Preface

All throughout history, libraries and archives have been the guardians of the documentary heritage of mankind. Although during past centuries the writing medium underwent only very few changes, from parchment to paper, the last two centuries have seen the recurrent emergence of the new media, ranging from daguerreotype to digital disk.

Given the rapid evolution of the new technologies, safeguarding the cultural heritage becomes more and more a concern for specialists. At the same time the participation of the entire library and archive profession is necessary. It has become equally indispensable to raise awareness among decision-makers, professionals and the public at large.

One of the main goals of the UNESCO "Memory of the World" programme is to promote the preservation of the documentary heritage of mankind. Thus a guide providing the recommended practices and listing the standards and reference literature related to preservation of documents of all kinds was published by the Sub-Committee on Technology of the Memory of the World Programme. In order to disseminate this guide among a wider range of users, hoping that it becomes an initial or permanent training tool, UNESCO contracted IFLA to create a thoroughly illustrated CD-ROM both in English and French on the causes of deterioration of library collections and archival documents as well as on the preventive measures to be taken. Thanks to the hypertext links this CD-ROM should be able to extend the possibilities of research by providing the links with other Internet sites dealing with similar information in the preservation field.

Besides the participation of the experts from UNESCO "Memory of the World" programme who edited the Guide, the CD-ROM is the result of work and fruitful collaboration of many library an archives professionals along with their institutions. This project, directed by IFLA PAC (Preservation and Conservation) Core Programme, hosted by the National Library of France, was carried out successfully thanks to scientific assistance from the Mission on Research and Technology of the Ministry of Culture, Paris, France.

We would like to acknowledge the invaluable help of all the participants, in particular Astrid Brandt-Grau, who initiated and managed this project.

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Introduction

Access and Preservation : two diametrically opposed yet reconcilable missions

One of the essential goals of archival and library services is to facilitate access to the documents in their care, thus ensuring that cultural heritage is kept alive and can be an object of research and enrichment. Their other equally important mission is the preservation of the documents in their care so that cultural heritage may be passed on intact to future generations, since the future of a nation, a people or a community is unthinkable without knowledge of its past.

At first sight these two missions might seem irreconcilable. How can documents be made available without damaging them ? How can documents be preserved whilst being used ? To fulfill both of these missions successfully it is necessary to draw up a long-term preservation policy with the aims of preventing, stopping or slowing down the deterioration of the documents and which can, if necessary, improve the preservation conditions of collections or, at least, safeguard the content by creating surrogate documents.

Unfortunately, the condition of collections tends to deteriorate due to a combination of elements such as : inadequate and careless use and handling of the documents ; badly controlled environmental conditions ; and inappropriate storage. Moreover, many modern materials are less durable (e.g. paper and bindings manufactured after about 1850, manuscripts, photographs, audio and moving image documents).

A good preservation policy must guarantee access to the information and minimise document deterioration. Thus, preservation is a core responsibility of all archival and library services possessing documents of national heritage importance.

From document conservation towards a global approach to the preservation needs of collections

For a long time preservation was limited to the conservation and restoration of older, rare and precious documents. The attention of librarians and archivists was focused on this type of documents. Due to the high frequency of consultations and the violation of recommended preservation practices, the field of application of the conservation concept has been increased considerably. The new goal is the reduction of the need for major treatment on individual items in order to increase the number of items able to be treated.

Since the 1970s we have moved from merely estimating the extent of deterioration to instituting preservation programmes. Many surveys were carried out to evaluate the quantity of endangered documents. The results of these surveys were alarming and showed that millions of archival and library documents are endangered in the short or medium term, due to lack of preventive measures or adequate treatment. Most groups of documents and information carriers are suffering from decay problems. The documents include those on acid paper, on various types of film supports, on magnetic tapes.

Awareness of the extent of deterioration gave rise to the development of mass treatment methods for paper documents and international cooperation programmes. In 1986 the International Federation of Library Associations and Institutions (IFLA) created the PAC (Preservation and Conservation) Core Programme. In 1988 the CPA (Commission on Preservation and Access) was founded, and a European Commission on Preservation and Access came into existence in 1994. In the archival domain the International Council of Archives (ICA), founded in 1948, has taken a leading role in raising awareness and developing widely accepted methods to preserve textual materials.

In the areas of sound and moving image documents, the Fédération Internationale des Archives du Film has been promoting the preservation of early films on cellulose nitrate base and, more recently, working to reduce the impact of the Vinegar Syndrome on safety film stocks. The Fédération Internationale des Archives de Télévision has been facing the problems of the increasingly swift obsolescence of formats. The International Association of Sound and Audiovisual Archives is using the results of a survey of audio collections to focus its research on the most highly endangered types of audio recordings.

UNESCO created the Memory of the World Programme in 1993 to support these initiatives to preserve and make accessible the rich documentary heritage of the world.

Today, preservation plays an increasingly important role among other archival and library services. In some cases it has led to the creation of Preservation Management directorates. Preservation is now considered as a responsibility of management at the highest level. All collections need a preservation programme. Preservation programmes are increasingly being allocated a budget representing a significant proportion of the establishment's total budget. Considerable efforts have been made to raise awareness of preservation issues among all personnel at all levels.

In this context, the term "preservation" is used to refer to the organisation and programming of all kind of activities regarding conservation of the collections in general. Conservation as a concept includes preventive conservation which aims to reduce risks of deterioration : environmental control ; regular maintenance and protection of the collections by using appropriate treatment, anti-theft devices and creating surrogate documents for heavily-used original documents.

From awareness of deterioration factors to integration of the preventive conservation concept

Not only it is necessary to have a thorough knowledge of document deterioration factors, it is also essential to know how to implement a coherent preservation programme able to exclude or diminish the risks of deterioration.

It is important, therefore, to integrate the preventive conservation concept at all stages of document processing : acquisition and initial processing, reproduction, placing in protective containers, shelving and delivery to users. First, one has to define the goals and priorities depending on the degree of deterioration, the frequency of use of the document and its value, then estimate the budget necessary for correct conservation and, finally, implement the conservation programme in a coherent way.

Although reducing the deterioration factors remains the ultimate aim, preventive conservation programmes should be adapted to each institution separately, in accordance with its needs. To ensure proper management of cultural heritage, the persons in charge of the collections sometimes have to take difficult decisions, due to the quality and quantity of the collections.

A coherent preventive conservation programme function needs to be implemented in stages. Inspection of the storage facilities and of the state of the collection gives an overview of the causes and consequences of deterioration. That makes it easier to rank risks in order of importance and helps to determine the priorities in risk prevention and/or treatment of damage.

Knowledge of the risks, damage and the measures to be taken helps to allocate a budget in accordance with the financial and human resources of each institution. It is preferable to define short, medium and long-term projects. Each preservation measure individually contributes to reducing risk and should be taken, even though the totality of the problems cannot be resolved at the same time.

Recommended practices should be followed : they are fundamental to good preservation of the collections. These practices and measures are presented in this CD-ROM, designed to be a working tool for all persons in charge of library or archival collections.

The CD-ROM includes six sections :

– environment issues and document preservation
– disaster preparedness in libraries and archives
– preservation of graphic documents
– preservation of photographic documents and films
– preservation of mechanical, magnetic and optical carriers
– preservation of electronic publications, electronic documents and virtual information

Each section was written by a specialist in the field. They define document types, deterioration factors and preventive measures. Some sections have synopsis.

Remedial measures are deliberately not considered here since they require the involvement of trained and experienced restorers.

Specific terms used are defined in the glossary. Hypertext links help to enhance the information on the CD-ROM by referring to other selected and constantly updated sites relevant to this field.

Each section includes a select bibliography and information on international standards already published or in preparation. These standards can be used as recommendations or specifications according to each case.

The sections are fully illustrated - the CD-ROM with 400 pictures helps to deepen our knowledge and can be used as a basis for preparation of a course or a conference.

Part of the content of the CD-ROM will also be made available on the websites of UNESCO (" Memory of the World ") and of the Ministry of Culture and Communication (" Sciences et Patrimoine culturel ").

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Environment and Storage

EXTERNAL CAUSES OF DETERIORATION **2**
Mechanical Forces 2
Theft and Vandalism 2
Fire 3
Water 3
Biological Agents 3
Air Pollution and Dust 3
Light, Infrared and Ultraviolet Radiation 3
Figure 1 : electromagnetic spectrum (logarithmic scale) 3
Temperature and Relative Humidity 4
The main degradation factors for documents of all kinds 5
MONITORING PRESERVATION CONDITIONS **5**
Vital Measuring Instruments 5
Location of instruments for measuring climate 5
Modification of climatic conditions 6
Figure 2 : psychrometric chart (simplified representation) 6
– air conditioning plant 7
– independent regulation of relative humidity 7
– passive regulation of relative humidity 7
PREVENTIVE MEASURES **8**
The best suitable preservation conditions 8
Prevention of deterioration caused by humans 8
Disaster Prevention 8
Prevention of pollution 8
Prevention of damage caused by light 9
Prevention of damage due to magnetic stray fields 10
Prevention of damage due to temperature and relative humidity 10
– influence of temperature 10
– influence of relative humidity 10
preservation in extreme climatic regions : the case of libraries in tropical zones 11
CONCLUSION **12**
STANDARDS **13**
BIBLIOGRAPHY **14**
WEBSITE DIRECTORY **16**

Environment and Storage

Environmental conditions and methods of storage have a great influence on the preservation of documents. Control of the environment and the provision of good storage conditions constitute the first of all preventive measures.

External Causes of deterioration

Libraries and archives are situated in a given geographic region characterised by a climate (temperate, tropical, equatorial) and a microclimate (town or country). The collections housed inside a building, whether it is new or old, are exposed to various causes of deterioration.

Causes of deterioration may be external or internal. External causes are : poor environmental conditions, unsuitable storage procedures, risky handling, unauthorised exposure, as well as theft, vandalism and natural or accidental disasters. Internal causes are essentially : the poor quality of materials making up documents or the poor quality of assembly of these materials. In the present text, only external causes of deterioration are considered. External causes fall into several categories :

- mechanical forces
- theft and vandalism
- fire
- water
- biological agents
- air pollution and dust
- light, infrared and ultraviolet radiation
- magnetic stray fields
- temperature and humidity

Mechanical Forces

The origin of these forces may be natural (earthquake), accidental (collapse of a roof or a shelf), or human (handling, but also vibrations from a busy road nearby). The forces may act for a very brief period of time or a prolonged period. In the first case, the damage they cause generally results from shocks received by the document. In the second case, they cause deformation of the document.

Thus the use of inadequate supports during an exhibition or the piling up of documents during storage may cause this type of damage. The damage caused by vibrations may come into one or the other of these categories according to whether the vibrations last for a short or long time.

For audiovisual carriers of all kind mechanic deterioration is one of the greatest risk. Especially mechanical and magnetic carriers are deteriorated by the normal playback process. Therefore, handling and replay of originals have to be reduced to the absolute minimum. Moreover, with all machine readable carriers, the condition of replay equipment is of high importance to the integrity of the carriers. Badly maintained or inadequately used equipment may immediately destroy the documents. Therefore, maintenance and proper handling of equipment must be given utmost priority.

Nevertheless, mechanical deterioration is most frequently caused by poor handling of documents while they are being moved, made available to readers, photocopied or photographed.

Theft and Vandalism

These risks are normally dealt with by the security service. Theft, like vandalism, may lead to the total loss of the object or document. Acts of war can be included in this category.

Fire

Fire is a danger for all collections, but organic materials are particularly vulnerable. Fires cause widespread damage and massive losses.

Water

Water is a serious threat to collections. The damage may be due to : leaking pipes, leaking roofs, flooded rivers, hurricanes, fire-fighting. When the water damage is not discovered in time, or when rescue measures are insufficient for the scale of the disaster, then further damage is generally caused by mould.

Biological Agents

Biological agents of deterioration (mould, insects and rodents), are the major cause of damage to collections. These agents feed on the organic layers they find in materials. Absence of ventilation, darkness, and high temperature and relative humidity levels encourage their spread. The damage caused (destruction of paper and bindings, stains…) is irreversible.

Air Pollution and Dust

Another important factor is air pollution. This takes the form of gas : sulphur dioxide or nitrous oxides and ozone from motor vehicles and industry, formaldehyde escaping from certain materials (wood, textiles, papers) used in exhibitions or for storage. It also takes the form of solids (soot, particles).

Gaseous pollutants catalyse chemical deterioration of materials by oxidation and hydrolysis. Solid pollutants cause mechanical deterioration by abrasion and encourage the spread of mould and insects.

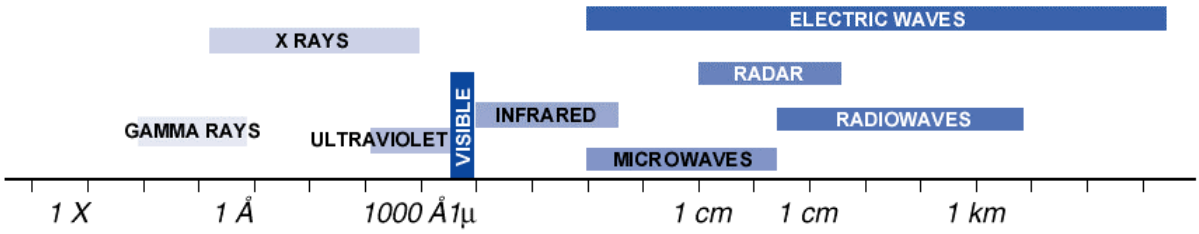
Especially audiovisual documents are extremely sensitive against dust, which influences not only the integrity of the carriers by abrasion, but also deteriorates the retrieval of the signals in the replay process. In severe cases a total signal breakdown can be observed.

To air pollution we may add the liquid contaminants present as plasticising agents in synthetic materials or as fatty matter or sweat deposited on the surface of a document while it is being handled.

Light, Infrared and Ultraviolet Radiation

Light, that is the part of the spectrum of electromagnetic waves which is visible to our eyes, also constitutes a serious factor for deterioration of collections. Light, which gives rise to particle and wave phenomena, transmits energy which is inversely proportional to the wavelength. Light sources, daylight as well as electric lights, all emit in variable proportions electromagnetic waves which are invisible to us. On either side of the visible spectrum there is ultraviolet radiation and infrared radiation.

Figure 1 : electromagnetic spectrum (logarithmic scale)



Ultraviolet radiation, of higher energy than visible radiation, causes photochemical deterioration. Infrared radiation causes deterioration by heating of matter itself or of its immediate environment particularly by affecting the level of relative humidity of the environment. Visible radiation itself carries certain dangers, as it still carries enough energy to cause changes at molecular level.

Temperature and Relative Humidity

Temperature and relative humidity are linked parameters. Relative humidity is defined as the relationship between the quantity of water vapour contained by a given volume of air at a given temperature, and the maximum quantity of water vapour which this same volume can contain at the same temperature. This relationship is expressed as a percentage

RH = AH / S x 100 AH : absolute humidity (g of water / g of air)
S : humidity at saturation (g of water / g of air)
RH : relative humidity (%)

The relationship between the temperature and the quantity of water vapour in a given volume of air means that the higher the temperature the greater the quantity of water vapour which a volume of air can contain. Heating a volume of air containing a given quantity of water lowers the relative humidity. This is what happens during the period when a building is heated. Conversely, cooling the same volume of air increases the relative humidity. This results in certain circumstances in the condensation of water on cold surfaces.

Because of the interdependance of temperature and relative humidity it is imperative to always control both parameters simultaneously.

Temperature	5° C	10° C	20° C	30° C
Humidity at saturation	7 g/m^3	9 /m^3	17 g/m^3	30 g/m^3

Materials are hygroscopic in varying degrees - a parameter which should be considered when monitoring storage conditions. One should also watch for microclimates. A badly ventilated building will not be able to eliminate fast enough any excess water vapour accidentally brought in. In this case the water vapour is absorbed by the books which only release it slowly. This may explain the development of micro-organisms even when the temperature and humidity in the bookstacks seem to be correct.

The main degradation factors for documents of all kinds

Carriers	Deterioration										
	Temperature		Relative Humidity			Uncontrolled Lighting	Dust	Pollution	Chemical or Biological Factors	Magnetic Fields	Shock
	high	fluctuating	low	high	fluctuating						
traditional documents											
papyrus	speeding up of chemical reactions		drying	mould growth	tearing	yellowing and fading ; catalysing of photochemical reactions	stain	hydrolysis and oxidation	hydrolysis and oxidation		tearing
parchments	idem		idem	idem	deformation	idem	idem	idem	idem		deformation
papers	idem		idem	idem	tearing	idem	idem	idem	idem		tearing
photographic documents											
B&W negatives and photographies	speeding up of chemical reactions		drying (if RH<20%)	mould growth	deformation, speeding up of chemical reactions	fading ; catalysing of photochemical reactions	scratch, stain	hydrolysis and oxidation	hydrolysis and oxidation		deformation, tearing
coloured negatives and photographies	idem		idem	idem	idem	idem	idem	idem	idem		idem
negatives on glass plate	idem		idem	idem	idem	idem	idem	idem	idem		break, scratch
audiovisual documents											
cylinders	deformation	crack		mould growth, chemical reactions			scratch	oxidation			break
mechanical discs	deformation	dilamination (flaking-off of lacquer)		idem			idem				break, scratch, loss of material
magnetic tapes (audio and video)	degradation of the signal		static electricity (if RH<20%), embrittlement	idem	deformation		idem			degradation of the signal	
CD (replicated) CD (recordable)	thermo-oxidation of the varnish					affect dye layer (recordable CD)	idem				

Monitoring preservation conditions

Vital Measuring Instruments

For monitoring of ambient conditions it is essential to take measurements to quantify the phenomena. Measurement of lighting levels with a luxmeter, measurement of UV radiation from light sources with a UV-meter, continuous measurements of temperature and relative humidity with a thermohygrometer and a thermohygrograph. In addition, measurements of air pollution and biological contamination may be carried out. These latter should however be done by specialists, whereas the former can be done by library staff provided certain instructions are followed.

The measuring instruments, whether mechanical or electronic, must be kept in good working order. Instruments for measuring temperature and humidity also need frequent calibration.

When a library acquires measuring instruments to monitor climatic conditions, it should possess :

– a psychrometer (Assmann type electronic psychrometers are more reliable than mechanical psychrometers) to adjust the mechanical thermohygrometers,

– an electronic thermohygrometer, which can be calibrated either with the aid of supersaturated solutions of salts sold together with the apparatus, or at the factory by the manufacturer,

– a stock of mechanical thermohygrographs or electronic sensors to record climate data in the different stacks over periods of a week or a month.

Location of instruments for measuring climate

The choice of location of the thermohygrograph in a stack or exhibition room must be made in accordance with certain criteria. To obtain good measurements, the apparatus must be placed :

- near the collections to be monitored,

- accessible for taking readings,
- away from the public,
- far from any undesirable microclimate (air vent, for example),
- in a typical climate zone,
- sheltered from pollutants and dust.

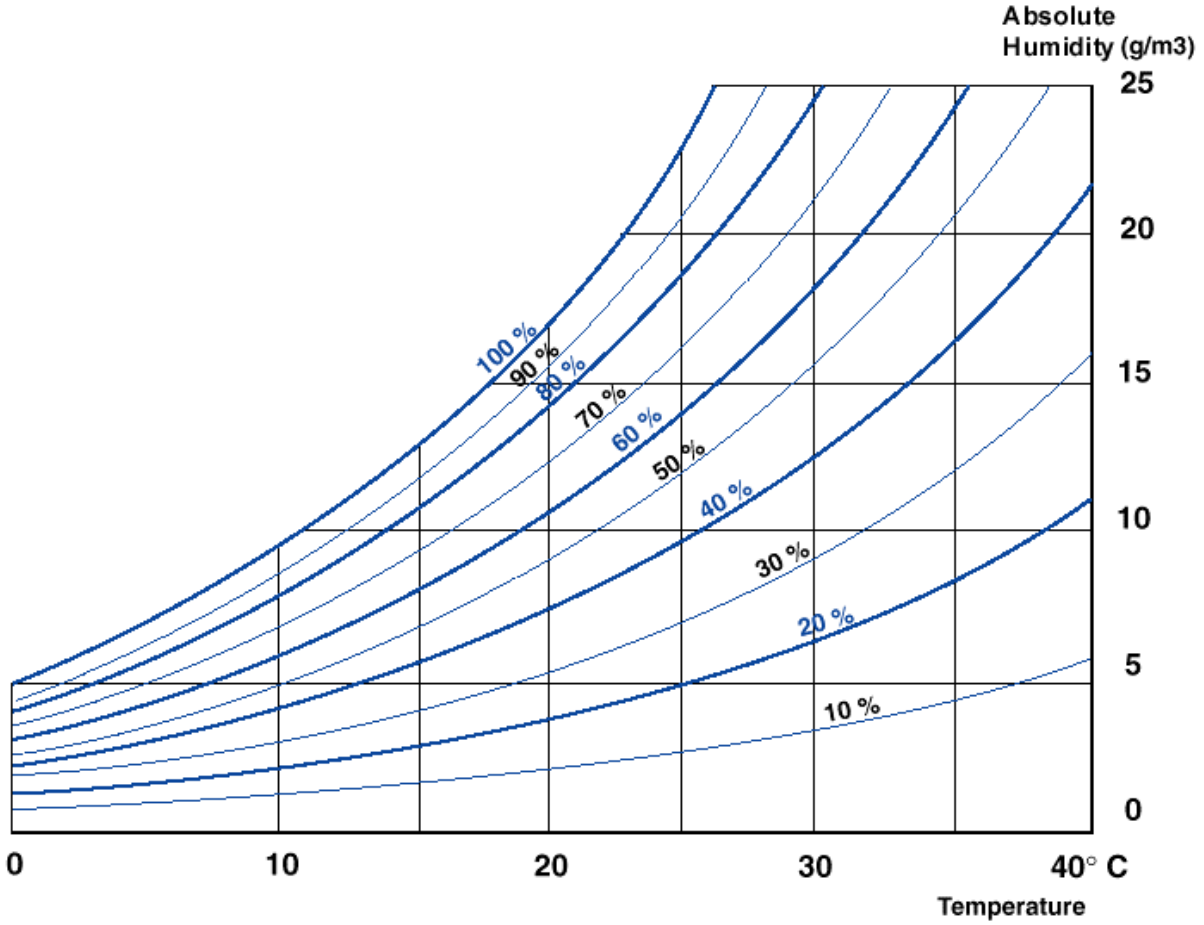
A good awareness of climate conditions in the building over the course of a year makes it possible to :

- dialogue constructively with other specialists (administrators, architects, climatologists),
- better understand the thermic inertia of the building,
- select stacks according to the stability of their climate,
- place the most fragile collections in stacks with the most stable climate,
- find out if a glass case is airtight,
- correct climatic conditions by having air conditioning installed or by using additional humidifiers or dehumidifiers.

