book easy to read and full of common sense and good advice:

Baynes-Cope, A. D.

*Caring for books and documents.* - 2nd ed. - British Library Preservation Office, 1989. - ISBN 0-71230-151-8 pbk.

Most National or State Libraries employ conservators and restorators to care for their own collections. Conservators employed in these institutions can also usually provide information and list of colleagues in private practice. Some institutions even offer a consultation service for a small price. However, if ever work is to be undertaken, ensure that both the scope and the cost of the work is fully understood before going ahead.

In the European Community framework, the Directorate General X has published in 1993 a *European Directory of acid-free and permanent book paper*. This booklet is freely distributed by the Commission of the European Communities.

The Bibliothèque nationale de France has been designated as the International focal point for the Preservation And Conservation - PAC - IFLA Core Programme. The Deutsche Bücherei in Leipzig is the Regional Centre for Eastern Europe. Although the PAC focal point does not have much funds to cover the cost of travel and living expenses for foreign visitors, it has been able to provide training in preservation practices and management. So, work is going on a world-wide scale to develop a standard system for the international communication of preservation decisions and actions.

Pierre Yves Duchemin  
Bibliothèque nationale de France  
Direction des collections spécialisées  
58 Rue de Richelieu  
75084 Paris Cedex 02  
France