Modification of climatic conditions

It may be that analysis of the thermohygrographic readings shows that the climatic conditions inside the stacks are not good. In that case what action should be taken to alter the temperature and relative humidity ?

Figure 2 : psychrometric chart (simplified representation)



From the humid air diagram it can be seen that there are six possibilities :

A) to increase the relative humidity while keeping the absolute humidity constant, the temperature must be reduced (= cooling the air),
B) to reduce the relative humidity while keeping the absolute humidity constant, the temperature must be increased (= heating the air),
C) to reduce the relative humidity while keeping the temperature constant, the absolute humidity must be reduced (= dehumidify the air),
D) to increase the relative humidity while keeping the temperature constant, the absolute humidity must be increased (= humidify the air),
E) to keep the relative humidity stable if the temperature goes down, the absolute humidity must be reduced (= dehumidify the air),
F) to keep the relative humidity stable if the temperature goes up, the absolute humidity must be increased (= humidify the air).

– air conditioning plant

If a building or part of a building is air conditioned, these six operations are carried out by the central air conditioning facility. These facilities have four functions :

- control and stabilise the temperature,
- control and stabilise the relative humidity,
- purify the air by filtering out dust, mould spores and gases,
- ventilate.

The disadvantages of these systems are the high capital and running costs, and the risks to the collections in case of breakdown. For the latter reason, it is preferable to have several small air-conditioning plants serving different parts of the building rather than a large facility serving the whole building.

– independent regulation of relative humidity

If the building is not equipped with an air conditioning facility, small appliances may be used such as air humidifiers and dehumidifiers to regulate seasonal variations : a dry climate in winter during the heating period and a humid climate in summer.

There are various types of humidifiers and dehumidifiers. It is very important not to place the appliances too near the collections (just beside a bookshelf or a glass display case, for example), to avoid the risk of creating microclimates. Similarly, it must be possible to detach the humidistat – which regulates the operation of the appliance – from the main body of the appliance and place it in the area that needs to be monitored, i.e. near the collections. The appliances can be connected directly to the piping (fresh water and waste water) which avoids the need to empty the water reservoir of the dehumidifier or to fill the reservoir of the humidifier. However one should ensure that the pipes are in good working order.

– passive regulation of relative humidity

In contrast to the active solutions for changing climatic conditions which have been discussed so far, in the case of glass display cases it is preferable to adopt a passive solution. For this, so-called "buffer" substances are used. These have the property of regulating the climate inside a closed volume (box, glass case, cupboard) by absorbing water vapour when the ambient relative humidity rises and releasing it when the ambient humidity goes down.

Organic materials (paper, textiles, wood) have these characteristics, but their reaction time is slower than that of silica gel which is normally used for this purpose. Having been preconditioned to the right relative humidity (for example, 50 %), silica gel will stabilise the relative humidity inside a glass exhibition case. The quantity of buffer substance to be placed inside the case depends on its volume and how airtight it is. For efficiency, it is advisable to make the case as airtight as possible.

Preventive Measures

It is possible to slow down deterioration of documents by acting on factors such as temperature, relative humidity, light, biological agents (mould, insects or rodents) chemical and mechanical agents (pollutants and dust particles). It is possible also to avoid or limit deterioration caused by human action.

The ideal environment for collections is one where the temperature and relative humidity are controlled, which is free from pollutants, which has good ventilation, where light is controlled, which is free from mould, insects and rodents, magnetic stray fields, and where good maintenance and security practices (fire, water, theft) are applied.

The best suitable preservation conditions

Carriers	Environmental Conditions											
	Temperature		Relative Humidity		Lighting	Dust	Pollution			Chemical or Biological Factors	Magnetic Fields	Shock
	level	fluctuation	level	fluctuation	intensity		sulphur dioxide	nitrogen oxides	ozone			
	°C	°C	%	% per 24h	lux *	class	parts/billion/volume				A/m	
traditional documents												
parchment and leather	18	2	50-60	5	50-200 **					isolation of the contaminated carriers, good house-keeping		appropriate protection, good handling
papyrus	18	2	50-60	5	50 **					idem		idem
paper	18	2	45-55	5	50-200 **		5 à 10	5 à 10	5 à 10	idem		idem
photographic documents												
B&W negatives and photographies	<21	2	25-35	5	50 **					isolation of the contaminated carriers, good house-keeping		appropriate protection, good handling
coloured negatives and photographies	<2	2	25-35	5	50 **					idem		idem
negatives on glass plate	<21	2	30-50	5	50 **					idem		idem
audiovisual documents												
cylinders	18	2	40	5						isolation of the contaminated carriers, good house-keeping		appropriate protection, good handling
mechanical discs	18	2	40	5		filter				idem		idem
magnetic tapes (audio and video)	18	2	30	5		<100 000				idem	<400 AC <800 DC	idem
CD (replicated) CD (recordable)	20	3	40	5	very sensitive	<10 000				idem		idem

Prevention of deterioration caused by humans

Damage due to human action can be minimised. Negligence is often the result of lack of training in the techniques of preventive conservation and lack of understanding of the consequences of poor conservation conditions and handling. Especially with the ever-growing importance of machine readable formats, and the enormous progress of technology, the training of staff must be organized as an ongoing, continuous process. Damage from vandalism and theft must be reduced by the installation of suitable systems for protection and surveillance.

Disaster Prevention

As for disasters (fire, flooding, earthquake…), the aim of any preservation policy must be to limit the potential risks as far as possible and increase the chances of rescuing materials in case of disaster. It can be helpful to prepare a disaster plan in advance, to save time in an emergency. For that it is vital to know which procedures to apply, to test them and include them in periodic security exercises involving all the library staff. An up-to-date address list must be kept indicating who to call in case of disaster (the fire brigade, companies specialising in refrigerated transport, freezing and freeze-drying, for example).

Prevention of pollution

When storage areas are air-conditioned, air pollution can be reduced by using efficient air filters. However, electrostatic filters should be avoided, as they give off ozone, a powerful oxidising agent. In all cases, regular maintenance of the stacks and collections by dusting will minimise deterioration. It is

essential that the vacuum cleaners used for dusting be fitted with absolute filters, to avoid dispersing the spores of micro-organisms into the air.

Prevention of damage caused by light

As we have seen, natural light, fluorescent lamps and tungsten-halogen lamps all emit a not insignificant quantity of ultraviolet radiation which is disastrous for the organic materials which go to make up the great majority of our documents. For this reason it is essential to eliminate such radiation. This can easily be done using self-adhesive film for glass surfaces, organic filters for fluorescent lamps, and mineral filters for halogen or metallic halide lamps. It should be noted that laminated glass used in the building industry cuts out 95 % of UV radiation and that there exist tungsten-halogen lamps and metallic halide lamps with anti-UV treated bulbs.

Similarly, infrared radiation must be reduced. In the case of natural light, this can be done both by the design of the building, and by using additional equipment such as shutters and sun blinds, films, or - even better - special glass for solar protection. In the case of artificial light, the best solution is to keep light sources away from documents. Fibre optic technology offers an excellent solution, provided that the source of light (and heat) is kept well away from the documents on display. For stacks and stores another solution worth considering is the "light guide" technique (not to be confused with optical fibre, which is a different technology).

Naturally, visible radiation must also be controlled. It must be eliminated in all places where there is no human activity. For an exhibition, the light exposure level (i.e. the lighting level multiplied by the number of hours of exposure) must not exceed 84 Klux hours/year, and must even be reduced to 12,5 Klux hours/year for certain documents made of very sensitive paper (wood pulp base). These levels are important because the photochemical action of electromagnetic rays is cumulative and because, for example, the damage caused to a document by lighting at 50 lux for 10 000 hours (3 years at 8 hours per day) is the same as the damage caused by lighting at 1 000 lux for 500 hours (2 months approximately). There too, glass, blinds, film and other systems help to counter the action of light.

Among all heritage materials that are the most sensitive to light, graphic and photographic documents are to be found in the first place. They can be divided into three categories depending on their constituents, state of conservation and sensitivity to light :

- highly sensitive documents (B&W photographs, etc.),
- very highly sensitive documents (B&W prints on resin coated paper, etc.)
- extremely sensitive documents (colour prints, etc.).

Depending on these categories, the levels indicated below should not be exceeded. These levels are called Total Amount of Exposure (TAE). They can be obtained by multiplying the intensity of light by the total duration of exposure. It is expressed in lux.hours (lx.h).

Levels of light sensitivity	**TAE**
insensitive	---
sensitive	600,000 lx.h/year
very sensitive	150,000 lx.h/year
highly sensitive	84,000 lx.h/year
very highly sensitive	42,000 lx.h/year
extremely sensitive	12,500 lx.h/year

Note 1 : levels dealing with graphic and photographic documents are shaded.
Note 2 : light has a cumulative effect : the same amount of damage will result from exposure to light at 50 lux per 250 hours every year as 150 lux per 250 hours every three other year.

Prevention of damage due to magnetic stray fields

Stray magnetic fields are the natural enemy of magnetically recorded information. Sources of dangerous fields are dynamic microphones, loudspeakers and head sets. Also magnets used for magnetic notice boards etc, possess magnetic fields of dangerous magnitudes. By their nature, analogue audio recordings, including audio tracks on video tapes, are the most sensitive to magnetic stray fields. Analogue video and all digital recordings are less sensitive. For the safeguarding of analogue audio recordings is necessary to keep to the following maximum magnetic stray fields :

- AC fields : 5 Oe (Oersted) = 400 A/m (Ampere per metre)
- DC fields : 25 Oe = 2000 A/m.

It should be noted that normally a distance of 10-15 cm is enough to diminish the field strength of even strong magnets to acceptably low values.

Prevention of damage due to temperature and relative humidity

Though most of the causes of deterioration can be minimised or even eliminated, it is often difficult to correctly control the "temperature" and "relative humidity" factors. These are indeed interdependent parameters which have more variable and complex effects on documents than do other parameters.

– influence of temperature

Materials which are generally sensitive to temperature fluctuations are composite objets where the constituent materials have different extention factors depending on the temperature (enamels, for example).

Excessively low temperatures may make plastic materials fragile : they become vitreous and increasingly friable. Excessively high temperatures speed up the deterioration of unstable materials (acid paper, nitrate films, cellulose acetate films and colour films). Film archives are used to store films even to - 18° C. It is increasingly becoming customary to distinguish between access storage, which holds materials at temperatures which are acceptable for human beings as a working environment and preservation storage which keeps the materials at much lower temperatures (and lower humidities), to slow down the degradation process. Theoretically, each reduction in temperature of 10° C will double the life expectancy of these materials. However it is often not very economical to keep materials continually below the ambient temperature. Should the cooling system break down, considerable damage can be caused by condensation of water vapour on the cold surface of the materials.

– influence of relative humidity

In the case of organic materials, the majority components of library and archive documents, the levels and fluctuations of relative humidity have a much greater impact on the preservation of collections than the levels and fluctuations of temperature (95 % against 5 %). What then are the acceptable levels and variations of relative humidity ? There are no standards for relative humidity, only recommendations.

Most museums, archives and libraries in the United States and Europe have adopted the level of 50 % ± 5% relative humidity. Museums in countries with cold winters (Scandinavia and Canada) recommend levels of 40 % ± 5%, as higher levels risk causing condensation on the cold surfaces of buildings (panes of glass, walls). In fact, these figures were adopted on the basis of technical feasibility more than on knowledge of the impact of these levels of humidity on the preservation of collections.

Levels of relative humidity to be avoided fall into three categories : too high, too low, and fluctuating.

1) <u>excessively high relative humidity</u>

Excessive humidity (over 65 %) leads to the proliferation of mould and rapid corrosion of metals. The risk grows rapidly with each rise above this threshold. For example, at ambient temperature, mould will develop in a few weeks at 75 % relative humidity, but in a few days at 90 % relative humidity.

2) excessively low relative humidity

Humidity plays an important role in the process of chemical change in materials. In theory these processes can be halted only at 0 % relative humidity. On the other hand, excessively low relative humidity leads to dehydration of organic materials which then become fragile.

Excessively low relative humidity also furthers static charges of polymers, which is annoying in the replay of mechanical carriers and magnetic tape.

3) fluctuating relative humidity

Fluctuations in relative humidity should be avoided for most collections, as they lead to mechanical stresses of varying degrees (extention, shrinking). One cycle of a sudden change in relative humidity can cause visible cracking in objects (ivories, for example). Some recently restored objects are particularly sensitive to variations in relative humidity. Repeated cycles of variations in relative humidity lead to mechanical fatigue which makes the object in question progressively more fragile.

Currently, the recommendations vary greatly according to the types of materials – organic or minerals – and the composition of objects – homogeneous or composite. For a collection made up of a variety of materials, as is generally the case, either a compromise must be found, or the most fragile documents must be taken out and placed in stores with a specially controlled climate, or "microclimates" must be created for these documents (air conditioned glass cases, boxes or frames containing "buffer" substances regulating the relative humidity).

It is generally observed that the recommended level of relative humidity ± 5 % tends to be broadened to a variation of ± 10 % either side of an average value. Thus, for many collections, levels of relative humidity between 40 % and 60 % are perfectly acceptable (i.e. 50 % ± 10 %). These new environmental recommendations offer museums, archives and libraries some margin for balancing financial restrictions, the effects of the often historic character of the building, and requirements concerning relative humidity.

In temperate regions, the optimum levels of temperature and relative humidity for traditional collections are around 18° C and 55 % respectively. Fluctuations are generally accepted in the ranges 16-21° C and 40-60 % relative humidity. In contrast, for collections of photographs, microfilms, mechanical, magnetic and optical carriers, the recommended levels are lower : no more than 16° C nor more than 40 % relative humidity in the storage areas.

preservation in extreme climatic regions : the case of libraries in tropical zones

The preservation of heritage collections in geographic regions where the climatic conditions are widely different from the conditions prevailing in a part of the Northern Hemisphere is a difficult problem to resolve, as can be imagined in the light of the above recommendations. Maintaining ideal temperature and relative humidity levels would require high-performance air conditioning systems which themselves would have implications both for operating and maintenance costs and for the risk of thermic shock – two problems with significant consequences.

The further the outside temperature and relative humidity are from ideal conditions, the more difficult it is to keep the inside temperature and relative humidity close to recommended levels. To do so, a lot of energy must be expended, resulting in high operating costs. It also assumes the installation of a particularly efficient and reliable air conditioning plant, which in turn requires regular and costly maintenance. Also, for comfort, the difference between the outside and inside temperatures cannot be too great (a difference of more than 10 % causes discomfort to the human body) : to adopt "ideal" preservation conditions means either subjecting documents to significant thermic shocks when they are moved from stacks to reading rooms (with damaging condensation forming on cold surfaces like films and magnetic tapes), or forcing users to subject themselves to thermic shocks when they enter the library or the reading rooms, which is unacceptable.

The recommended solutions fall into two categories :

– a sophisticated technical solution using air conditioning throughout the buildings which must be adapted to avoid any loss of energy, with the financial consequences referred to above ;

– a compromise solution using methods which take advantage as much as possible of the qualities of certain materials (brick, earth, etc. ; commonly used in many tropical countries, for example), using architectural techniques which permit constant circulation and renewal of air in the storage areas to avoid the stagnant air that encourages mould, using buffer zones (air locks) for aligning temperature and relative humidity. While the collections may not "benefit" from ideal conditions as they would in a temperate climate, at least they are not subjected to the sudden variations in temperature and humidity which are one of the chief threats to the preservation of materials.

The solution chosen must be supplemented by a strict policy of monitoring the building : monitoring climatic variations (with recording thermohygrometers) and monitoring the development of mould and the spread of insects.

The final recommendation is to carefully consider the desired objective and the means available, in order to find a solution which, though not the most satisfactory for preservation of the collections, is the most acceptable. A cautious approach is needed, avoiding hasty conclusions and taking account of all the factors which make each case unique.

Conclusion

The basic aim of any preventive preservation policy is to reduce impacts on objects and collections. Environmental and storage conditions have a decisive effect on preservation of collections. In order to provide good preservation conditions, it is essential to plan regular checks of environmental and storage conditions, paying particular attention to methods of handling works.

Standards

Standards in preparation :

ISO / DIS 11799	Document storage requirements for archive and library materials.
ISO / WD 16245	Archives boxes and file covers for paper documents.

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Publications by the Commission on Preservation and Access (Washington D.C., Etats-Unis d'Amérique) and the European Commission on Preservation and Access (Amsterdam, The Netherlands).

Website Directory

IFLA Principles for the Care and Handling of Library Material
Basic information on the preservation and conservation of library documents.
Available in English in HTML and PDF formats.
http://www.ifla.org/VI/4/news/pchlm.pdf

Preservation of Library & Archival Materials : a Manual
The 3rd edition of the Manual, revised and expanded by Sherelyn Ogden, 1999.
Available in English, in HTML and PDF formats.
http://www.nedcc.org/manhome.htm

Preservation of Archival Records : Holdings Maintenance at the National Archives
Manual by Mary Lynn Ritzenthaler (National Archives and Records Administration - United States).
Available in English in HTML format.
http://www.nara.gov/nara/preserva/maintena/hm1.html

"Protection et conservation des collections patrimoniales des bibliothèques : recommandations techniques"
(Preservation and Conservation of Heritage Collections in Libraries : recommended methods)
Technical specifications developed by the "Direction du Livre et de la Lecture" of the French Ministery of Culture and Communication, brought together in one volume, published in 1998. Full text version online, in French, in PDF format.
http://www.culture.fr/culture/conservation/fr/preventi/guide_dll.htm

LIS 2214 - Library and Archival Preservation
A training course bibliography (University of Pittsburg).
http://www.lis.pitt.edu/~sb/Fall1997.html

The Physics of the Museum Environment
Thesis and documents by Tim Padfield.
http://www.natmus.dk/cons/tp/

CALIPR - Preservation and Planning Software
An MS Windows programme for assessing the preservation needs of book and document collections for international or national planning.
http://sunsite.berkeley.edu/CALIPR/

Websites last visited : 2nd August 1999

Disaster Planning

prevention, preparedness, response, recovery

PRINCIPAL CAUSES OF DISASTERS 2

– NATURAL DISASTERS 2
– MAN-MADE DISASTERS 2

SOME MAJOR EFFECTS OF DISASTERS 3

FIRE 3
WATER 3
EARTHQUAKES 3
BIOLOGICAL AGENTS 3

DISASTER PLAN 3

PHASE 1 : PREVENTION 3
PHASE 2 : PREPAREDNESS 4
PHASE 3 : RESPONSE 4
PHASE 4 : RECOVERY 5

BIBLIOGRAPHY 6

WEBSITE DIRECTORY 8

Disaster Planning

prevention, preparedness, response, recovery

A library or archives disaster is an unexpected event which puts collections at risk. No institution can be excluded from or is immune to the possibility. Disaster planning is a matter of basic security for libraries and archives, their staff and their collections. It is considered to be an essential part of any preservation programme to be implemented by any kind of library or archives. A formal written plan enables an institution to respond efficiently and quickly to an emergency, and to minimize damage to the building and its contents.

Principal Causes of Disasters

– Natural Disasters

- Rain and wind storms
- Floods
- Biological agents (micro-organisms, insect or vermin infestation)
- Earthquakes
- Volcanic eruptions

– Man-Made Disasters

- Acts of war and terrorism
- Fires
- Water (broken pipes, leaking roofs, blocked drains, fire extinguishing)
- Explosions
- Liquid chemical spills
- Building deficiencies (structure, design, environment, maintenance)
- Power failures

Natural disasters cannot be prevented, but measures can be taken to eliminate or reduce the possibility of trouble. Regardless of the many forms a disaster may take, the actual damage to collections is usually caused by fire or water. Even when they are not the initial factor, fires and floods almost invariably occur as secondary causes of library and archives disasters.

Some Major Effects of Disasters

Fire

Books burn fairly slowly. Paper chars and crumbles when handled. Smoke and soot discolour books not otherwise affected. Microforms and audio-visual materials can be completely destroyed or damaged beyond repair.

Water

Paper absorbs water at different rates depending on the age, condition and composition of the material. Generally speaking, books and manuscripts dated earlier than 1840 absorb water to an average of 80 % of their original weight. Modern books, other than those made of the most brittle paper, absorb to an average of 60 % of their original weight.

Leather and parchment warp, wrinkle or shrink. The damage done to book covers may be irreparable. Water can cause gelatinization on parchment.

After floods, mould rapidly begins to form in damp conditions.

Audio-visual materials, photographs, microforms, magnetic media and other disks, are also vulnerable to water, and the damage depends on the type of the material, the length of exposure to water, its temperature, etc.

Earthquakes

Shelving may collapse and the contents be thrown on to the floor. Few books can withstand such treatment. Fire and water damage often result from seismic activity.

Biological Agents

Materials may be eaten, soiled, stained and shredded.

Disaster Plan

This usually involves four phases :

1. Prevention
2. Preparedness
3. Response
4. Recovery

The following guide to producing a disaster plan outlines recommended action in all four phases, but prevention is the best protection against disaster, natural or man-made.

Phase 1 : Prevention

Identify and minimize the risks posed by the building, its equipment and fittings, and the natural hazards of the area.

- Carry out a building inspection and alter factors which constitute a potential hazard.
- Establish routine housekeeping and maintenance measures to withstand disaster in buildings and surrounding areas.
- Install automatic fire detection and extinguishing systems, and water-sensing alarms.
- Take special precautions during unusual periods of increased risk, such as building renovation.
- Make special arrangements to ensure the safety of library or archival material when exhibited.
- Provide security copies of vital records such as collection inventories, and store these off-site.

- Protect computers and data through provision of uninterrupted power supply.
- Have comprehensive insurance for the library or archives, its contents, the cost of salvage operations, and potential replacement, re-binding and restoration of damaged materials.

Phase 2 : Preparedness

Getting ready to cope.

- Develop a written preparedness, response and recovery plan.
- Keep the plan up-to-date, and test it.
- Keep together supplies and equipment required in a disaster and maintain them.
- Establish and train an in-house disaster response team. Training in :
  - disaster response techniques,
  - identification and marking on floor-plans and enclosures of irreplaceable and important material for priority salvage.
- Prepare and keep an up-to-date set of documentation including :
  - Building floor-plans, with locations of cut-off switches and valves.
  - Inventory of holdings, with priorities for salvage marked on floor-plans.
  - List of names, addresses, and home telephone numbers of personnel with emergency responsibilities.
  - List of names, addresses, and home telephone numbers of the in-house disaster response team.
  - List of names, addresses and home telephone numbers of trained conservators with experience in salvaging water-damaged materials, resource organisations, and other facilities able to offer support in the event of a disaster.
  - List of disaster control services, in-house supplies and equipment, and in any central store, including locations and names of contacts with home telephone numbers.
  - List of suppliers of services and sources of additional equipment and supplies, including names of contacts and home telephone numbers.
  - Arrangements made to access freezing facilities.
  - Arrangements for funding emergency needs.
  - Copies of insurance policies.
  - Salvage procedures.
- Distribute the plan and documentation to appropriate locations on- and off-site.
- Institute procedures to notify appropriate people of the disaster and assemble them rapidly.

Phase 3 : Response

When disaster strikes.

- Follow established emergency procedures for raising the alarm, evacuating personnel and making the disaster site safe
- Contact the leader of the disaster response team to direct and brief the trained salvage personnel
- When permission is given to re-enter the site, make a preliminary assessment of the extent of the damage, and the equipment, supplies and services required.
- Stabilize the environment to prevent the growth of mould.

- Photograph damaged materials for insurance claim purposes.
- Set up an area for recording and packing material which requires freezing, and an area for air-drying slightly wet material and other minor treatment.
- Transport water-damaged items to the nearest available freezing facility.

Phase 4 : Recovery

Getting back to normal.

- Establish a programme to restore both the disaster site and the damaged materials to a stable and usable condition.
- Determine priorities for restoration work and seek the advice of a conservator as to the best methods and options, and obtain cost estimates.
- Develop a phased conservation programme where large quantities of material are involved.
- Discard items not worth retaining, and replace or re-bind items not justifying special conservation treatment.
- Contact insurers.
- Clean and rehabilitate the disaster site.
- Replace treated material in the refurbished site.
- Analyse the disaster and improve the plan in the light of experience.

– Be prepared for any type of disaster. Contact and consult other libraries or archives and library or archives associations to share information and experience, and with a view to regional co-operation.

– Take advantage of educational sessions, particularly disaster planning workshops and preparedness exercises.

– Seek expert advice and help from the preservation offices of national and large research libraries, members of the Standing Committee of the Section on Conservation of the IFLA, the centres of the IFLA-PAC Programme, and the Technical Committees of ICA and of the International Audiovisual Archives Associations FIAF, FIAT, and IASA.

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Deterioration agents and damaged documents

A Virtual Exhibition of the Ravages of Dust, Water, Moulds, Fungi, Bookworms and other Pests
Horrifying testimony to the damage done to collections due to lack of preventive measures.
http://www.knaw.nl/ecpa/expo.htm

"They can destroy our cultural heritage"
Essential information and a database on insect pests harmful to museum, library and archival collections (Pages from the website of OCIM).
http://www.ocim.fr/htposter/presins.htm

Pest Management
A list of online information resources on the effects of pests and fungi in libraries.
http://palimpsest.stanford.edu/bytopic/pest/

Mycological Aspects of Indoor Environmental Quality
An inexhaustible source of information on fungi. (Website of the University of Minnesota).
http://www.dehs.umn.edu/fungus/myco.html

Risk Management

Hazards and Risk Virtual Library - by Impacts - Cultural Heritage
A list of resources (projects, papers, reports...) on the management of natural and technology risks to the cultural heritage.
http://life.csu.edu.au/hazards/9CulturalHeritage.html

Disaster Preparedness and Response
List of online resources available on the CoOL website.
http://palimpsest.stanford.edu/bytopic/disasters/

Emergency Drying Procedures for Water-Damaged Collections
Emergency measures to be taken in case of flood damage to collections.
http://lcweb.loc.gov/preserv/emerg/dry.html

Disaster Planning for Libraries and Archives : Understanding the Essential Issues
A paper presented by Jan Lyall during the Pan-African Conference on Preservation and Conservation of Library and Archival Materials. Nairobi (Kenya), June 21-25, 1993.
http://www.nla.gov.au/nla/staffpaper/lyall1.html

Cultural Heritage Fire Suppression Systems : Alternatives to Halon 1301
What are the alternatives to Halon 1301 gas (which is harmful for the environment) to fight the fire in museums ?
http://www.museum-security.org/halon-alternative.htm

Websites last visited : 2nd August 1999

Graphic Documents

TYPOLOGY AND HISTORY **2**
THE PRECURSORS OF PAPER 2
– PAPYRUS 2
– PARCHMENT 2
PAPER 2
– HAND-MADE PAPER 3
– MACHINE-MADE PAPER 3
GROUNDWOOD PULP 3
CHEMICAL PULP 3
– THE BISULPHITE PROCESS 3
– THE SULPHATE PROCESS 3
SIZING 4
RECYCLED PAPER 4
PERMANENT PAPER 4
SYNOPSIS : TYPOLOGY OF TRADITIONAL CARRIERS 5
CAUSES OF DETERIORATION **5**
INTERNAL DETERIORATION 5
EXTERNAL DETERIORATION **6**
PREVENTIVE MEASURES **6**
– LIGHTING 6
– CLIMATE CONTROL 6
– COMBATTING POLLUTION 6
– COMBATTING BIOLOGICAL AGENTS 6
– HANDLING, MOVING AND USING DOCUMENTS 7
– SECURITY OF COLLECTIONS 7
STANDARDS **8**
STANDARDS IN PREPARATION : 8
PUBLISHED STANDARDS : 8
BIBLIOGRAPHY **9**
WEBSITE DIRECTORY **10**

Graphic Documents

Typology and history

By graphic documents is meant objects as diverse as : books, manuscripts, drawings, engravings, posters and maps. They are composed mainly of organic material of which the origin may be vegetable (paper, bark), animal (leather, parchment), mineral (metals, precious stones) or more recently synthetic (film). They may be flat or three-dimensional. They are also defined by the technique used to transmit their message (manuscript, printed text, drawing, etc.).

The precursors of paper

Since the beginning of the human race, man has drawn signs on all sorts of materials : stone, bone, ivory, clay, metal, wood, bark and leaves, silk.

Stone, used since prehistoric times, is undoubtedly the oldest writing material. Fresh clay was used by the Chaldeans to engrave cuneiform signs. Wood, in the form of tablets covered with wax, chalk or plaster, was known to the Hebrews and the Greeks in the 9th century before our era. Silk was used in China before paper. Tree leaves, dried and rubbed with oil, were used by the Egyptians and the Indians (palm leaves). Tree bark was used almost universally : the Greek and Latin words for "book", respectively *biblos* and *liber*, both signify "bark".

– Papyrus

Throughout Antiquity, papyrus was the most used writing material. Papyrus is an aquatic plant, 2 to 4 metres high, which grows on the banks of the Nile. It seems to have been used in Egypt as long ago as 2 500 years B.C. and its use continued up until the 12th century of our era.

– Parchment

Parchment was used by the Egyptians, the Persians and the Greeks. Parchment was the most common writing material during the Middle Ages in Europe, where it replaced papyrus from the 3rd or 4th century, until the invention of printing in the 15th century gave rise to a strong demand for a lighter and more flexible material. In the beginning, parchment was rolled like papyrus, but it gradually came to be used in the form of a book or codex composed of several gatherings each of a certain number of pages.

Parchment is made from animal skin, generally sheep or calf skin. Vellum, made from the skin of a still-born lamb, is of finer quality. To make parchment, the skin undergoes lengthy processing : the hair and flesh are removed with the aid of lime, the skin is scraped, it is stretched out on a frame to dry, it is polished and finally rubbed with French chalk to make its surface suitable for writing.

Paper

Paper was invented in China. It was made from the bark of the paper mulberry tree. Paper dating from 200 years B.C. has been discovered in a Chinese tomb. Tsai Lun, born in 62 A.D. is thought by some to be the real inventor of paper in China. In any case, it was he who perfected and prescribed the method of papermaking. Subsequently the Chinese made paper from hemp, rhea, rattan, mulberry, bamboo, rice or wheat straw, or even old recycled paper. It was only in the 8th century that the Chinese were forced to pass the secret of papermaking to the Arabs.

Papermaking techniques were slightly changed by the Arabs, who introduced linen into the raw material and the use of paper mills. Paper arrived in Europe by two routes, one via Spain in the 10th century and the other via Italy in the 11th century. The first paper mills were set up in Andalucia, in

Cadiz and Seville. In Italy, paper was introduced via Sicily. In France, papermaking began only toward the middle of the 14th century. The use of paper spread with the invention of printing by Gutenberg.

– Hand-Made Paper

The types of paper produced in the Orient as in the West are made of cellulose (vegetable fibres or material made with these fibres, such as rags) and water by a technique which consists of turning the cellulose into a pulp, dispersing it in water, then letting it drain through a tight mesh mould. Once drained, the layer of pulp remaining in the mould is laid out on a felt, dried and pressed to make a sheet of paper which will undergo different treatment depending on the proposed use.

Until the 19th century, paper was made only from old rags made of linen, hemp or cotton. These rags contained pure cellulose, the other vegetable material in them having been eliminated during previous textile processing.

– Machine-Made Paper

In the 19th century, to cope with the shortage of cotton, experiments were made with other types of raw material : straw, annual plants, and finally wood which became the principal raw material from the second half of the 19th century onward.

Wood is broken down into its component fibres either by mechanical or chemical means. We therefore speak of two main categories of paper pulp : groundwood or mechanical pulp, and chemical pulp.

Groundwood Pulp

Groundwood pulp is obtained by grinding rounds of wood while water is sprayed over them, or by crushing wood chips between the two discs of a defibrator. The heat thereby given out softens the lignin which binds the fibres together. Due to its production process, groundwood contains all the elements of wood : the cellulose, but also the hemicelluloses and the lignin. This process is very efficient (over 90 % of the wood is transformed into pulp), which explains the low cost of groundwood pulp. Mechanical pulp is used mainly for making newsprint and cheap book paper. From the 1870s onward, groundwood pulp was used extensively for papermaking.

Chemical Pulp

Chemical pulp is obtained by dissolving the lignin using appropriate chemical reagents, in order to recover the fibres which are mainly composed of cellulose. The process is carried out at high temperature and high pressure for a variable length of time. This process is relatively inefficient (45-55 % of the wood is transformed into pulp) and the cost of the pulp is thus higher than that of groundwood pulp. Chemical pulp is used to make book paper and writing paper.

Because of the chemical agents used, the two main processes are referred to as 'acid' (using bisulphite) and 'alkaline' (using sulphate).

– The Bisulphite Process

The acid or bisulphite process became widespread after first being used on an industrial scale in 1874. Its active element is sulphurous anhydride which 'sulphonates' the lignin in the presence of heat and transforms it into soluble ligno-sulphonic acids which are then eliminated along with part of the hemicelluloses. These days production by this method is in decline, since new factories are designed for the sulphate process, which pollutes less and offers many advantages in terms of paper quality.

– The Sulphate Process

The alkaline or sulphate process, invented at the same time as the bisulphite process, suffered for a long time from the disadvantage of producing very dark brown pulp which was difficult to whiten using the techniques available at the time. Technical developments in the second half of the 20th century overcame this difficulty and gave the process great new potential, as it can be used successfully with all vegetable material, in contrast to the bisulphite process which can be used only with resinous woods.

The process uses sodium hydroxide (soda) as a descaling agent in the presence of sodium sulphide. It owes its name to the fact that the basic chemical producing these two reagents is sodium sulphate.

Sizing

At the beginning of the 19th century, traditional gelatine sizing was replaced by rosin sizing, which is cheaper and easier to use. Rosin sizing became widely used from 1826 onward.

Sizing is done by introducing into the paper pulp either a resin soap obtained generally by the reaction of rosin on soda, or an actual emulsion of rosin and paraffin. To obtain the gluing effect, aluminium sulphate is added to the resin. The consequent reduction in pH causes the precipitation of resinic acids from resinate ions. These precipitates are held by the fibres, but definite fixing occurs only after drying. This process is falling into disuse with the increasingly wide use of the alkaline sulphate process. In this case pine resin is replaced by synthetic resins

Recycled Paper

Recycled paper is currently the most important raw material for the production of paper and is increasingly frequently used for printing and writing papers. There are several reasons for changes in the paper industry : ecological (elimination of chlorine to avoid the formation of dioxin), chemical and technical (the use of new sizing products in a neutral medium). It is inadvisable to use recycled paper for archival storage, as the composition of the fibres is often unknown and variable. Moreover, such paper contains a high proportion of groundwood. The recycled fibres have been refined several times, dispersed, mixed with additives and dried at high temperature. Recycled water, increasingly used in papermaking to protect the environment, contains ionic substances and organic substances of low molecular weight which pollute papers.

Permanent Paper

Permanent paper is a paper made exclusively from chemical pulp in a neutral or alkaline medium. However, it is not necessary to use rags as a raw material. Wood may thus be used provided that all non-cellulose elements and particularly lignin are removed

The first international standard for permanent paper (ISO 9706) was published by the International Standards Organisation (ISO) in March 1994, and sets out 'requirements for the permanence of paper for documents', meaning that such paper remains chemically and physically stable for a long period.

This international standard is the equivalent of the American ANSI standard Z39.48 of 1992 : "Permanence of paper for printed library materials".

For a paper to be declared in conformity with ISO 9706 (or ANSI Z39.48), it must meet the following criteria :

- the pH of the aqueous extract of the paper pulp must be between 7.5 and 10,
- the Kappa number of the paper pulp, which indicates resistance to oxidation (linked to the presence of lignin), must be below 5,
- the alkaline reserve must be higher than or equal to 2 % of calcium carbonate equivalent,
- the tear resistance must be higher than 350mN for a paper whose weight is more than 70g/m^2.

The symbol for this standard is the mathematical sign for infinity within a circle below which appear the words "ISO 9706".

Synopsis : Typology of Traditional Carriers

Carrier	Date of appearance	Manufacturing
papyrus	400 BC (Egypt)	sheets obtained by cutting stalks from papyrus into strips and by superposing them perpendicular to each other, the adherence is obtained by pressure
parchment	1400 BC (Egypt)	skin of sheep or calf stretched on a frame and from which the grease is extracted with lime
paper	200 AD (China)	paper made from vegetal fibres (mulberry tree, bamboo etc.)
rag paper (Occident)	middle of the 11th century	paper made from old linen, hemp or cotton rags. The rags contained pure cellulose, as the other vegetal substances had been removed during textile processing
mechanical pulp paper	about 1867	pulp obtained by grinding logs under a stream of water, or by grinding chips between the two discs of a refiner
chemical pulp paper	about 1850	pulp obtained by dissolving the lignin with chemicals so as to leave fibres consisting mainly of cellulose
sulphite process (acid process)	about 1874	the active substance is sulphur dioxide which during pulping sulphonates the lignin and converts it into soluble ligno-sulphonic acids which are then eliminated with some of the hemicelluloses
sulphate process (alcaline process)	about 1878 (used since 1930)	this process makes use of caustic soda which, in the presence of sodium sulphide, removes encrustants. The fibre obtained through the chemical process no longer contains lignin. At present sulphate pulps are gradually replacing sulphite pulps
permanent paper	1994	paper which is manufactured by the alcaline sulphate process and contains an alkaline buffer. This paper refers to the international standard ISO 9706

Causes of deterioration

Causes of deterioration may be either internal (endogenous), or external (exogenous).

Internal Deterioration

If the component elements of a paper are relatively pure, it has good durability and quite long life expectancy. This is the case of most of the papers made up until the 19th century. Unfortunately, the appearance of wood pulp in the 19th century lead to a reduction in quality. Paper made with wood pulp purified more or less well according to the process applied - mechanical or chemical wood pulp - then sized with rosin (pine resin) in an acid medium stand up much less well to aging than most of the papers made previously. They yellow and rapidly lose their original flexibility. Many 19th and 20th century printed or manuscript documents kept in libraries and archives are today in very bad condition and can no longer be used by readers.

Chemical deterioration of industrially-produced paper results largely from the production processes used. There are two main types of deterioration : hydrolysis and oxidation.

The glucosidic links of cellulose are stable in a neutral or weakly alkaline medium. On the other hand, they become rapidly hydrolysed in presence of a strong acid or a strong base. This can be seen in the more or less significant reduction in the degree of polymerisation and therefore of the molecular mass.

Sizing with rosin has a very negative effect on the preservation of cellulose, as aluminium sulphate, used to precipitate the resin on the fibres of paper, is an acid salt which when combined with humidity from the air turns back into sulphuric acid, a strong acid.

Hydrolysis of the cellulose is promoted by the presence of oxide groups (aldehydes, carboxyls). Moreover, the presence of transition metals (iron, manganese) catalyses the oxidation processes including that of sulphur oxide which forms sulphuric acid.

Lignin and rosin may combine to form peroxides even at ambient temperature. These are very powerful oxidation agents which react directly on the different chemical groups of the cellulose.

External Deterioration

To the internal causes of deterioration may also be added the external factors such as air pollution, bad climate or lighting conditions and attack by biological agents (see the chapter on preservation conditions).

Preventive Measures

– Lighting

Three important factors need to be taken into account : the composition of light, the intensity of lighting and the duration of lighting. Light sources are natural (the sun) or artificial (electric lights). The following measures may reduce the damaging effect of light.

– Exclude ultraviolet (UV) and infrared (IR) rays by closing window shutters or by fitting blinds in the storage areas. When on display, framed works should be protected by filter glass. Fluorescent (neon) lights emit a high level of UV and it is essential to fit them with filters. UV radiation after fitting of filters should not exceed 75 microwatt/lumen. Documents must not be placed near any heat source emitting IR radiation (incandescent lamps).

– Check the light intensity. For fragile graphic documents (drawings, watercolours, colour photographs, illuminated manuscripts), the light intensity must not exceed 50 lux.

– Limit the duration of lighting. This must not exceed 3 months for a display period of 8 hours a day at 50 lux.

– Climate Control

For correct preservation of collections of printed books, manuscripts and prints, a temperature of 18° C +/- 2° C and a relative humidity of 55 % +/- 5 % are generally recommended.

The organic materials making up the majority of documents are very sensitive to fluctuations in relative humidity, so this must be kept stable throughout the year.

– Combatting pollution

Graphic documents must be protected against air pollution. Modern air conditioning plants can be equipped with good-quality filters which stop chemical and particulate pollution. In the absence of such a system, it is even more essential to ensure the maintenance of storage areas, especially by regular dusting and placing documents in protective containers.

– Combatting biological agents

Biological agents spread preferably in dirty and damp areas. It is absolutely essential not to bring organic material (foodstuffs, unauthorised cardboard packing material) into storage areas. Also, older

documents acquired by donation or purchase must first be examined and if necessary disinfected. In case of doubt, these documents must be quarantined and their state of preservation assessed by a specialist.

Regular inspection and preventive treatment of the building (cleaning, traps, etc.) will banish harmful insects and vertebrates, while at the same time being cheaper and less harmful for staff, collections and the environment than the chemical treatment which is indispensable following an infestation.

– Handling, moving and using documents

The golden rule when handling documents is first of all to provide a clear area where the documents being moved can be laid, and secondly to pay constant attention to gestures.

When moving documents, one must avoid carrying documents of different sizes and weights together. Heavy documents must be moved on a trolley. Books must be placed upright and held firmly in position. They should not be placed on the spine or on the fore-edge, as that could break the binding at the joints. Books in boxes must be laid flat for transport, except in the case of large items for which this is not possible. In this case, the works are to be transported upright if they are mounted on panels, or rolled around a rigid tube. One must also become familiar with the types of fastening of the various containers (handle, cord, Velcro), in order to avoid their contents unexpectedly falling out.

In archives and libraries, care should be taken not to make available to a reader any document which is on restricted access, or an original document if a surrogate copy exists (microform or photograph). When giving documents to a reader, one should not place them one on top of another, nor place them on a surface which is not flat or not cleaned. The researcher must be informed of the essential rules for handling documents. The principles to follow when consulting documents are the following : it is forbidden to drink or eat near documents, to lean on documents while reading them or while taking notes, to mark documents in any way, to fold the corners of pages, etc.

Before returning documents to the shelves, one must check that protection systems are back in place (box, envelope, clasp, dividers). Documents should not be shelved too tightly or too loosely together. Force should never be used to place a document or a container on a shelf.

– Security of collections

To protect collections against theft, buildings must be equipped with security devices. This does not do away with the need for monitoring in the reading room (which requires constant vigilance on the part of the staff, and perhaps also cameras).

In every institution, the risk of fire must be minimised by the installation of smoke detectors or heat detectors. In places where graphic documents are stored, smoking should be prohibited everywhere at all times.

In addition, it is highly advisable to put in place a permanent programme for disaster prevention, and an emergency plan. Prevention is done by means of regular inspections of risk areas (for example, roof gutters which may become clogged up in autumn), whereas the emergency plan ensures that, in case of disaster, the essential human expertise and materials for rescuing documents are available.

Standards

Standards in preparation :

ISO / DIS 11799	Document storage requirements for library and archive materials.
ISO / DIS 11798	Permanence and durability of writing, printing and copying on paper - Requirements and testing methods.
ISO / DIS 14416	Requirements for binding of books, periodicals, serials and other paper documents for library and archive use - Methods and materials.
ISO / CD 15659	Standardization of permanent and durable boards used for bookbinding and document storage purposes.

Published standards :

ISO 9706 : 1994	Information and documentation - Paper for documents - Requirements for permanence.
ISO 11108 : 1996	Information and documentation - Paper for archival documents.
ISO 11800 : 1998	Information and documentation - Requirements for materials and methods for bookbinding.

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(http://www.culture.fr/culture/conservation/fr/preventi/guide_dll.htm)

UNESCO RAMP Studies which are usually available in English, Arabic, Chinese, Spanish, French and Russian.

Publications by the Commission on Preservation and Access (Washington D.C., Etats-Unis d'Amérique) and the European Commission on Preservation and Access (Amsterdam, The Netherlands).

Website Directory

Mass Deacidification

Mass Deacidification
A bibliography and list of documents available online.
http://palimpsest.stanford.edu/bytopic/massdeac/

Mass Deacidification. An update of possibilities and limitations
Report by Henk J. Porck on the advantages and limitations of the most frequently used deacidification treatments, published in 1996.
http://www.knaw.nl/ecpa/publ/porck.htm

Technology Helps Library Save Its Paper Collections
"Bookkeeper" - new deacidification treatment based on impregnation of documents with oxide of magnesium, presented by Will Dalrymple in the Bulletin of the Library of Congress.
http://lcweb.loc.gov/loc/lcib/970421/web/deacid.html

Permanent Paper

International standard ISO 9706 : Information and documentation - Paper for documents - Requirements for permanence
http://www.iso.ch/catf/d17562.html

Discussion Lists

Book_Arts-L Archives
A list managed by the University of Syracuse and intended for art book specialists, curators etc. The list archives can also be consulted.
http://palimpsest.stanford.edu/byform/mailing-lists/bookarts/

ExLibris Archives
A discussion forum hosted by the University of California (Berkeley) on rare books and manuscripts. The list archives can also be consulted.
http://palimpsest.stanford.edu/byform/mailing-lists/exlibris/

Websites last visited : 2nd August 1999

Photographic Documents and Films

TYPOLOGY AND HISTORY **2**
- MICROFILM 2
- NEW PRINTING TECHNIQUES 2
- ORIGINAL AND SUBSTITUTES 2
- SYNOPSIS : TYPOLOGY 3

DETERIORATION OF PHOTOGRAPHIC MATERIAL **3**

CAUSES OF DETERIORATION **3**

INTERNAL DETERIORATION **3**
- CELLULOSE NITRATE FILMS 3
- CELLULOSE ACETATE FILMS 4
- COLOUR PHOTOGRAPHS 4
- COLLODION 4
- PE OR RESIN COATED PAPERS 4
- MICROFILMS 4

EXTERNAL DETERIORATION **5**
- ENVELOPES 5
- FURBISHING 5

PREVENTIVE MEASURES **5**
- CLIMATIC CONDITIONS 5
- POLLUTION 6

CONCLUSION **7**

STANDARDS **8**

BIBLIOGRAPHY **9**

WEBSITE DIRECTORY **10**

Photographic Documents and Films

Typology and history

Photography can be defined as any method producing a visible image by the inter-action of light with a layer of chemicals. Since the birth of still photography in 1839, photographs have been manufactured employing many different methods. About 40 of these methods have been used commercially and examples of the resulting images can now be found in great numbers and varieties in archives and library collections.

The development of a commercially successful system for recording and viewing moving images was the result of work by many people in the latter part of the 19th century. The first successful public demonstrations were given by Lumière in Paris in 1895. Since then many advances have been made including the introduction of sound and of colour. Many different frame rates and sizes of film were devised before the industry stabilised on to a few "standard" formats. A film collection still has to be able to handle films on many formats.

Microfilm

Microfilm was developed to secure original print and image material with special historical, commercial or scientific value. The use of microfilms can also improve the access to the information carried by the original documents. The use of microfilm for access will, as with other forms of access copy, help preserve the original by protecting it from wear and tear and from theft.

New printing techniques

The most recent developments are as a result of the computer revolution. New techniques have been developed using equipment such as ink-jet and thermal sublimation printers to produce copies of digitised images. These should be considered as printing techniques and not as photographic materials although they can provide a good representation of the original photographic image. Because of the short life expectancy and the sensitivity to light and heat, these printing techniques cannot be considered a substitute for photographic materials.

Original and substitutes

The best practice for photographic materials is to have several sets of images. The Original Image kept in ideal conditions and disturbed as infrequently as possible.

– A Safety Master used as a reserve copy. It should be stored in a separate place to the original in case of the loss of the original in a fire or some other disaster and also kept in good storage conditions.

– A User Copy Master made from the original or the safety master and used to make User Copies. User Copies for routine access to the images.

Though photographic images have been made in a great number of different sizes - from microfilms to large posters - the deterioration and preservation principles are dependent upon the chemical process used to make the image and not the size or purpose of the image.

Synopsis : typology

Carrier	Date of manufacturing	Procedure	Composition
daguerreotype	1839-1860	positive (direct)	cooper plate covered with a fine silver layer
salted paper	1839-1860	positive (direct)	print on a paper containing silver chloride
calotype	1841-1860	negative	paper containing silver nitrate treated with potassium iodide
ambrotype	1851-1880	positive (direct)	collodium plate *cliché* seems to be a positive when placed on a dark paper
albumin print	1850-1900	positive (direct)	print on a paper with an albumine coating treated with silver nitrate
collodium plate	1851-1885	negative	solution of coton and pouder in a mixture of alcohol and ether extended on a glass plate
ferrotype	1856-1930	positive (direct)	solution of coton and pouder in a mixture of alcohol and ether extended on a black varnished metallic plate
silver gelatin procedure	1880-	negative	suspension of silver bromide in gelatin
aristotype	1885-1930	positive (direct)	paper containing gelatin with silver citrate or collodium
autochrome	1907-1945	positive (direct)	glass plate with a coloured potato starch coating covered by an emulsion containing silver chloride
negative and positive for colour development	1939-	negative/positive	different procedures

Deterioration of photographic material

As the production of photographs has included many different chemical processes in the capture of the image, photographs also have a wide variety of ageing properties. Some materials were made of extremely self-destructive components, others were very sensitive to physical contact and almost every photographic material is sensitive to the environment, not only temperature, relative humidity and air pollution but also oxidising substances found in emissions from some building materials, wall paints and wooden furnishing. The card-board and paper in boxes and envelopes used for protecting the items from physical damage may also contain harmful substances.

Causes of deterioration

Deterioration factors can be categorised in two ways - internal and external.

Internal Deterioration

Internal deterioration factors are dependent on the components of a photographic item and the residual chemicals from developing- and post treatment processes. The speed of the decay processes is related to relative humidity, temperature and oxidising substances.

Cellulose nitrate films

The most commonly known example of a photographic material deteriorating from internal processes is cellulose nitrate film, which during deterioration emits substances that both accelerate the deterioration process as well as attacking materials in the vicinity. The main ingredient of nitrate film is cellulose nitrate which emits nitrous gases. The gases are not only oxidative but also toxic and explosive. In a self-accelerating deterioration process, the support - the film base - and the emulsion are eventually completely destroyed. What is left is a sticky substance. Cellulose nitrate film is

flammable at fairly low temperatures and rolls of film, like motion picture films, might even self ignite at a room temperature as low as 41° C when kept for an extended period of time in a badly ventilated environment, for example in the traditional metal film can.

Cellulose nitrate film sheets do not self ignite in the same way because the mass per volume is much less and normally the emitted gases slowly evaporate away from the negatives when they are kept in envelopes and open boxes.

Cellulose acetate films

Another materials group exposed to self destruction is that of acetate film - the first safety film. Until recently, acetate film was considered as very stable but today the problem of the Vinegar Syndrome - the popular name for the deterioration of acetate film with the emission of acetic acid (vinegar) vapour as a by-product that acts to accelerate the rate of decay - is widely known. Still another example, although involving an old process, is the yellowing of albumen prints, where the egg white in the emulsion bleaches the silver image.

Acetate film was introduced in the 1920s as a substitute for the flammable cellulose nitrate film. It was labelled "safety film" as it was less flammable than its predecessor. The early acetate film lacked dimensional stability which made it shrink and loosen the emulsion from the support. The acetate base was improved and was considered more or less stable until the vinegar syndrome was discovered during last decade.

Colour photographs

Colour photographs - negatives, prints and transparencies - generally have bad ageing properties as the colour-components are unstable unless kept below 0°C. Photographic colour materials are not only subject to light fading - fading of the colours and image in the presence of light - but also to dark fading - fading in the absence of light. Transparencies are commonly considered to have better colour stability than colour negatives and prints but ageing properties may differ greatly due to different chemical properties.

Collodion

Collodion, one of the earliest photographic emulsion materials, was used in several similar photographic techniques during the mid-18th century, e.g. ambrotypes, collodion wet plates, pannotypes, ferrotypes and celloidin paper. The collodion emulsion contains cellulose nitrate (also used for the first "plastic-type" film base) and emits nitrous gases, though far less than cellulose nitrate film. These gases may attack other objects in the vicinity and, due to the loss of gas which leads to shrinkage of the emulsion, the emulsion may eventually crack.

PE or Resin coated papers

PE or Resin Coated papers are made from paper fibres covered with polyethylene with the gelatine emulsion outside the polyethylene layer. Until about the mid 1980s this photographic print paper had bad ageing characteristics. The paper base contained optical whiteners which absorbed light energy. An oxidising substance was formed which attacked the resin coating resulting in cracking. The oxidant also attacked the silver image and bleached it. During the last decade an anti-oxidant has been introduced and thus the resin coated papers now have improved longevity.

Microfilms

Microfilms have been and are produced using a variety of processes but the silver-gelatine developing-out film is considered to have the best long-term stability. Diazo- and vesicular processes are commonly used for making access copies but they do not have long-term stability and are not recommended for preservation copies.

External Deterioration

Envelopes

External deterioration factors are harmful substances in the preservation environment. Among the many contaminants, a few should be particularly mentioned. Lignin, alum rosin sizing and oxidative residual chemicals in paper and cardboard used for envelopes, boxes and mounting boards as well as plasticisers in PVC-folders and similar storage media are the most common together with air pollutants.

Furbishing

Furbishing in repositories should not consist of materials emitting oxidising gases. Oxidising gases react with photographic materials in a similar way as common air pollutants.

High temperature and relative humidity accelerates these processes.

The external deterioration factors may co-operate with the internal factors to increase the reaction speed of the internal deterioration factors.

Materials with good initial ageing properties - i.e. with few internal deterioration factors - may last longer in a bad environment than an object with bad ageing properties - i.e. with many internal deterioration factors - kept in a good preservation environment.

Good storage conditions will counteract deterioration of materials with bad ageing properties to a certain point, while bad storage conditions will always accelerate deterioration processes.

Preventive Measures

The best way to preserve photographic materials is to emphasise measures on preventive care. The necessity of proper storage materials - envelopes, boxes, archive and library furbishing, etc. - and storage climate cannot be over estimated.

Climatic conditions

If possible a photographic collection should be divided and stored as two sets ; an active and a passive. The active set is for frequently used material - mainly copies of originals - and the passive set is for long term keeping of the originals. The passive set should have a stable climate with low temperature and relative humidity

A number of recommendations exist but they do not differ significantly from the requirements listed in the following table. These are weighted for a good cost/effectiveness ratio. The requirements can be difficult to achieve but must always remain the target. The target temperature and humidity readings can be relaxed provided that the conditions are kept stable and with the proviso that the humidity level is kept above 25 % and below about 60 % - the level above which moulds are encouraged to grow. The penalty in most cases is, however, a shorter life expectancy for the carriers.

Preservation Climate Requirements for Photographic Materials						
	temperature	±/24h	±/year	RH	±/24h	±/year
	°C	°C	°C	%	°C	°C
Still Images						
Negatives	< 18	1	2	30-40	5	5
b/w Prints	<18	1	2	30-40	5	5
Cellulose Nitrate Film	<11	1	2	30-40	5	5
Colour Negatives	<2	1	2	30-40	5	5
Colour Slides	<2	1	2	30-40	5	5
Colour Prints	<2	1	2	30-40	5	5
Moving Images						
Colour Films	-5	1	2	30	2	5
b/w Safety Films	<16	1	2	35	2	5
b/w Nitrate Films	4	1	2	50	2	5
b/w Microfilm						
Silver-Gelatine	<18	1	2	30-40	5	5

A range of humidity levels are quoted for still images and microfilm. The humidity must not move outside this range. Any variation must not exceed the change of RH figure for 24 hours. For moving images, a target humidity level and figures for the maximum movement from this figure over periods of 24 hours and one year are quoted.

Basements and attics are usually not suitable for storing photographic materials. Basements are usually very humid and often accommodate plumbing which, if it starts to leak, may cause irreversible damages. Attics, if not properly insulated, will have an uncontrolled climate affected by the out-door conditions.

High temperature and high relative humidity (RH) accelerates most deterioration processes. The cooler the temperature, the slower the deterioration rate. The control of relative humidity is even more important in an archive or library with photographic materials. These types of damage may occur when the RH is **too high** :

- mould and fungi start to grow when RH rises above 60 %,
- the emulsion swells and get sticky,
- residual chemicals will accelerate deterioration processes,
- glass plates might start to deteriorate and the glass may turn foggy,
- deterioration processes caused by air pollutants, paints, etc, may accelerate,
- photographs on metal support, ferrotypes, may start to corrode.

The following damages may occur when RH is **too low** :

- the emulsion dries out and might flake,
- dry emulsion may fall off the support,
- film support may lose its flexibility.

Pollution

It may be difficult to keep the air in an archive or library clean since most major collections are usually situated in the centre of major cities. But it is nevertheless of the utmost importance to keep the areas free from air pollutants as possible. They are very reactive with substances in both b/ w and colour photographs. Listed in the following table are the requirements for clean air in photographic collections.

Other harmful substances exist in the air but good chemical filters customised for the substances listed in the table will control these as well.

Air Quality Requirements in Archives and Libraries for Photographic Materials		
Gas	**Active Set**	**Passive Set**
	g/m^3	g/m^3
SO_2	1	1
NO_x	5	1
O_3	25	2
CO_2	45	45
fine particles	75	75

If the collection includes any nitrate moving films, seek advice from the local fire authorities about the storage requirements, the maximum quantity of film that can be kept in one storage area and any other restrictions that they may require. This action is not merely good advice - it is essential. Nitrate movie film is considered to be an explosive by the fire authorities in many countries.

Conclusion

Photographic objects belong to a very delicate category of our cultural heritage which need special attention by trained personnel. Materials are susceptible to air pollutants, both fuel generated and emitted from furbishing and protective materials in repositories, as well as high humidity and temperature. It is important, therefore, to be in control of the preservation environment. It is also important to be able to identify the photographic methods represented in a collection and thus be aware of specific preservation problems.

Specifications, methods and measures for improving the preservation environment for photographic materials can be found in special literature and standards. Some of these are listed below.

Standards

ISO 417	Photography - Determination of residual thiosulfate and other related chemicals in processed photographic materials - Methods using iodine-amylose, methylene blue and silver sulfide.
ISO 543	Cinematography- Motion picture safety film - Definition, testing and marking
ISO 3897	Photography - Processed photographic plates - Storage practices.
ISO 4331	Photography - Processed photographic black-and-white film for archival records - Silver-gelatin type on cellulose ester base - Specifications
ISO 4332	Photography - Processed photographic black-and-white film for archival records - Silver-gelatin type on poly(ethylene terephthalate) base - Specifications
ISO 5466	Photography - Processed safety photographic films - Storage practices
ISO 6051	Photography - Processed reflection prints - Storage practices.
ISO 6200	Micrographics - First generation silver-gelatine microforms of source documents - Density specifications
ISO 8126	Micrographics - Diazo and vesicular films - Visual density - Specifications
ISO 9718	Photography - Processed versicular photographic film - Specifications for density
ISO 10214	Photography - Processed photo graphic materials - Filing enclosure for storage.
ISO 10602	Photography - Processed silver-gelatine type black-and-white film - Specifications for stability.
ISO 5-1	Photography - Density measurements - Part 1 : Terms, symbols and notations
ISO 5-2	Photography - Density measurements - Part 2 : Geometric conditions for transmission density
ISO 5-3	Photography - Density measurements - Part 3 : Special conditions
ISO 5-4	Photography - Density measurements - Part 4 : Geometric conditions for reflection density

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WILHELM, Henry and BROWER, Carol. The Permanence and Care of Colour Photographs : Traditional and Digital Colour Prints, Colour Negatives, Slides, and Motion Pictures. - Grinnell, IA : Preservation Publishing Co., 1993.

Website Directory

Organisations

International Federation of Film Archives (FIAF)
The International Federation of Film Archives brings together over 100 institutions devoted to the preservation of films.
http://orson4.filmtv.ucla.edu/FIAF/

National Film Preservation Foundation
Non-profit organisation which aims at preservation of the American film heritage.
http://www.filmpreservation.org/

American Film Institute (AFI)
AFI ensures the coordination of the organisations concerned with the motion-picture image as art. It has a National Centre for Film and Video Preservation, a database with information on film archives, and a collection of films. The website has pages on deterioration mechanisms, the craft of restoration, and restoration laboratories in the United States.
http://www.afionline.org/preservation/preservation.frame.html

Association of Moving Image Archivists
This non-profit professional association coordinates organisations concernded with collections, preservation, exhibitions and use of film archives.
http://www.amianet.org/

Image Permanence Institute
A laboratory working on photograph and film preservation.
http://www.rit.edu/~661www1/FRAMESET.html

Centre de recherches sur la conservation des documents graphiques (CRCDG)
This French research centre on preservation of graphic and photographic documents (run by the French Ministery of Culture and Communication, the CNRS (Centre national de la recherche scientifique) and the French National Museum of Natural History), carries out research programmes on photographic materials (e.g. the study of organic materials, of deterioration processes...)
http://www.culture.fr/culture/conservation/fr/laborato/crcdg.htm

Documents

Film/Digital/film
Latest information on different preservation methods and film preservation techniques, notably electronic imaging, by Michael Friend.
http://www.oscars.org/cmps/friend/friend.html

Discussion List

Microform Mailing List
To subscribe, send a message to : majordomo@lists.uoregon.edu *and indicate* subscribe microforms *in the body of the message.*

Websites last visited : 2nd August 1999

Mechanical Carriers

TYPOLOGY AND HISTORY **2**

PHONOGRAPH CYLINDERS 2
SHELLAC DISCS 2
INSTANTANEOUS DISCS 2
MICROGROOVE DISCS 3
TYPOLOGY OF MECHANICAL CARRIERS - SYNOPSIS 3

CAUSES OF DETERIORATION **3**

HUMIDITY AND TEMPERATURE 3
MECHANICAL DEFORMATION 4
DUST AND DIRT 4

PREVENTIVE MEASURES **4**

STANDARDS **5**

BIBLIOGRAPHY **6**

Mechanical Carriers

Within the group of documents commonly labelled audiovisual (photographic still and moving images, audio and video recordings) are sound recordings on cylinders and discs. The common factor with this group of documents is the method of recording the information. This is by means of a groove cut into the surface by a cutting stylus and which is modulated by the sounds, either directly in the case of acoustic recordings or by electronic amplifiers.

There are no official standards for the preservation of these materials but there are, however, a number of standard reference publications available. These are listed in the bibliography that follows. In addition, the Proceedings of the series of Technical Symposia organised by the international archive federations (FIAF, FIAT, IASA and ICA) on the preservation of sounds and moving images contains many papers of interest.

Typology and history

Phonograph Cylinders

Cylinders, originally developed for use as dictating devices, have been used since around 1889 for original recordings in the academic world and later also as mass produced recordings for the entertainment industry in competition with early gramophone (shellac) discs. While industrial production ceased in the late twenties, they continued to be used for field recording until the 1950s (!). Most cylinders are made of wax ; some of the mass replicated cylinders are made from celluloid. There are about 300,000 cylinders in the custody of recorded sound collections world-wide. They are extremely brittle and fragile and if they have been stored under conditions which are too humid, they suffer from mould. Fortunately, most of these holdings have already been transferred onto modern media and thus their contents, which are frequently of unique historical value, are already safeguarded.

Shellac Discs

Coarse groove gramophone discs, commonly called shellacs or 78s, were the main mass produced audio format of the first half of our century. It is estimated that the world-wide stocks of this format amount to 10 million discs. They were produced from 1898 until the mid-fifties. The discs consist of various mineral substances bound together by organic substances like shellac or similar binding materials. Although breakable if dropped, these gramophone records are fairly stable and there are no reports of a systemic instability problem.

Instantaneous Discs

Prior to the introduction of magnetic tape, which occurred in the late 1940s and early 1950s, the "instantaneous discs" - so called because they can be played immediately after recording the sounds without the need for the lengthy processes required for mass produced discs - were the only medium for audio recordings that could be played back immediately. The total number in existence amounts to about three million. Practically all of these discs are irreplaceable originals, many of them of great cultural, historical and scholarly importance.

Unfortunately, the largest group of these instantaneous discs, the "acetate discs", are at the greatest risk. These discs are laminates consisting of a core plate, usually of aluminium but plates of glass, steel and card are also known, with a lacquer coating of nitrate or acetate cellulose which is soft enough to be cut by a recording machine, but hard enough to withstand several replays. With age, the coating shrinks and becomes brittle by a hydrolytic process : the stresses between the shrinking lacquer and the stable core increase until, suddenly, the lacquer breaks apart, and flakes off. By this

means a considerable portion of the holdings world-wide have already been lost. Even if programmes to transfer the sounds were hastily established, further losses of irreplaceable information cannot be prevented. Every day, apparently intact records are being affected by this phenomenon.

Microgroove Discs

From the late 1940s onward microgroove discs (vinyl or LP records) replaced shellac discs and only relatively recently (since about 1990) has this format been replaced by the compact disc (CD). The total number of microgroove discs in sound archives world-wide is estimated to be more than 30 million. They are made mainly of polyvinylchloride. No systematic stability problems on a great scale have arisen so far, but their stability in the long term, thinking in centuries, is unknown.

Typology of mechanical carriers - synopsis

carrier	date of manuf.	media	type of recording	composition	recording process
cylinder - recordable	1886- 1950s	sound	analogue	wax	mechanical
cylinder - replicated	1902- 1929	sound	analogue	wax nitrocellulose with plaster ("Blue Amberol")	mechanical
coarse groove disc - replicated	1887- 1960	sound	analogue	mineral powders bound by organic binder ("shellac")	mechanical
microgroove disc ("vinyl") - replicated	1948-	sound	analogue	polyvinyl chloride - polyacetate co-polymer	mechanical
coarse and microgroove discs - recordable ("instantaneous discs"	1930-	sound	analogue	various homogenous and laminated materials : acetate lacquer disc : acetate or nitrate cellulose coating on aluminium or zinc base	mechanical

Causes of deterioration

The main factors related to instability of mechanical carriers and retrievability of information can be summarized as :

- humidity and temperature,
- mechanical deformation,
- dust and dirt of all kinds.

Humidity and Temperature

Humidity, as with all other data carriers, is a most dangerous factor. While shellac and vinyl discs are less prone to hydrolytic instability, most kinds of instantaneous discs are extremely endangered by hydrolysis. Additionally, all mechanical carriers may be affected by fungus growth which occurs at humidity levels above 65 % RH.

Elevated temperatures beyond 40° C are dangerous, especially for vinyl discs and wax cylinders. Otherwise, as with other carriers, the temperature determines the speed of chemical reactions like

hydrolysis and should, therefore, be kept reasonably low and, most importantly, stable to avoid unnecessary dimensional changes.

Mechanical Deformation

Mechanical integrity is of the greatest importance for mechanical carriers. It is imperative that scratches and other deformation caused by careless operation of replay equipment are avoided. The groove that carries the recorded information must be kept in an undistorted condition. Only specialist personnel should, therefore, be allowed to handle and replay mechanical carriers.

While shellac discs are very fragile, instantaneous and vinyl discs are more likely to be bent by improper storage. Generally, all mechanical discs should be shelved vertically. The only exceptions are some soft variants of instantaneous discs.

Dust and Dirt

Dust and dirt of all kinds will deviate the pick-up stylus from its proper path causing audible cracks and clicks. Fingerprints are an ideal adhesive for foreign matter. A dust-free environment and cleanliness is, therefore, essential.

Preventive Measures

Obsolescence of hardware is not yet a major issue for mechanical carriers. Replay equipment for microgroove and 78rpm discs is still available and several sound archives have constructed cylinder replay machines which offer excellent performance for cylinders of all formats. With the exception of instantaneous discs and cylinders, mechanical carriers are not generally at risk. Because the discs wear when played, migration to a modern digital format will be necessary for items in frequent demand.

Because of the extreme risk to the future survival of instantaneous discs, all existing holdings must be transferred with highest priority.

Recommended Climatic Storage Parameters						
	temperature	±/24h	±/year	RH	±/24h	±/year
	°C	°C	°C	%	°C	°C
preservation storage	Between 5 and 10	±1	±3	30	±5	±5
access storage	about 20	±1	±3	40	±5	±5

Operation areas (studios) should have the same climatic conditions as access storage areas.

It is of utmost importance to control both temperature and humidity simultaneously. Archivists and librarians are explicitly warned to not to cool the storage environment without dehumidification because such action will normally lead to an unacceptable rise of relative humidity and may encourage the growth of moulds and fungi.

Standards

IASA TC-03	The Safeguarding of the Audio Heritage : Ethics, Principles and Preservation Strategy. 1997.

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Magnetic Carriers

TYPOLOGY AND HISTORY 2

MAGNETIC TAPES 2
TYPES OF MAGNETIC TAPE CONSTRUCTION 2
TYPES OF MAGNETIC TAPE HOUSING 3
– OPEN SPOOL TAPES 3
– CASSETTE TAPES 3
– TAPE CARTRIDGES 4
MAGNETIC DISCS 4
DATA DENSITY VERSUS DATA SECURITY 4
TYPOLOGY OF MAGNETIC TAPE CARRIERS (AUDIO AND VIDEO) - SYNOPSIS 5

CAUSES OF DETERIORATION AND PREVENTIVE MEASURES 5

THE STABILITY OF MAGNETIC CARRIERS 5
HUMIDITY 5
TEMPERATURE 6
MECHANICAL INTEGRITY 6
DUST AND DIRT 6
MAGNETIC STRAY FIELDS 6
SUMMARY 7

STANDARDS 8

BIBLIOGRAPHY 9

WEBSITE DIRECTORY 11

Magnetic Carriers

Typology and history

Magnetic media are essential to modern life. They are used in the form of tape to record sounds and images and to record digital data. In the form of hard and floppy discs they are used to store computer data. When applied in the form of a magnetic strip to a card, magnetic media control our access to money from cash dispensers, entry to doors and to many other things.

The basic principles for recording signals on a magnetic medium were set out in a paper by Oberlin Smith in 1880. The idea was not taken any further until Valdemar Poulsen developed his wire recording system in 1898. Magnetic tape was developed in Germany in the mid 1930's to record and store sounds. The use of tape for sound recording did not become widespread, however, until the 1950's. The BBC, for example, was still using disc recorders until around 1965.

The recording of images on magnetic tape came later. As with sound recording, there were several systems before tape recording came into common use. The first known recordings of images by a non-photographic method were made by John Logie-Baird in 1924. The images were recorded on to 78 rpm discs which are now in the National Sound Archive in London. The first practical recordings of television programmes were made using special film cameras filming video screens. The first video recording machine using tape was made by the BBC in 1955. It used a half inch tape running at 120 inches per second - just over 3 metres per second. This was swiftly superseded by the introduction of the Ampex Corporation's 2 inch video tape system. The arrival of new formats for recording video pictures has steadily increased since then. It has been calculated that, taking the different broadcast standards and electricity supplies into account, images have been recorded on over 100 different formats in the 40 years since video-tape recording started.

Although some dictating machines using a disc coated with a magnetic pigment were in use from the 1950's, disc based media did not develop until computers became widespread. The steady increase in the storage capacity and decrease in physical size of both hard and floppy discs has paralleled the developments in the tapes used for sound and image recording.

Magnetic Tapes

Magnetic media in the form of tapes on open reel or housed in cassettes and cartridges are the most widespread carriers for audio and video data and are widely used for the storage of large quantities of computer data. They are a reliable, low-risk and economical storage medium. Archivists and librarians can rely on a long period of experience in the care and handling of magnetic tapes in archives. If free from production faults, they can be preserved for many years. The oldest audio tapes are now over 60 years old and still perfectly readable.

Types of Magnetic Tape Construction

Early audio tapes used cellulose acetate as the support film material, which is also used for safety film. Cellulose acetate has a tendency to become brittle through hydrolysis caused by the moisture contained in the atmosphere. This brittleness generally causes serious problems when playing old audio tapes. Tapes with severe cases of hydrolysis can suffer from the so-called "Vinegar Syndrome", an auto-catalytic process whereby acetic acid is set free in ever increasing quantities and thus creates an accelerating effect on the decay process. This has been particularly experienced in film archives, especially in hot and humid climatic areas. Affected films become soft and limp, ending up as powder or slime. While, in theory, this may also happen to acetate audio tapes, no disastrous losses similar to those in the film world have been reported. Still, acetate tapes, which were produced until the mid 1960s, are at risk and transfer onto other carriers must be envisaged.

Another group of historical audio tapes used polyvinyl chloride (PVC) as the base film material. As with vinyl discs, these tapes have not exhibited any systematic instability ; the long term prospects are, however, unknown.

Polyester is the base film material which is used for all modern audio and all video and computer tapes. It has the greatest resistance of all base materials to mechanical stress and the influence of humidity. No systematic stability problems have occurred so far but, again, its stability over very long periods (centuries) is unknown.

Many varieties of magnetic materials have been used for the pigment layer, for example the various oxides of iron used from the very first tapes until today and chromium dioxide. Only metal powder, as used in more recent high density tape formats, has given cause for serious concern. Early tapes metal powder tapes suffered from corrosion but this problem now seems to be under control. There is, again, no precise answer to the question of how long metal particle tapes will keep their information undistorted and readable. It must be emphasized, however, that, contrary to layman's expectations, the magnetic information on properly stored and handled tape does not fade away.

The greatest problem related to magnetic tape is the stability of the pigment binder - the glue that holds the magnetic particles together and to the base film. A considerable number of audio and video tapes, especially amongst those produced during the seventies and eighties, are suffering from pigment binder hydrolysis. The atmospheric moisture is absorbed by the pigment binder causing the polymer to hydrolyse and lose its binding property. Tapes of this kind deposit a smear of magnetic particles onto the replay heads. This clogs the heads and swiftly makes the tape unreadable. In extreme cases, the oxide layer the completely delaminates from base in large segments when the tape is played. Processes to render such tapes playable again are available, but the restoration process is cumbersome, time consuming and cannot restore the most severely affected tapes. This problem has been found especially in hot and humid areas where many tapes do not last longer than a few years.

Types of Magnetic Tape Housing

There are three basic methods for the immediate storage of tape : open spool, cassette and cartridge. The tape on an open spool has to be threaded on to the machine and the free end secured on a second spool by hand - a time consuming task and easily performed incorrectly. Tape in a cassette is enclosed in a shell and the two ends of the tape are securely fixed to captive spools. A cartridge is also fully enclosed but the tape is in the form of a continuous loop. Cassettes and cartridges are easier to load on to a machine than open spool tapes and are also suitable for use in robotic storage systems. Cassettes are common for modern video and computers but relatively few are used for professional audio. Cartridges are most commonly encountered with data but some are used for audio - particularly for short items such as station idents and commercials.

– Open Spool Tapes

Open spools were until recently the main form of tape used for professional audio recordings. Continental European tradition generally uses professional tape on flangeless hubs only, a practice that requires additional care when handling the tapes. Some expensive professional digital audio formats like DASH and PD (ProDigi) use reel-to-reel tape and stationary head technology. Early video and many data tape formats also used tape in open spool form.

– Cassette Tapes

Cassettes are used for many purposes. They range from the Compact Audio Cassette or Musicassette through the many types of video cassette to the latest Digital Audio Tapes with rotary heads (R-DAT). They are probably the most widely used form of tape used in modern systems.

The Compact Audio Cassette was originally designed for use with dictating machines. Its convenient size led to it becoming used for the issue of commercial music recordings and for home recording. Except as an access tape, it was not normally used for professional work. In addition to the Compact Cassette, there have been several other cassette tape formats used for dictating machines.

Many types of cassette have been used for analogue video recordings both professionally and in the home. The commonest is the ubiquitous VHS cassette. Other formats include the 3/4 inch U-Matic - a

semi-professional format - and the 1/2 inch BetaCam used by many broadcasters around the world. All video tape formats, analogue and digital, use rotary head technology. Some of these digital video formats were also adapted for the storage of general computer data.

Rotary head technology is used for the digital audio format R-DAT, while stationary head technology is employed for the DCC (Digital Compact Cassette), a data-reduced digital consumer audio format designed to replace the Compact Audio Cassette, but without success.

A variety of cassette formats are used in the computer world as back-up tapes for the information held on hard discs as well as carriers in mass storage systems - the so-called streamer tape formats. These include linear formats like QIC- 80, Exabyte or DLT as well as various rotary head formats, derivates of R-DAT (DDS) and of various digital video formats.

The R-DAT format potentially makes an ideal data backup media. However, there is little experience of their long-term storage qualities. Opinions are divided. Some experts say that a five year re-copying term is appropriate, others claim that DAT are not suitable for long-term storage. For safety reasons, a two year recopying term is advisable until more is known of the long-term performance of these formats.

– Tape Cartridges

The primary use for cartridges is for storing computer data but a variant was extensively used to record short sound sequences for commercials, station identifications and the like. These audio cartridges were either monophonic or stereophonic (two tracks). The cartridges used for computer data, however, use 24 tracks which permits a storage capacity of 12 700 bpi. Due to the sequential recording, the average access-time is relatively long.

Magnetic Discs

There are two types of magnetic disc - the hard discs and the floppy discs. While reading and writing, the disc is rotating around its centre. The data are recorded in circular tracks, sector by sector. Because of the sectorial access to the data, the average access- time is relatively short.

Floppy discs are thin, flexible plastic plates covered with a magnetic oxide layer and protected by a firmly fastened square plastic jacket. At present, the common format is the 3.5 inch disc. The older 3.0, 5.25 and 8.0 inch discs are no longer in use and it is difficult to find drives for them. The storage capacity of a 3.5 inch disc is 1.4 MB. 3.5 inch discs with a capacity of 2.88 MB have been developed but are not very common.

Data interchange on floppy discs usually causes no media problems provided that a drive for the physical format of the disc is available. Discs are not suitable for long-term storage. They can deform because of the instability of the plastic material and damage the drive. They should, therefore, only be used for a limited period of time.

Hard discs are usually found installed permanently in computer systems and used for very fast access, short term storage. Removable hard discs exist but they are not common. Although hard discs are reliable, it is advisable to make back-up copies of data stored on them. Storage capacities in excess of 8 GB are now common and, when hard discs are used in an array (RAIDs), very large storage capacities can be achieved - albeit at greater cost compared with other storage formats. Hard discs in RAIDs will be in continuous use and have a life expectancy of several years.

Data Density versus Data Security

The history of magnetic storage media is the history of ever increasing data density. This has been achieved by the steady decrease in size of the elementary magnetic structure - from iron oxide via chromium dioxide to "pure metal" as used in metal particle tape and hard discs. In parallel with this, has come the development of ever smaller gaps in the reading heads, very thin base films (some R-DAT tapes are only 9µm "thick") and very narrow tracks widths (13µm on R-DAT). By use of these developments, ever increasing quantities of information can be recorded on ever decreasing sizes of carriers.

The danger is, however, that the recorded information becomes increasingly vulnerable. It is generally true to state that, because of their increased data density, modern formats are less reliable than older formats with their less dense storage capacities. Correct recording and reading of information onto or from modern magnetic formats is highly dependent on the physical and chemical condition of the recording medium being in pristine condition, the replay equipment functioning perfectly and an environment free from disturbing factors such as smoke, dust, and other pollutants.

Typology of magnetic tape carriers (audio and video) - synopsis

carrier	date of manuf.	media	type of recording	record. proced.	composition
magnetic tape	1935- 1960	sound	analogue	magnetic	base : cellulose acetate magnetic pigment : Fe_2O_3 formats : open reel audio
	1944 - 1960	sound	analogue	magnetic	base : PVC magnetic pigment : Fe_2O_3 formats : open reel audio
	1959-	sound / video	analogue	magnetic	base : polyester magnetic pigment : Fe_2O_3 formats : open reel audio, compact cassette IEC I 2 inch ("quadruplex") open reel video
	1969-	sound / video	analogue / digital	magnetic	base : polyester magnetic pigment : CrO_2 formats : compact cassette IEC II, DCC 1 inch open reel video, VCR, U-matic; VHS, Betamax, Video 2000, Betacam, D1
	1979-	sound / video	analogue / digital	magnetic	base : polyester magnetic pigment : metal particle (MP/ME) formats : compact cassette IEC IV, R-DAT ; video8/Hi8, Betacam SP, M II, all digital video formats (except D1)

Causes of deterioration and Preventive Measures

The stability of magnetic carriers

The main factors that affect the stability of carriers and the retrieval of information can be summarised as :

- humidity and temperature,
- mechanical deformation,
- dust and dirt of all kinds,
- magnetic stray fields.

Humidity

Humidity is the most dangerous environmental factor. Water is the agent of the main chemical deterioration process of polymers : hydrolysis. Additionally, high humidity values (above 65 % RH) encourage fungus growth, which literally eats up the pigment layer of magnetic tapes and floppy discs and also disturbs, if not prevents, proper reading of information.

Temperature

Temperature is responsible for dimensional changes of carriers, which is a particular problem for high density tape formats. Temperature also determines the speed of chemical processes : the higher the temperature, the faster a chemical reaction (eg hydrolysis) takes place ; the lower the temperature, the slower the chemical reaction.

Recommended Climatic Storage Conditions						
	temperature	±/24h	±/year	RH	±/24h	±/year
	°C	°C	°C	%	°C	°C
preservation storage	between 5 and 10	±1	±2	30	±5	±5
access storage	around 20	±1	±2	40	±5	±5

Fluctuations of target temperature and humidity values should be kept to a minimum. Operational areas (studios) should, therefore, have the same climatic condition as the access storage areas. Tapes must be allowed to slowly acclimatise to the change in conditions when brought out of or returned to the preservation storage.

It is of utmost importance that both temperature and humidity are controlled simultaneously. Damage to tapes can occur if attempts are made to cool the storage environment without dehumidification. Such action will normally lead to an excessive rise in relative humidity.

Mechanical Integrity

Mechanical integrity is a much underrated factor in the retrievability of data recorded on magnetic media : even slight deformations may cause severe deficiencies in the play back process. Most careful handling has, therefore, to be exercised, along with regular professional maintenance of replay equipment, which, if it malfunctions, can destroy delicate carriers such as R-DAT very quickly. With all tape formats, it is most important to obtain an absolutely flat surface of the tape pack to prevent damage to the tape edges which serve as mechanical references in the replay of many high density formats. All forms of tape - open reel, cassettes and cartridges - and floppy discs should be stored upright.

Dust and Dirt

Dust and dirt prevents the intimate contact of replay heads to media which is essential for the retrieval of information, especially with high density carriers. The higher the data density, the more cleanliness has to be observed. Even particles of cigarette smoke are big enough to hide information on modern magnetic formats. Dust may also be responsible for "head crashes" of computer hard discs and of rotary head formats, which inevitably leads to irretrievable loss of data. It goes without saying that in addition to the mechanical problems caused by dust, fingerprints and smoke, chemical pollution caused by industrial smog can accelerate chemical deterioration. The effective prevention of dust and other kinds of dirt and pollution is, therefore, an indispensable measure for the proper preservation of magnetic media.

Magnetic Stray Fields

Magnetic stray fields, finally, are the natural enemy of magnetically recorded information. Sources of dangerous fields include dynamic microphones, loudspeakers and head sets. Also magnets used for magnetic notice boards etc, possess magnetic fields of dangerous magnitudes. By their nature, analogue audio recordings, including audio tracks on video tapes, are the most sensitive to magnetic stray fields. Analogue video and all digital recordings are less sensitive. For the safeguarding of analogue audio recordings it is necessary to keep to the following maximum magnetic stray fields :

- AC fields : 5 Oe (Oersted) = 400 A/m (Ampere per metre)
- DC fields : 25 Oe = 2000 A/m.

It should be noted that normally a distance of 10-15 cm is enough to diminish the field strength of even strong magnets to acceptably low values.

Summary

Although magnetic media are generally quite stable and analogue magnetic tape has been in existence for over 60 years, none of the magnetic media are designed with longevity in mind. Even if all recommended standards and practices for the preservation of original magnetic carriers are carefully observed, it not possible to preserve them for long periods. Sooner or later copies will have to be made. Because of the increasing deterioration of audiovisual information when copying in the analogue domain, a preservation policy based on copying can only be successful in the digital domain. For digital documents, audiovisual as well as computer data, the problems related to the preservation of the carriers are increasingly overshadowed by the problems of the obsolescence of hardware and associated software. The management of future migration is, therefore, becoming the central issue of audiovisual as well as of general data preservation. Self-checking and self-regenerating digital mass storage systems are likely to become a powerful tool in future preservation policy.

The digitization of analogue carriers and the migration of information already in the digital domain are gigantic tasks. Because these will take time to complete, digitization/migration projects must be arranged in a hierarchical order. Priority must be given to those documents which are in frequent demand and to those which are at immediate risk. Meanwhile, those documents which are in good condition can wait. They must, however, be stored with all possible care in order to keep them in the best possible physical condition until their turn for digitization or migration comes.

Standards

– **International**

ISO/IEC 11172	MPEG-1 - Video compression system.
ISO/IEC 13818	MPEG-2 - Video compression system.

– **National**

ANSI X3.14-1983	American national standard for information systems : recorded magnetic tape for information exchange.
BS 4783:1972	Recommendations for the care and transportation of magnetic tape.
BS 4783:1988	Recommendations for storage, transportation and maintenance of magnetic media for use in data processing and information storage. Part 2 : Recommendations for magnetic tape on open spools.
BS 4783:1988	Recommendations for storage, transportation and maintenance of magnetic media for use in data processing and information storage. Part 3 : Recommendations for flexible disk cartridges.
BS 4783:1988	Recommendations for storage, transportation and maintenance of magnetic media for use in data processing and information storage. Part 4 : Recommendations for magnetic tape cartridges and cassettes.

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Website Directory

Records and Information Management Resource List
Links to Records and Information Management (RIM) and other related Websites.
A list of resources created by Alan S. Zaben.
http://home.earthlink.net/~survivoraz/infomgmt/medstr_f.htm

Electronic Storage Media
A list of information resources on the CoOL website.
http://palimpsest.stanford.edu/bytopic/electronic-records/electronic-storage-media/

Audio/Video Glossary
Searchable alphabetically and by subject.
http://www.soundsite.com/glossary/glossary.html

European audiovisual Conference
Speeches, papers and reports from the Conference. Birmingham (UK), 6-8th of April 1998.
http://europa.eu.int/eac/bg-intro_en.html

Optical Carriers

TYPOLOGY AND HISTORY 2

Mass Produced Discs 2
Write-Once Recordable Media 2
Optical Tape 3
Rewritable Optical Media 3
Typology of optical carriers - synopsis 4

CAUSES OF DETERIORATION AND PREVENTIVE MEASURES 5

The Stability of Optical Carriers 5
Humidity and Temperature 5
Mechanical Deformation 5
Dust and Dirt 5
Light 6
Magnetic Stray Fields 6

STANDARDS 7

BIBLIOGRAPHY 8

WEBSITE DIRECTORY 9

Optical Carriers

Typology and history

Optical media are used for storing digital sounds, images and data. There are three main families :

— the commercially issued, mass produced, CD family including the digital audio CD – both 12 cm and the "single" 8 cm disc – CD-ROM, CD-I and CD-V and the analogue Video Disc,

— optical discs and tapes that can be recorded on once,

— re-recordable discs.

Jukeboxes are available for most types of disc allowing automated access to a number of discs.

Mass Produced Discs

The mass-produced discs of the CD family have the digital information in the form of microscopic pits pressed into a polycarbonate base which is coated with a light reflective layer. This reflective layer is usually of aluminium, but gold and silver are also used. A transparent lacquer is then placed over the reflective surface to protect it. This surface also carries any label information. As the data are impressed, they cannot be altered or rewritten.

Because of the high costs to setup the production of a pressed disc, the discs are only used when large numbers of copies are required (over about 100), for example, encyclopaedia or sound recordings. The higher the number of discs issued, the lower is the unit price. The storage capacity of a 12 cm CD is about 650 MB or 74 mn of audio. The average access time is about 300 ms with a double speed player, 250 ms with quadruple speed and 130 ms with sextuple speed.

The first disc in the family to be developed was the 30 cm analogue LV (Laser Vision) Disc for video. This usually consisted of two discs stuck back-to-back to form a double sided disc with one hour of video per side. A sub-format was developed which could store up to 54,000 still video images per side. The LV disc was the most successful of several attempts to generate market acceptance but is expected to be superseded by the DVD (Digital Versatile Disc or Digital Video Disc) that was launched in 1997.

The DVD is the same diameter as the CD (12 cm) but, by using a laser with a shorter wave length of light, the storage capacity of one layer is increased by a factor of 7 to 4.7 GB. Additionally, a dual layer structure will be possible, read by two different laser wave lengths, thus doubling the capacity to 9 GB. In principle, by glueing two such double layer discs together like the LV video discs, a total capacity of 18 GB can be achieved. The disc is intended for the storage of data-reduced video-films or, like CD-ROMs, texts and multimedia data with, however, considerably higher storage capacities.

Write-Once Recordable Media

There are several types of write-once recordable discs. The format that is becoming the most widely used is the recordable CD (CD-R or CD-WO) which has been available since 1993. Having the same format and storage capacity as the audio CD and the CD-ROM, the CD-R can be played on the appropriate standard CD drives. The polycarbonate body of the disc has a dye layer placed on it which is then coated with a metallic reflective layer. The dye layer carries the data in place of the pits of pressed discs. When recording, high-intensity laser pulses change the dye shape so optical properties. The low-intensity read laser reads the changes in reflected light as a digital bit stream. Once written, the data cannot be altered. CD writing drives are available on different speed levels. The CD-R is a well established and standardized format. Different standardized software protocols are available for

recording Audio CDs and CD-ROMs. The Photo-CD is a CD-R with a proprietary software protocol to record photographs as electronic still images.

A recordable version of the DVD in not yet available, but is expected in the near future.

CD-Rs are but the latest and most prominent examples of so-called WORM (Write Once, Read Many) discs which have been in use as computer storage media for quite some time. The biggest problem with WORMs is the great variety of systems and formats. A number of producers offer WORMs with a continuous helical recording format similar to a sound LP disc ; others offer discs with ring-shaped tracks as on computer floppy and hard discs. Some can use both formats. The proprietary software of WORMs poses a problem, too. Not even the physical dimensions are standardized.

One writing method used by a number of manufacturers including LMS, Toshiba and Sony burns pits in the metallic surface of the disc with a laser beam. Another system supported by ATG and Optimen creates bubbles by the heat of the laser beam. In both cases the reflectance of the metallic layer is changed and the data can be read by a low power laser beam.

Optical Tape

Optical tape is made by ICI and packaged in a cassette for use as a WORM format data storage tape. The tape drives are made by EMASS in the USA and supplied in Europe by GRAU Storage Systems. Kodak are about to launch a competing system.

The tape contains a dye layer which changes its state when a high power laser beam is applied and can be read by a lower power laser - the same basic method as for CD-Rs. Because the tape is a sequential carrier, the access time can be quite long. In compensation, the storage capacity of one tape is considerably greater than a disc (up to 100 GB).

Rewritable Optical Media

In contrast to the preceding optical media, data on rewritable optical discs ("Erasable"), Magneto-Optical (M/O) and Phase-change, can be altered or deleted many times. There are rewritable optical discs in the 5.25 inch format and, more recently, in the 3.5 inch format. The most common still are the magneto-optical discs, where a laser beam in the write mode heats the inner layer of the optical disc and thus changes the polarity of a magnetic coating. The resulting microscopic magnetic marks of different polarity can be read as a bit stream by a low-energy laser beam in the read mode. A more recent recording technology is the Phase-change where the carrier layer is coated with a thin semi-metal film, which can be both in an amorphous and in a crystalline state. A laser beam in the write mode can change single spots to either an amorphous or a crystalline state so that, again, a digital bit stream is created. The Phase-change may replace M/O in the future.

Rewritable optical discs have a short access-time (600 milliseconds). The storage capacity has steadily increased up to the current 2.6 GB.

Typology of optical carriers - synopsis

carrier	date of manuf.	media	type of recording	recording method	replay method	composition
LV Laser Vision	1982-	video / still image	analogue	mechanically pressed	optically read by laser	base : polycarbonate, reflective layer : aluminium varnish
CD - replicated	1981-	all media	digital (except CD-V : video analogue)	mechanically pressed	optically read by laser	base : polycarbonate, reflective layer : aluminium varnish, inks
CD recordable	1992-	all media	digital	thermically written by laser	optically read by laser	base : polycarbonate, organic dyes : cyanine, phtalocyanine reflective layer : gold, silver varnish, inks
CD rewritable	1996-	all media	digital	phase change written by laser	optically read by laser	base : polycarbonate, phase change layer reflective layer varnish, inks
DVD replicated	1997-	all media	digital	mechanically pressed	optically read by laser	base : polycarbonate, semi-reflective layer, fully reflective layer : aluminium coating glue double face
DVD recordable	1997-	all media	digital	thermically written by laser	optically read by laser	base : polycarbonate, organic dye, reflective layer : gold coating glue, inks single face
DVD rewritable	1998-	all media	digital	phase change written by laser	optically read by laser	base : polycarbonate phase change layer reflective layer single face disc in caddy
MD MiniDisc replicated	1992-	sound	digital	mechanically pressed	optically read by laser	base : polycarbonate reflective layer : aluminium varnish disc in caddy
MD MiniDisc recordable	1992	sound	digital	magnetic written by laser	optically read by laser	base : polycarbonate MO layer reflective layer : aluminium disc in caddy

Causes of deterioration and Preventive Measures

The Stability of Optical Carriers

The main factors that affect the stability of carriers and the retrieval of information can be summarised as :

- humidity and temperature,
- mechanical deformation,
- dust and dirt of all kind.

For some carriers there are additional factors :

- light,
- stray magnetic fields.

Humidity and Temperature

Humidity is, as with other data carriers, a most dangerous factor. In the case of optical media it has a hydrolytic action on components such as the protection layer of CDs and a corrosive influence on all metal components including metallic reflective layers. As a secondary effect, high humidity levels (above 65 % RH) encourages the growth of moulds and fungi which can obstruct the reading of optical information.

Temperature, as with all other data carriers, determines the speed of (deteriorating) chemical reactions. More importantly, it is responsible for dimensional changes which may be of concern, especially in the case of multi-layer media.

Recommended Climatic Access Storage Parameters						
	temperature	±/24h	±/year	RH	±/24h	±/year
optical media	about 20°C	±1°C	±3°C	40%	±5°C	±5°C

Fluctuations of chosen parameters should be kept to a minimum. Operation areas (studios) should, therefore, have the same climatic conditions as storage areas. As with magnetic carriers, tighter parameters would be favourable for long term preservation. Such suggestions have, however, to be offset against the availability of hard- and software, which seems to be of greater concern than the stability of the carriers themselves.

Mechanical Deformation

Mechanical integrity is of utmost, and underrated, importance. Even microscopic scratches can hinder the reading laser beam, as do fingerprints and other foreign matter. Mechanical bending of discs cause microscopic cracks which again divert the laser. While the WORM and MO-discs developed as computer storage media are housed in cartridges which only open when inserted into the respective players, the representatives of the CD-family must be handled with utmost care, keeping mechanical integrity in mind. Some professional CD players will handle CDs kept in special storage cartridge shells that prevent the disc being touched or deformed when loading and unloading. These add to the expense but can help preserve frequently used or particularly valuable discs.

Dust and Dirt

Dust and dirt prevent the proper reading of the recorded information. Cigarette smoke will accumulate on the disc surfaces and may hide information. The CD-family is again more exposed to this danger than those discs that are protected by cartridges.

Light

Light may affect the dye layers used in recordable and erasable discs.

Magnetic Stray Fields

Magnetic stray fields must be kept away from magneto-optical discs.

Standards

ISO/DIS 9171-1.2. ISO/IEC 9171-1:1989	Information Processing – Information Interchange on 130 mm Optical Disc Cartridge – Write Once (5.25 inch-WORM, 297-327 MB on each Side), Part 1 : Unrecorded Optical Disc Cartridge (Technical concept, conditions for handling and storing, measures, mechanical and physical properties, optical properties or information, physical interchangeability between systems)
ISO/DIS 9171-2.2. ISO/IEC 9171-1:1990	Information Processing - Information Interchange on 130 mm Optical Disc Cartridge - Write Once (5.25 inch-WORM, 297-327 MB on each Side), Part 2 : format of recording (tracks and sector, correction of mistakes, methods of modulation of recording, sequence of recording, data capture)
ISO DP 10090- Draft Proposal	Standards for Information Interchange on 86 mm Optical Disc Cartridges (3.5 inch Rewritable M/O, 120 MB on each Side) are still under preparation.
AES28-1997	AES Standard for Audio Preservation and Restoration - Method for Estimating the Life Expectancy of compact discs (CD-ROM), based on the effects of temperature and relative humidity.
AES35-xxxx	Draft AES Standard - Method for estimating the Life Expectancy of magneto-optical (M-O) discs, based on the effects of temperature and relative humidity.
AES36-xxxx	Draft AES Standard - Procedures for the storage of optical discs including read only, write once and rewritable.
AES38-xxxx	Draft AES Standard - Life Expectancy of information stored in recordable compact disc systems. Methods for estimating, based on the effects of temperature and relative humidity.

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Website Directory

Records and information management resource list
Links to Records and Information Management (RIM) and other related websites.
A list of resources created by Alan S. Zaben.
http://home.earthlink.net/~survivoraz/infomgmt/medstr_f.htm

Electronic Storage Media
A list of information resources on the CoOL website.
http://palimpsest.stanford.edu/bytopic/electronic-records/electronic-storage-media/

Audio/Video Glossary
Searchable alphabetically and by subject.
http://www.soundsite.com/glossary/glossary.html

European audiovisual Conference
Speeches, papers and reports from the Conference. Birmingham, 6-8th of April 1998.
http://europa.eu.int/eac/bg-intro_en.html

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Electronic Publications, Electronic Documents and Virtual Information

ELECTRONIC PUBLICATIONS **2**

DEFINITION AND TYPOLOGY OF ELECTRONIC PUBLICATIONS **2**

OFF-LINE PUBLICATIONS 2
ON-LINE PUBLICATIONS 2
DISTINCTION BETWEEN AUDIOVISUAL MATERIAL AND AN ELECTRONIC PUBLICATION 3
ELECTRONIC DOCUMENTS OR VIRTUAL INFORMATION 3

WHAT IS INVOLVED IN ACQUIRING ELECTRONIC DOCUMENTS AND PUBLICATIONS ? **3**

SELECTION 3
ACQUISITION AND REGISTRATION 4
INSTALLATION 4
DESCRIPTION OF THE DOCUMENT 4
METADATA 4
UNIQUE IDENTIFICATION 4
AUTHENTICITY AND INTEGRITY 4
DE-INSTALLATION 5
MIGRATION, STORAGE, CONVERSION AND EMULATION 5

LONG TERM AVAILABILITY AND ACCESS FOR END USERS : REMOTE OR ON SITE **5**

INDEXING 5
ACCES 5
COPYRIGHT ISSUES, AUTHORS AND PUBLISHERS 5
USAGE OF STANDARDS 6
AVAILABILITY OF ELECTRONIC PUBLICATIONS ON THE MARKET 6

BIBLIOGRAPHY **7**

WEBSITE DIRECTORY - ELECTRONIC PUBLICATIONS **9**

WEBSITE DIRECTORY - DIGITIZATION **11**

Electronic Publications, Electronic Documents and Virtual Information

This chapter reviews the special problems created by these new methods of creating and supplying information. Many of the documents rely on storage provided by physical media that have been discussed in the preceding chapters.

Electronic Publications

Electronic publications cover the rapidly increasing area of publications that require a computer to be used to access the information that they contain. They can be documents distributed free of charge or obtained by purchase. They are supplied in two forms –- Off-line publications and On-line publications. Some electronic publications are not supplied on physical carriers and need to be copied into the libraries' access system and be stored on hard disc stacks, tape streamers or other data storage systems ; others are supplied on physical carriers and can be stored on shelves. This chapter will, therefore, be looking not at the physical carriers –- they have been covered in the preceding chapters –- but at the specific problems of acquiring, selecting, storing and accessing this group of documents.

Definition and Typology of Electronic Publications

Off-line Publications

An off-line publication is an electronic document which is bibliographically identifiable, which is stored in machine readable form on an electronic storage medium. CD-ROM, diskettes or floppy discs and magnetic tapes are examples.

– Off-line monograph eg a CD-ROM encyclopaedia.
– Off-line serial eg a CD-ROM journal.

On-line Publications

An on-line publication (or resource) is an electronic document which is bibliographically identifiable, which is stored in machine readable form on an electronic storage medium and which is available on-line. For example - an electronic journal, a World Wide Web page or an on-line database.

- On-line monograph eg. a dictionary on the Web.
- On-line serial eg. an electronic journal on the Web.
- On-line resource eg. an organisation's home page.

Electronic publications can be original electronic publications, but they can also be the digitised version of a written or printed document. For many collections, most of the electronic publications will be the digitised version of a written or printed document in their possession. Examples include the CD-ROM of the National Library in Prague which contains several manuscripts and other documents, the Saint Sophia Project from Bulgaria, the Radziwill Chronicle, the Sana'a Manuscripts and the Memoria de Iberoamerica.

The producers and publishers of electronic publications can be traditional publishers who expand into new areas of publishing. It can also be newly established content providers, especially in case of the new publications on the World Wide Web, who only offer on-line electronic publishing. In addition, some companies specialize in CD-ROM publishing.

Nowadays, most publications are written, edited and formatted using word processors and desk-top-publishing software. The printed version of the journal or the monograph is derived from the electronic form.

Distinction between Audiovisual Material and an Electronic Publication

Multimedia publications are now produced which contain a mixture of material e.g. a biography, a bibliography, stills (photos), animation, video and sound. It sometimes becomes difficult to distinguish between an audiovisual document and an electronic publication related to text. For example, a movie with subtitling is audiovisual – a CD of Michael Jackson with a video clip consisting of moving images is considered to be an audio CD. A CD-ROM which contains a biography, a bibliography, texts of the songs, some sound, video and photos is considered to be a multimedia CD-ROM publication.

In short, an electronic publication must contain a considerable amount of text before a library will take it on deposit. Some libraries also take audiovisual publications into deposit. e.g. Die Deutsche Bibliothek in Frankfurt am Main in Germany.

Electronic Documents or Virtual Information

The term Electronic Documents or, as they are sometimes called, Virtual Information, refers to the modern methods of transmitting documents between individuals, primarily text-based documents – the equivalents of letters and memoranda – by electronic means ie. without the use of paper. Many of the actual and potential problems created by electronic documents are similar to those created by electronic publications.

The documents, while stored on a physical carrier somewhere and easily accessible to a small group of people including the author, are, nethertheless, difficult for an archivist to obtain access to and preserve. The documents include E-Mail messages and computer files held on personal computers. When electronic documents are stored, it is on physical carriers used by other types of documents. The main factor that differentiates electronic documents from other documents is the method of transmission.

The first, and major, problem in the preservation of electronic documents is to gain access to them and discover what exists. This can only be done with the active support of the institution and its staff. If the institution has a PC network, the problem of access can be eased.

Since many of the E-Mail messages between staff are likely to be trivial and, perhaps, somewhat embarrassing if read by others than the author and the intended recipients, it is essential to ensure that everyone is aware that the archive will be periodically reviewing both formal files and messages held in the central file server to select material that is worth preserving.

Once access is gained, the material can be subject to standard selection criteria and the chosen information copied into the archive's data storage system. The long term preservation of the information can then be part of the archive's strategy for documents in general.

What is involved in acquiring electronic documents and publications ?

Selection

Research is being carried out by many archives and libraries into the best methods to give access to electronic materials in the very long term. Because of the sheer quantity of material being produced, particularly for access via the World Wide Web, selection is essential. Many archives and libraries use the existing selection criteria for printed materials for electronic materials as well. The contents of the document are the relevant factors for selection and not the medium. This means that the physical carrier, the hardware and the software used are not relevant for the selection process. Local policy defines the criteria for selection e.g. in Germany audiovisual material is included in the national bibliography, in some other countries it is not.

Acquisition and Registration

Off-line publications can often come to the library as printed publications. Obviously, when the library starts collecting off-line publications, the publishers have to be notified. In the Netherlands, where deposit is done on voluntary basis, it is important that the publishers are kept informed about the new selection criteria. In France, the law defines what publications are to be submitted.

On-line publications require a new form of co-operation. The publication has to be transmitted from the host system to the library via the network. Selected documents are either ordered, transferred automatically by the publisher or harvested by the library with a harvester application. For on-line documents, acquisition means the physical migration (via the network) of the document from the host-system to the depository system. The publisher/producer or administrator (for archives) needs to be involved in this process.

It is necessary to register documents when they are received by the library. This requires the exchange of bibliographic information (pre-publishing information) between the depository library and publisher (for archives this will be between the governmental institution and the archive), preferably before acquisition. The registration of incoming documents should be activated on arrival.

Installation

It is necessary to install the electronic publication so it can be viewed and described by the librarian. For on-line documents, a connection to the host-system is required ; off-line documents have to be physically installed on a workstation.

Description of the Document

Cataloguing systems for electronic documents are still the subject of much debate. Various groups are discussing how to describe an electronic document. The existing book-based systems such as MARC and its variants do not fully describe these new formats. For example, to be able to view an electronic publication it is also necessary to describe the technical features - which computer and operating system was the publication made for ? which formats are used ? etc. Many fields for the technical description will be made in coded form.

Metadata

Electronic publications offer an opportunity to automate part of the production of a catalogue. Bibliographic data can be retrieved from the electronic publication itself, e.g. from the table of contents (TOC). A research project of the European Commission, BIBLINK, is studying how data can be exchanged between publisher and library in an automated way. The Dublin Core defines the fields that are necessary to support adequate bibliographic description of a Web page. The Dublin Core has received significant support, particularly from North America and including some publishers. A threat that may ultimately make it unacceptable, is that the Dublin Core contains too many features requiring definition at the national level or that require a large maintenance overhead.

Unique Identification

In the international book trade, the unique identification numbers ISBN (International Standard Book Number) and ISSN (International Standard Serial Number) are widely used to uniquely identify a certain version of a monograph or serial publication. ISBN and ISSN are also used for CD-ROMs and on-line publications like electronic journals. However, these numbers are not designed for electronic publications and a proposal was, therefore, made for a Digital Object Identifier (DOI). The DOI is designed by Association of American Publishers and the Corporation for National Research Initiatives.

Authenticity and Integrity

Some electronic publications can easily be changed. What guarantee is there that the bibliographic description defines exactly the version which is stored ? And will it still do so after the lapse of several hundred years and the migration to other carriers and formats. This is still a very tricky area. Several methods are being considered, e.g. time stamps, encryptions and watermarks. But it must be said that the final solution for this issue has yet to be found.

De-installation

After the bibliographical and technical description the electronic publication must be removed from the hard disc on the computer and an on-line session must be closed. This activity has generated new information which should be included to the descriptive record.

Migration, Storage, Conversion and Emulation

Other factors that have to be considered when collecting electronic documents include the following :

- **Migration** – Migration of the electronic content from the original carrier to the physical storage of the depository system, including migration quality control and duplication for backup (preferably on another medium).

- **Storage** – The physical storage system will probably use different types of media with different access speeds, e.g. hard disc (very fast), magneto-optical (fast), tape (slow). This requires sophisticated software to monitor the use of documents and to shift documents from tape to discs and vice versa.

- **Pathfinder** – This is a section of storage that records the physical locations of all the files in a document and makes the file map available to the search engine.

- **Conversion and Emulation** – Do you have to convert the format of the document to a new format, or do you have to design a system in which the document is stored in the original format ? Emulation software enables the document stored in the original format to be viewed using the new hardware and software.

These techniques are concerned with preservation and final solutions have not yet been found. Increasing speed of technological innovation, new publishing techniques, InterNet and the present lack of standards are a few examples of the uncertainties in which the manager of a depository system must work. There is no proven solution for these systems, large vendors have built systems for data-warehousing and data-mining, although some lack the structured indexing and large scale preservation solutions needed by libraries and archives.

Long term availability and access for end users : remote or on site

Indexing

Descriptive information is indexed for use within the search engine of the depository system. This engine can be part of the pathfinder software or can be a separate existing library system's OPAC module, to be defined locally. To find the right compromise between (the user's) indexing requirements and the technical possibilities is very complicated.

Access

Access to electronic publications by end users must be clearly defined. At present, most access is "on-site" but, when agreements are made with the owners of the information, remote access may be possible.

As with the deposit for printed publications, electronic deposit collections should be used as "collections of last resort". Libraries can, however, give access when agreements are reached with publishers and authors.

Copyright Issues, Authors and Publishers

It is obvious that it is very important that the digital archives and libraries discuss restrictions on access and availability with publishers and authors when this is appropriate.

Usage of Standards

There are many relevant standards for electronic publications. The European Commission has launched an initiative, OII (Open Information Interchange), as part of the IMPACT2 programme. The aim of the OII initiative is to promote the awareness and use of standards for the exchange of information in electronic form. The target audience are developers and providers of information products and services, as well as end-users. Standards can be purchased from international standard offices and many countries have an organisation which translates and distributes the standards. For more information visit the Commission's Web site where copies of publications on standards can be found : http://www.echo.lu/oii/activity.html.

For the preservation of electronic publications a variety of standards are relevant. These include standards on hardware, operating systems (Windows, MS-DOS, UNIX), physical carriers (CD-ROM, WORM, DAT, diskettes, magnetic tapes), application programs like word processors, databases, spread sheets and formats like MARC, SGML, HTML, etc.

Availability of Electronic Publications on the Market

Printed publications like monographs and serials are no longer available on the market permanently. After a relatively short time, a specific edition of a monograph can be difficult to find in a book shop. It may be possible to order from a large distributor or even the publisher. With off-line electronic publications it is exactly the same. The publishers are no longer interested in keeping publications available when there is no commercial interest in the products. This may be understandable from the market point of view but is still unfortunate. In addition, publishers often do not have a full archive of their own publications. It is very important, therefore, that as soon as possible after the publication date a document should be selected, described and made available (at least for review on site) by a public body like a national archive or a national library.

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(http://www.archives.ca/ica)

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Website Directory - Electronic Publications

Organisations and Resources

Preserving Access to Digital Information (PADI)
Information (documents, links to other resources, news, publications, glossary, discussion lists) useful for authors, editors, curators, researchers and those interested in the long-term availability of digital documents. (The PADI website is managed by the National Library of Australia; the PADI initiative has received support from several Australian national organisations in the libraries, archives and museums sector, and others.
http://www.nla.gov.au/dnc/tf2001/padi/

IFLA - Digital libraries : resources and projects
A list of resources on digital libraries (bibliography, list of electronic journals, conference calendar, survey of American and European projects).
http://www.ifla.org/II/diglib.htm

Digital Library Information Resources - Berkeley Digital Library SunSITE
The "Preservation resources" page on this site offers information (reports, articles, links to other resources) on the preservation of digital documents.
http://sunsite.berkeley.edu/Info/

The Association of Research Libraries (ARL)
The server provides information on ARL's programmes for the preservation of research library collections and digital documents in particular.
http://www.arl.org/

Council on Library and Information Resources (CLIR)
Commission on Preservation & Access
Cooperation programmes with China, Eastern and Western Europe, Latin America and South Africa, documents on preservation of the film heritage and digital documents. Report on digital imaging and on microfilm preservation.
http://www.clir.org/programs/cpa/cpa.html

Research Libraries Group (RLG)
RLG manages the PRESERV programme on preventive conservation dealing notably with digital documents.
http://www.rlg.org/

Getty Information Institute : Time And Bits
The focus of this site is the long-term preservation of digital documents. It has a selection of links on the subject.
http://www.ahip.getty.edu/timeandbits/index.html

Publications of Cornell University Library
Publications notably concerning digital images in the libraries and archives, evaluation of CD Kodak use, study on microfilms / digital images.
http://www.library.cornell.edu/preservation/pub.htm

Digital Preservation : a Guide to Web Resources
The "Arts and Humanities Data Service" (UK) website provides selected links to resources and commentary on the preservation of digital documents.
http://ahds.ac.uk/resource/preserve.html

Reports and recommendations

Preserving Digital Information : Final Report and Recommendations
Report of a working group set up in 1994 by the Commission on Preservation and Access (CPA) and the Research Libraries Group (RLG). The study aims at ensuring a long-term access to the national cultural heritage. It includes an analysis of digital information particularities and preservation sstrategy which helps to develop organisations and technical principles.
http://lyra.rlg.org/ArchTF/

Digitisation as a Method of Preservation ?
The final report of a working group of the Deutsche Forschungsgemeinschaft (German Research Association).
http://www.knaw.nl/ecpa/publ/weber.html

Using Kodak Photo CD Technology for Preservation and Access. A Guide for Librarians, Archivists, and Curators
A guide written by Anne R. Kenney and Oya Y. Rieger, Department of Preservation and Conservation, Cornell University Library.
http://www.library.cornell.edu/preservation/kodak/cover.htm

Programmes

Programme JTOR
A programme on long-term preservation of journals (notably in the humanities) initiated by the Andrew W. Mellon Foundation in 1994.
http://www.ifla.org/ifla/IV/ifla63/63genr.htm
From project to independant organisation
http://www.dlib.org/dlib/july97/07guthrie.html

Bibliographies

Bibliographies
Recent texts (starting 1990) on the management of electronic media by Richard J. Cox (presented in alphabetical order).
http://www.gslis.utexas.edu/~lis389/coxbib.html

Online Journals

RLG DigiNews
Preservation of digital archives.
http://www.rlg.org/preserv/diginews/edu/timeandbits/

Discussion Lists

DigLibns Electronic Discussion
A discussion list on digital libraries.
http://sunsite.berkeley.edu/DigLibns/

Electronic Archives in Europe : DLM Forum
This forum for public authorities and national archives deals with issues of management, storage, preservation and dissemination of computeised and digital data.
http://www.dlmforum.eu.org/

Websites last visited : 2nd August 1999

Website Directory - Digitization

Directory of resources

Digital Library Information Resources - Berkeley Digital Library SunSITE
http://sunsite.berkeley.edu/Info/
Image and Multimedia Database Resources - Berkeley Digital Library SunSITE
http://sunsite.Berkeley.EDU/Imaging/Databases/

Digital Libraries : Resources and Projects
Discussion list on digital libraries (bibliography, list of electronic journals, programmes of conferences, inventory of American and European projects) set up by IFLA.
http://ifla.inist.fr/II/diglib.htm

Directories of resources
Digital Libraries : a Selected Resource Guide by Katharina Klemperer and Stephen Chapman
http://www.lita.org/ital/1603_klemperer.htm
Building Digital Libraries
http://www.texshare.edu/Services/Professional/digital.html
Electronic Collections Development
http://www.enssib.fr/miroir/okerson/ecd.html

Time & Bits : Managing Digital Continuity
List of resources on conservation of digital documents.
http://www.ahip.getty.edu/timeandbits/links.html

Scholarly Electronic Publishing Bibliography
http://info.lib.uh.edu/sepb/sepb.html

Projects for electronic access to library collections

– ***Developing countries and Mediterranean countries***

Memoria - Memory - Mémoire
"Memory of the world" is a programme launched by UNESCO to promote the preservation of library and archival heritage collections throughout the world and ensure widest possible access to them.
http://www.unesco.org/webworld/mdm/index.html

MEDLIB Internet-based virtual library network for the Mediterranean region
Project of a virtual library for the Mediterranean region,launched by UNESCO,MEDLIB aims to built up a network of libraries and information centres by making use of the latest information technologies, notably the Internet. The network is open to all the interested institutions North and South of the Mediterranean. Links to other relevant websites of libraries and archives in this region are also provided.
http://www.unesco.org/webworld/mediter/medlib.htm

– ***Europe and North America***

Berkeley Digital Library SunSITE
Berkeley Digital Library SunSITE handles digitisation of collections and dissemination of information to leaders of digital library projects. Digitised collections are available particularly in American history and in literature.
http://sunsite.berkeley.edu/

ARTFL Project
ARTFL - American and French Research on the Treasury of the French Language (Trésor de la langue française), is a joint project of the University of Chicago and the French "Institut national de la langue française (InaLF). It includes a corpus of texts from the 13th to the 20th century (novels, poetry, theatre, correspondance...). It uses PhiloLogic search software.
http://humanities.uchicago.edu/ARTFL/ARTFL.html

Athena
The texts digitised by Athena include classical literature, texts from Geneva, and university research work. A list of links is provided to digitised texts accessible on other servers.
http://un2sg1.unige.ch/www/athena/html/authors.html

Electronic Text Center
The Electronic Text Center of the University of Virginia provides several thousand texts in English, French, German, Japonese and Latin in SGML format according to the recommendations of the "Text Encoding Initiative".
http://etext.lib.virginia.edu/

Project Gutenberg
One of the earliest projects for a library of digitised texts, started by Michael Hart. It includes selected literary texts and reference materials in the public domain.
http://promo.net/pg/

Canadiana
A virtual library on Canadian history (16th century to 19th century) developed jointly by four Canadian organisations (The "Institut canadien de microreproductions historiques" (ICMH), The National Library of Canada, Laval University Library and the University of Toronto Library).
http://www.canadiana.org/

Prototype for electronic access to theses of the University of Montreal
Full texts of doctoral theses are available in various formats (PDF, SGML, HTML...).
http://www.pum.umontreal.ca/theses/index.html

Elise Project (Electronic Library Image Service for Europe)
A projet supported by the European Commission (DG XIII) within in the framework of the "Telematics for Libraries". ELISE I (1993-1995) was followed by ELISE II (1996-1999).
http://severn.dmu.ac.uk/elise/

Digital libraries in the United Kingdom
e-Lib : Electronic Librairies Programme
http://ukoln.bath.ac.uk/elib/intro.html
Ariadne : journal on digital library projects
http://www.ariadne.ac.uk/back/

GALLICA
A website providing experimental distance access to the digitised collections of the Bibliothèque nationale de France, BnF (French National Library) : full texts of French literary classics from the Middle Age to the 19th century, scientific texts, photographs and audio documents.
http://gallica.bnf.fr/

Computerization Project of the Archivo General De Indias, Seville, Spain
Strategies and Results
The project to digitise the "Archivo General de Indias" (Archives of the Indies), in Seville, Spain; introduced by Pedro González, 1998.
http://www.clir.org/cpa/reports/gonzalez/contents.html

MUISTI Project documents
A Finnish project for digitisation in cooperation between archives, libraries and museums.
http://linnea.helsinki.fi/memory/raporte.html

Retrospektive Digitalisierung von Bibliotheksbeständen
A virtual library project for researchers, created by the network of German libraries.
http://www.sub.uni-goettingen.de/ebene_2/vdf/einstieg.htm

Building up a digital library

– ***Methodological texts, guides and standards***

Digitization of rare library materials. Storage and access to data
A CD-ROM edited by Adolf Knoll, Library of the Czech Republic, 1999, available also on the website of UNESCO. Deals with the topics of digitisation, description and document formats. Note in particular the section on digitisation of rare and precious documents.
http://www.unesco.org/webworld/mdm/czech_digitization/index.html

Digitisation of the cultural heritage
Texts and recommendations for those involved in the digitisation of heritage collections (curators, documentalists, photographers...) : general policy of the French Ministry of Culture and Communication, notes on information technology methods and materials, legal texts, model contracts, technical specifications.
http://www.culture.fr/culture/mrt/numerisation/index.htm

The Multimedia Library
An extract from the publication « Bibliothèques et informatique *» by the Direction du livre et de la lecture (French Minstistry of Culture and Communication) : digitisation of cultural heritage collections (texts, images, sound).*
http://www.culture.fr/culture/mrt/numerisation/fr/dll.htm

Protection and enhancement of the library heritage
Contains technical specifications for the preservation of heritage documents (see especially chapter 13 : digitisation of heritage documents).
http://www.culture.fr/culture/conservation/fr/preventi/guide_dll.htm

Introduction to Imaging
This clear and concise guide published by the Getty Institute gives essential information for constructing an image database, with a glossary.
http://www.gii.getty.edu/intro_imaging/

Documentation of the Library of Congress
Methodological and technical information about digitisation projects of the Library of Congress (e.g. 'American memory', digitisation of manuscripts...)
http://lcweb2.loc.gov/ammem/ftpfiles.html
Digital formats
http://lcweb2.loc.gov/ammem/formats.html
Report on the digitisation of manuscripts
http://lcweb2.loc.gov/ammem/pictel/index.html
Access and interoperability
http://lcweb2.loc.gov/ammem/award/docs/interop.html

Documents of the University of Virginia
These web pages of the Special Collections Digital Center provide information on digitisation through links to : online publications on technical matters, sites dealing with the description of digital documents, digital data files, websites for legal information, organisations and associations working on digitisation (mainly museums), commercial websites, information on graphics file formats and image colour...
http://www.lib.virginia.edu/speccol/scdc/scdc.html
Links to web pages presenting standards (SGML, XML, HTML, TEI, EAD).
http://etext.lib.virginia.edu/standard.html

eLib standards guidelines
From the UK Office for Library and Information Networking (UKOLN).
http://www.ukoln.ac.uk/services/elib/papers/other/standards/

Guide for digital information
How to treat digital documents. Guide published by the European Union, 1998, full document downloadable in PDF format.
http://www2.echo.lu/dlm/fr/gdlines-fr.pdf

Text Encoding Initiative
Requirements for the creation and exchange of electronic documents (an international project).
http://www-tei.uic.edu/orgs/tei/

– ***Specialised magazines***

D-lib Magazine
The Magazine of Digital Library Research
http://www.dlib.org/

Document numérique
Summaries of articles in the journal Hermès - print edition. Access to the electronic edition is by paid subscription.
http://www.editions-hermes.fr/dnp.htm

Network Notes
An electronic journal of the National Library of Canada, dealing with networking projects and technologies.
http://www.nlc-bnc.ca/pubs/netnotes/fnetnote.htm

Journal of Digital Information (JoDI)
An elecronic publication of the British Computer Society and Oxford University Press.
http://jodi.ecs.soton.ac.uk/

Preservation & Access International Newsletter
http://www.clir.org/pubs/pain/pain03.html

Association of Research Libraries, Transforming Libraries Issues and Innovations
A specialised magazine for technical developments in libraries.
http://www.arl.org/transform/

Informations about digital libraries
The "News" page of the EPIC website (European Preservation Information Center).
http://www.knaw.nl/ecpa/ecpatex/news.htm

Discussion List

DigLibns Electronic Discussion
A discussion list on digital libraries.
http://sunsite.berkeley.edu/DigLibns/

Websites last visited : 2nd August 1999

Glossary

Because of the range of materials covered in this CD-ROM guide, it may be useful to define some of the terms used in the texts accompanying the lists of standards.

Further information can be found in the following glossaries :

– A glossary of InterNet terms by InterNet Literacy Consultants (TM) :
http://www.matisse.net/files/glossary.htm

– A glossary for NCSA Mosaic and the World Wide Web users :
http://www.ncsa.uiuc.edu/SDG/Software/Mosaic/GlossaryDL.html

– A glossary of statistics :
http://linkage.orckefeller.edu/wli/glossary/stat.html

– A glossary on airbone fungus elaborated by the Environmental Health and Safety Department of the University of Minnesota :
http://dehs.umn.edu.fungus/myco.html

A multi-lingual glossary for sound and moving image terms is under preparation by IASA for UNESCO and will be published shortly : http://www.llgc.org.uk/iasa

Acid
In chemistry, a substance capable of forming hydrogen ions when dissolved in water. Acids can damage cellulose in paper, board and cloth by catalysing hydrolysis.

Acid free paper
Papers that have a pH of 7 (neutral) or higher (alkaline) at the time of production but not necessarily an alkaline buffer or reserve.

Alkali
In chemistry, a substance capable of forming hydroxyl ions when dissolved in water. Alkaline compounds may be added to materials to neutralise acids or as an alkaline buffer for the purpose of counteracting acids which may form in the future.

Adsorption
Retention of molecules (gas, vapour) at the surface of a solid.

Amino-acid
Organic acid derived from ammonia ; part of the constituent of protein.

ASCII
American Standard Code for Information Interchange. A seven-bit standard code used to facilitate the interchange of data among various types of data processing and data communication equipment.

Authentication
A process for verifying the correctness of a piece of data.

Base
The support for a carrier. Examples include the clear film that holds a film or magnetic tape emulsion, the aluminium plate that is coated with lacquer to make an instantaneous disc.

Bibliographic description
A set of formalised data elements describing a publication.

Bibliographic record
A discrete bibliographic description stored either manually or electronically.

Bitstream
A sequence of bits transmitted across an electronic link. The software controlling the link is unaware of any structure inherent in the bitstream data.

Carrier
The physical package (i.e., the disc, film, paper, etc) in or on which information is fixed or recorded. Examples include : a magnetic tape ; a telephone cable ; a sheet of paper.

CD-ROM
Compact Disc Read Only Memory.

Cellulose
Chemically a complex carbohydrate. The main constituent of many fibrous plant products such as paper, board, textiles and some synthetic materials.

Cellulose acetate
Ester of acetic acid. Material used for films and plastic sheets.

Cellulose nitrate
Ester of nitric acid. Material used for films and plastic sheets. Very flammable and explosive substance.

CIP
Cataloguing-In-Publication records, created using information supplied pre-publication by the publisher.

Collagen
Proteineous substance, main substance of animal conjunctive tissue.

Condensation
Phenomenon which occurs above the saturation point of water vapour. Water is then present in a liquid state.

Confidentiality
The quality of protection against unauthorised accessed to private or secret information.

Conservation
Active intervention by specialists to inhibit further deterioration of an object and stabilise it in its present condition. As a part of conservation, preventive conservation aims to prevent deterioration by acting directly on the environment of the collection.

Corruption
A change in data such that the data content received is not what was originally sent.

Database (DB)
A computer Program for entering, storing and retrieving items of information in a structured fashion.

Dataflowa
Transfer of data between a sender and a recipient.

Degree of polymerisation
In chemistry the degree of polymerisation indicates the number of monomers in a polymer.

Deposit of publications
A system in operation in many countries, usually legally enforced, whereby publishers must deposit one or more copies of every publication within nominated libraries. Often referred to as Legal Deposit.

Desorption
Opposite of adsorption.

Deterioration
Alteration of the physical and chemical integrity of a material under the influence of internal or external factors or a combination of both. Synonym for alteration or degradation.

Dial-in service
A method of obtaining access to the services provided by a computer by establishing a connection through the telephone system.

Document
1) The combination of a medium and the information recorded on or in it which may be used as evidence or for consultation.
2) A single record or item. Examples include : a sheet of paper with writing ; an e-mail message ; a film with images ; a magnetic tape with a sound recording.

DTD
Document Type Definition.

Dublin Core
A metadata format being discussed internationally to define a minimal information resource description for use in a WWW environment. The term "Dublin" is used as Dublin, Ohio is the location of OCLC's headquarters.

EDI
Electronic Data Interchange. The exchange of structured data messages to enable automated transactions between application systems.

EDIFACT
EDI For Administrations, Commerce and Transport. The international EDI standard messaging syntax under the responsibility of the UN, for trading transactions in all industries. Also known as UN-EDIFACT.

e-journal
See electronic journal.

Electronic journal
Similar to a traditional journal but published only in electronic form - on a CD-ROM or the World Wide Web.

Electronic mail
A means for an originator of information to distribute information to an unlimited number of recipients via a value added network service which mimics the functions of the paper postal services.

Electronic publisher
See publisher.

Electronic publication
Document, file, journal, etc. made available in electronic form.

email
See electronic mail.

E-serial
Similar to a traditional serial but published only in electronic form - on a CD-ROM or the World Wide Web.

File transfer
A means of providing access to files on a remote IT system without requiring detailed knowledge of the structure and characteristics of the remote system.

Floppy disc
A type of computer storage medium, capable of storing up to 2 MB of data. Most commonly available in 3.5 inch size.

Format
1) The size of a given document (i.e., a sheet of paper, etc.).
2) In its widest sense, a particular physical presentation of an item. Examples include : a standard layout of memorandum in an office ; the arrangement of data in a computer application ; the general pattern of a television recording (VHS, BetaCam etc) ; the aspect ratio of a moving image production.
3) In the context of bibliographic control, the formalised structure in which the specific elements of bibliographic description are accommodated.

Foxing
A kind of mould which causes rust-coloured spots on paper.

Frame relay
A data service similar to X.25, but providing higher speeds and LAN interconnection.

FTAM
File transfer, Access and Manipulation. An alternative file transfer protocol to FTP.

FTP
File Transfer Protocol, an Internet standard means of transferring electronic files between computers.

Hemicelluloses
Chemically a carbohydrate similar to cellulose, with a lower degree of polymerisation.

High level technical options
Transmission options which operate at a higher level than low level technical options, e.g. EDIFACT, Warwick Framework, PICS, RDM, Web Crawler, Search and Retrieve. The high level technical options use one of the low level technical options as the underlying transmission medium.

Home page
A World Wide Web page set up as an introductory page by an organisation or individual.

HTML
Hypertext Mark-up Language. The standard language used for creating Web documents.

HTTP
HyperText Transfer Protocol. The protocol used for communication between Web clients and servers.

Hydrolysis
The decomposition of organic compounds by interaction with water. The degradation weakens or breaks molecular bonds, thereby leading to embrittlement and discoloration.

Hygroscopic
A substance which retains water.

IAFA
Internet Anonymous FTP Archive.

ILL
Inter-Library Loan.

Indexing service
A secondary service providing access to primary sources through the use of keywords appearing in metadata and/or full text.

Information
Recorded data. Examples include : writing on a sheet of paper ; the dyes on a photographic still ; the sound in the groove of a vinyl record; etc., the binary digits forming an e-mail message.

Integrity Consultants
The preservation of programs and data for their intended purpose.

Internet
The world wide network of computer systems connected to each other.

Internet Publisher
An organisation or person who publishes documents on the Internet. These will be on-line documents.

ISBD
International Standard Bibliographic Description. There are seven specific ISBDs as well as the general ISBD -(G) : monographs -(M), serial publications -(S), cartographic material -(CM), non-book material -(NBM), printed music -(PM), antiquarian publications -(A), computer files -(CF).

ISDN
Integrated Services Digital Network. A data service which can transmit both voice and data over a single line.

ISSN
International Standard Serial Number.

IT
Information technology.

Label
A PICS label, generated by a labelling service, contains a rating of Internet material.
Labelling service within the PICS environment, a labelling service generates ratings of Internet material. These ratings are contained in PICS labels.

Legal Deposit
See Deposit of publications.

Lignin
A component of the cell walls of woody plants, along with cellulose. Lignin is largely responsible for the strength and rigidity of plants, but its presence in paper and board is believed to contribute to chemical degradation.

Light
Part of the spectrum of electromagnetic waves which is visible to the human eye.

Low Level Technical Options
Generalised IT techniques for the transmission of data, e.g. e-mail, file transfer, opto-magnetic media and World Wide Web.

MARC
MAchine Readable Cataloguing. A family of formats based on ISO 2709 for the exchange of bibliographic and other related information in machine readable form. For example, USMARC and UNIMARC.

Medium (media)
A material or base on which information is stored or transmitted. It may be a physical medium such as a gramophone record or a piece of paper, or be virtual (for example, a radio carrier signal).

Metadata
Information about a publication as opposed to the content of the publication ; includes not only bibliographic description but also other relevant information such as its topic, price, conditions of use, etc.

Microclimate
Climatic conditions specific to a very limited zone.

MIME
Multimedia mail enhancements to the Internet mail standard.

Monograph
A publication either complete in one part or complete, or intended to be completed, in a finite number of separate parts. A non-serial publication.

Mould
The spores of fungi that become mould or mildew are always present in the air and on objects. They only await proper conditions of moisture and temperature to germinate, grow and reproduce. Mould causes staining and weakening of most library material.
Multimedia
A publication in which images, sound and text are integrated.

National Bibliography
A listing of all national publications. May include all publications produced in that country, or in the language of that country, or sometimes about that country.

National character set
All of the numbers, letters and symbols associated with a given language.

Non-repudiation
A security service which prevents the receiver of a message from denying that the message had been received.

On-line publication
See On-line resource.

On-line resource
An electronic document which is bibliographically identifiable, is stored in machine readable form on an electronic storage medium and is available on-line. For example a Web page.

Off-line publication
An electronic document which is bibliographically identifiable, is stored in machine readable form on an electronic storage medium. For example, a CD-ROM.

Opto-magnetic media
Various media used for the physical exchange of electronic information between IT systems, using postal or courier services.

Oxidation
Traditionally defined as a chemical reaction in which oxygen combines with another element to form an oxide. Today it is defined as a chemical reaction in which one or more free electron are released.

Oxidation may be caused by impurities present within or adjacent to the material or by atmospheric pollutants.

Packaging level option
A high level technical option which structures the data according to content.

Permanent paper
Paper manufactured to high standards for long-term survival good condition under reasonable storage conditions. It must have good resistance to internal and external chemical reactions, good mechanical strength and be composed of only virgin, or un-recycled fibres containing no lignin. Refers to the ISO standard ISO 9706 : 1994 – Requirements for permanence.

pH
In chemistry, pH is a measure of the concentration of hydrogen ions in solution, indicating acidity or alkalinity (pH > 7 is alkaline, pH < 7 is acid, pH = 7 is neutral).

Photochemical degradation
Damage or change caused or increased by exposure to light.

PICS
Platform for Internet Content Selection, an infrastructure for associating labels with Internet content.

Photography
Any method of producing an image by using the action of light to change a chemical compound.

Plain text file
A human-readable file of data. The data may be structured in some pre-defined format.

Polyester
The common name for the plastic polyethylene terephtalate. Used in sheets or film form to make folders, encapsulations and adhesive tapes. Trade names include Mylar, Melinex and Terphane. Only some of these polyester materials are suitable for conservation.

Polymer
A material built up from a serie of smaller units (monomers).

Polyvinylchloride (PVC)
A polymer which is not suitable for conservation. It can damage documents by emitting acidic components and plasticisers.

Preservation
Includes all the managerial and financial considerations, including storage and accommodation provisions, staffing levels, policies, techniques and methods involved in preserving library and archival material and the information they contain.

Print
An image on an opaque support. The image may be a photographic still or produced from an engraved plate or similar master.

Private data networks
Data networks owned by an organisation. The lines are rented from carriers but switching equipment belongs to the organisation.

PS
Postscript, a standard format for exchange of printable files.

Publications
Documents containing either text or sound or images, or a combination of these, packaged for wider distribution, whether off-line (e.g. printed book, CD-ROM) or on-line (e.g. Web, database for information retrieval).

Publisher
A person or organisation that produces documents and makes them available. Newly emerging publishers may produce and distribute documents electronically - for instance, on the Web.

Pull Model
When applied to a transfer of metadata between a Publisher and an NBA, the pull model describes the scenario whereby the NBA initiates the transfer by requesting or "pulling" data to the NBA.

Push Model
When applied to a transfer of metadata between a Publisher and an NBA, the push model describes the scenario whereby the Publisher initiates the transfer by providing or "pushing" data to the NBA.

RAMP studies
Studies published by the Records and Archives Management Programme of the General Information Programme of UNESCO.

RD
Resource Description. Consists of a URL and a number of value-attribute pairs.

RDM
Resource Description Messages. A technique for encoding and transmitting metadata relating to an Internet resource accessible via a URL.

RDM agent
Generates Resource Descriptions (RD) based on the content of Internet material.

RDM server
Stores a collection of RDMs, to be accessed across the WWW.

Receiver authentication
A security service which guarantees that the recipient of a message is the person to whom the message was addressed.

Record
See bibliographic record.

Record creation
The generation of bibliographic records by, for example, a bibliographic agency.

Record supply
The transmission of previously generated bibliographic records.

Relative humidity
Relationship, expressed as a percentage, between the quantity of water vapour contained by a given volume of air at given temperature and atmospheric pressure and the maximum quantity of water which this same volume can contain at the same temperature.

Restoration
The process of restoring an object to a condition as close as possible to that when it was first made.

RFC
Request For Comments, a method by which standards are proposed and agreed upon, usually with reference to the Internet.

Rosin
A resin which is used for the sizing of paper.

Search Service
An Internet service to search for electronic resources by means of keywords.

Sender authentication
A security service which guarantees to a recipient of data that the sender of the data is who he claims to be.

Serial
A publication in any medium issued in successive parts bearing numeric or chronological designations and intended to be continued indefinitely. Serials include periodicals ; newspapers ; annuals (reports, yearbooks, etc.) ; the journals, memoirs, proceedings, transactions, etc. of societies ; and numbered monographic series.

Serial Contents Database
A database of the contents of journals, issue by issue.

SGML (ISO 8879)
Standard Generalised Mark-up Language. ISO standard for document description, separating contents and structure.

SMTP
Simple Message Transfer Protocol. Internet e-mail standard.

Softener
A substance which is added to some plastics to soften them. Can deteriorate documents in contact with the plastic by migrating to the surface.

SR
Search and Retrieve.

SSSH
Simplified SGML for Serials Headers.

Standard
1) A set of guidelines, usually drafted by experts in a particular field of technology, that are issued for general use by national and international standards organisations.
2) The format used to distribute a television signal. Examples include NTSC, PAL, SECAM.

Subject Gateway
An Internet service listing (usually) on-line resources for a particular subject area. The resources included have been reviewed by subject specialists before inclusion.

Subscription Agent
A supplier of journals to libraries and other information agencies.

Sulphuric acid
Strong mineral acid which deteriorates cellulose by hydrolysis.

TCP/IP
Transmission Control Protocol/Internet Protocol. The Internet transport-level protocols, often used to refer to the entire collection of Internet protocols.

Trade bibliographic agency
An agency providing bibliographic information to, and based on input from, the book trade.

Transparency
A positive image on a transparent support.

Transport level technical option
See Low level technical option.

URL
Uniform Resource Locator. The standard way to give the address of a source of information on the WWW. It contains four different parts : the protocol type, the machine name, the directory path and the file name. For example : http://www2.echo.lu/libraries/en/libraries.html

VANS
Value added network services.

Voluntary Deposit
See Deposit of publications.

Web crawler
A system which crawls the WWW, generating all-encompassing Web indexes.

Web robot
See Web crawler.

Web site
Used to refer to a single location on the World Wide Web, usually on the same piece of hardware. Part of the Internet that stores and gives access to documents using HTTP.

World Wide Web
The global set of Internet Web sites offering world wide access to information using HTTP.

WWW
See World Wide Web.

X.25
A data service using packet switching techniques. The X.25 standard is internationally recognised.

X.400
Electronic mail standard developed by the public service providers and the IT industry. An alternative to SMTP.

Z39.50
A network protocol which allows searching of (usually remote) heterogeneous databases and retrieval of data, most often used for retrieving bibliographic records.

Glossary : organisations

AES
Audio Engineering Society

ANSI
American National Standards Institute

BSI
British Standards Institute

CPA
Commission on Preservation and Access (US based Commission - see also ECPA)

ECPA
European Commission on Preservation and Access (see also CPA)

FIAF
Fédération Internationale des Archives du Film

FIAT
Fédération International des Archives de Télévision

ICA
International Council on Archives

IEEE
Institute of Electrical and Electronics Engineers

IASA
International Association of Sound and Audiovisual Archives

IETF
Internet Engineering Taskforce

IFLA
International Federation of Library Associations and Institutions

NBA
National Bibliographic Agency

SMPTE
Society of Motion Picture and Television Engineers

Website Directory

GENERAL SITES 2
INTERNATIONAL INSTITUTES AND ORGANISATIONS 2
NATIONAL INSTITUTES AND ORGANISATIONS 3
TRAINING 5
BASIC TEXTS 5
DATABASES 6
DISCUSSION LIST 6
ENVIRONMENT AND PRESERVATION 7
DISASTER PREPAREDNESS 8
GRAPHIC DOCUMENTS 9
PHOTOGRAPHIC DOCUMENTS AND FILMS 10
MAGNETIC AND OPTICAL MEDIA 11
ELECTRONIC PUBLICATIONS, VIRTUAL INFORMATION 12
DIGITIZATION 14

Website Directory

General Sites

Conservation OnLine (CoOL)
This site was created by the Preservation Department of the Stanford University Libraries and is aimed at professionals in the field of conservation. It gives information and data concerning the library, archival and museum sectors. The following subjects are dealed with : intellectual property, digital imagery, electronic archives, training, documentation, mass deacidification etc. The site also offers address lists, directories of professionals classified by specialism and commercial suppliers and services. It lists programmes of conferences, seminars, calls for contributions and articles and mirror sites of other organisations. It gives many links to websites of other organisations.
http://palimpsest.stanford.edu

Sciences & patrimoine culturel
This French-language gateway was created by the French Ministry of Culture and Communication and is aimed at professionals working in preservation / restoration and students of the discipline. This site gives information on French research laboratories and restoration workshops, presents methods and techniques and current activities in preservation / restoration. Information on conference programmes and a directory of resources are also provided. The site gives links to other relevant websites and to catalogues and image databases.
http://www.culture.fr/culture/conservation/fr/index.htm

Preserve/Net
This site, constructed by students at Cornell University, refers to programmes of events, directories of training organisations in the USA, links to other relevant sites, job vacancies, preservation products and services.
http://www.preservenet.cornell.edu/pnetman2.htm

International Institutes and Organisations

European Confederation of Conservator-Restorers' Organisations (ECCO)
This professional organisation of about 5 000 members promotes the training of conservator-restorers and advocates legal recognition of the profession. The confederation has developed guidelines for the profession, its code of ethics and requirements for professional training and publishes an online newsletter.
http://palimpsest.stanford.edu/byorg/ecco/

International Council of Museums (ICOM)
ICOM, a non-governmental organisation with about 15 000 members in 147 countries, is concerned with the promotion of the profession and the development of museums at an international level. The website provides institutional information (programmes, press releases), as well as access to web resources of the various committees and working groups and to international standards (e.g. documentation on African collections, etc...).
http://www.icom.org/
Committee for Conservation (ICOM-CC)
http://www.natmus.dk/cons/icom_cc/

International Institute for Conservation of historic and artistic works (IIC)
This international organisation with about 3 500 members in 75 countries is concerned with the promotion of knowledge, of methods and standards in the field of preservation and protection of cultural property.
http://www.natmus.dk/cons/iic/
French section of IIC (SFIIC)
http://www.fnet.fr/sfiic/

European Preservation Information Centre
This gateway brings together libraries and archives for the promotion of the preservation of the European documentary heritage. It deals with preservation of different carriers : paper, photographs, film, audio and audio-visual documents, digitised documents. The site makes available a directory of relevant institutions and organisations working at European or international level with a brief description of each with its contact information and website. It gives a programme of events, a list of discussion groups and some basic texts on preventive conservation.
http://www.knaw.nl/ecpa/

International Centre for the Study of the Preservation and Restoration of Cultural Property (ICCROM)
ICCROM, a non-governmental organisation, is concerned with documentation, assessment, training and raising awareness. The site gives a programme of conferences, dates and topics of training courses, the catalogue of ICCROM's library, an image database, and information on current activities.
http://www.iccrom.org/

International Council of Archives (ICA)
ICA is the international organisation of archivists. It aims to promote the preservation, development and use of the world documentary heritage of archives. Several of its programmes concern the archives of developing countries.
http://www.archives.ca./ica/

International Federation of Library Associations and Institutions (IFLA)
This non-profit organisation of about 1 600 members in 150 countries offers a platform for exchanges and contacts in the field of library sciences. There are 5 core programmes, one of which is PAC Programme for preservation of library materials.
http://www.ifla.org/
The IFLA Core Programme for Preservation and Conservation (PAC), set up in 1984, is concerned with preservation of and access to library materials on all carriers.
http://www.ifla.org/VI/4/pac.htm

"Memory of the World" Programme of UNESCO
The aim of this programme is to promote the preservation of archival and library collections worldwide and to ensure the widest possible access to them. The site makes available guidelines and basic texts, and presents the worldwide survey on preservation and related projects.
http://www.unesco.org/webworld/mdm/index.html

National Institutes and Organisations

– ***Europe***

Centre de recherches sur la conservation des documents graphiques (CRCDG)
The "Centre de recherches sur la conservation des documents graphiques" is a research centre run jointly by the French Ministry of Culture and Communication, the CNRS (Centre National de la Recherche Scientifique) and the French National Museum of Natural History. It carries out research into paper, leather, parchment, photographic documents (e.g. studies of organic materials, of degradation processes...).
http://www.culture.fr/culture/conservation/fr/laborato/crcdg.htm

Preservation at the *French National Library*
This site presents the organisation and the main activities of the preservation department of the Bibliothèque nationale de France, BnF (French National Library) as well as two on-line publications "Actualités de la conservation", the newsletter of the preservation department of the BnF and "International Preservation News" the newsletter of the IFLA Core Programme on Preservation and Conservation.
http://www.bnf.fr/web-bnf/infopro/conserv/index.htm

Arbeitsbereich Europäische Bibliotheksangelegenheiten
This site presents the activities of this working group of the "Deutsche Bibliotheksinstitut" (German Library Institute), whose aims are to give information on European library issues and calls for projects by the European Commission, to advice those whising to submit projects, and to disseminate the results of the research.
http://www.dbi-berlin.de/bib_wes/dbi_euro/eurohome.htm

– ***North America***

Getty Conservation Institute (GCI)
The GCI works to enhance and preserve the worldwide cultural heritage. Its specialised library collections can be searched online. Its website disseminates the results of the research supported by the GCI. (Although the GCI was closed down in June 1999, its web server was still available as of July 1999).
http://www.getty.edu/gci/

Library of Congress : Preservation
The website of the Library of Congress gives access to studies of binding, the sound archives, permanent paper, the mass deacidification programme, expertise in preventive conservation in libraries and archives.
http://lcweb.loc.gov/preserv/

Preservation Resources
These web pages are produced by OCLC which manages the world's largest union catalogue. The site covers particularly microfilms and electronic publications.
http://www.oclc.org/oclc/presres/

Northeast Document Conservation Centre
This US non-profit organisation specialises in the preservation of paper, books, photographs. The site gives online access to an up-to-date manual on preventive conservation of library and archive documents.
http://www.nedcc.org/

American Institute for Conservation of Historic and Artistic Works (AIC)
The AIC is a professional organisation for the preservation of artistic and historic cultural property (paintings, paper, books, photographs, textiles, decorative arts, sculpture, wooden objects, architecture, archeology, natural sciences and ethnology). It carries out studies and training in art history, chemistry and related sciences. Note particularly its working group on paper and books.
http://www.pch.gc.ca/cci-icc/francais/francais.htm

Association of Research Libraries (ARL)
This site gives information on programmes for the preservation of heritage material in research libraries and particularly on digitised documents.
http://www.arl.org/

Council on Library and Information Resources (CLIR)
This site gives information on co-operative programmes with China, the European countries, Latin America, South Africa and on research on the preservation of the cinema heritage and digitised documents.
http://www.clir.org/

Research Libraries Group (RLG)
RLG is responsible for the PRESERV programme on preventive conservation, which is especially concerned with electronic documents.
http://www.rlg.org/

Canadian Heritage Information Network (CHIN)
This site gives access to online resources related to Canadian museums and cultural heritage. Several groups of data bases are also available for searching (on subscription) on the following subjects : preservation and restoration, museum sciences, legislation, catalogues of specialised libraries, data dictionaries, etc.
http://www.rcip.gc.ca/

Training

SLISNET
A worldwide network of schools of library and information science.
http://www.enssib.fr/SLISNET/

International Centre for the Study of the Preservation and Restoration of Cultural Property (ICCROM)
This site provides a calendar of training courses offered by ICCROM and a world list of other training courses.
http://www.iccrom.org/

Training
This webpage of the European Preservation Information Centre gives descriptions of several training organisations in Europe.
http://www.knaw.nl/ecpa/ecpatex/institut.htm#training

Lists of training courses on the ENSSIB website
This site of ENSSIB (Ecole Nationale Supérieure des Sciences de l'Information et des Bibliothèques), the French national library school, includes "ExpressO'doc", a directory of training courses in librarianship and information science provided by ENSSIB and other French institutions.
http://www.enssib.fr/Enssib/f_fc.htm

Basic Texts

The Virtual Past - CRM Conventions and Policies
International conventions (of UNESCO, ICOMOS, the European Union and the United States).
http://life.csu.edu.au/~dspennem/VIRTPAST/Conventions.html

Protection of the World Cultural and Natural Heritage
International conventions and guidelines of UNESCO.
http://www.unesco.org/general/eng/legal/cltheritage/index.html

Basic texts and Databases
UNESCO's manuals and guidelines on the preservation of the documentary heritage.
http://www.unesco.org/webworld/memory/basictexts.htm

ISO Standards
http://www.iso.ch

Databases

Databases accessible through the Canadian Heritage Information Network
The heading 'Reference database' groups together 11 databases covering heritage matters, in particular preservation, bibliographic databases and support for research in the humanities.
- the BCIN bibliographic database (bibliographic records of works on preservation)
- the MCIN materials database (1 000 products used in preservation and restoration)
- Database of suppliers of preservation products and services.
http://www.chin.gc.ca/Resources/Research_Ref/Reference_Info/f_reference.html

Catalogue of the ICCROM library
Online catalogue of a specialised collection (60 000 monographs and 700 periodicals) in the field of preservation of the cultural heritage. Offers simple and advanced searching (by title, author and keywords), downloadable keyword list.
http://library.iccrom.org/index.html/

Library of the Getty Conservation Institute
A specialised collection on cultural heritage preservation. The online catalogue offers a keyword search engine and multi-field searching.
http://opac.pub.getty.edu/screens/mainmenu.html

Library of the "Office de coopération et d'information muséographiques" (OCIM)
An online catalogue offering keyword and free text searching.
http://www.ocim.org/htdocs/biblio.htm

Discussion List

Cons DistList
Discussion list for professionals in cultural heritage preservation. To subscribe, send a message to : consdist-request@lindy.stanford.edu. *In the message indicate* : Subscribe Cons DistList <your name>

Websites last visited : 2nd August 1999

Environment and Preservation

IFLA Principles for the Care and Handling of Library Material
Basic information on the preservation and conservation of library documents. Available in English in HTML and PDF formats.
http://www.ifla.org/VI/4/news/pchlm.pdf

Preservation of Library & Archival Materials : a Manual
The 3rd edition of the Manual, revised and expanded by Sherelyn Ogden, 1999. Available in English, in HTML and PDF formats.
http://www.nedcc.org/manhome.htm

Preservation of Archival Records : Holdings Maintenance at the National Archives
Manual by Mary Lynn Ritzenthaler (National Archives and Records Administration - USA). Available in English in HTML format.
http://www.nara.gov/nara/preserva/maintena/hm1.html

"Protection et conservation des collections patrimoniales des bibliothèques : recommandations techniques" (Preservation and Conservation of Heritage Collections in Libraries : recommended methods)
Technical specifications developed by the "Direction du Livre et de la Lecture" of the French Ministery of Culture and Communication, brought together in one volume, published in 1998. Full text version online, in French, in PDF format.
http://www.culture.fr/culture/conservation/fr/preventi/guide_dll.htm

LIS 2214 - Library and Archival Preservation
A training course bibliography (University of Pittsburg).
http://www.lis.pitt.edu/~sb/Fall1997.html

The Physics of the Museum Environment
Thesis and documents by Tim Padfield.
http://www.natmus.dk/cons/tp/

CALIPR - Preservation and Planning Software
An MS Windows programme for assessing the preservation needs of book and document collections for institutional or national planning.
http://sunsite.berkeley.edu/CALIPR/

Websites last visited : 2nd August 1999

Disaster Preparedness

Deterioration agents and damaged documents

A Virtual Exhibition of the Ravages of Dust, Water, Moulds, Fungi, Bookworms and other Pests
Horrifying testimony to the damage done to collections due to lack of preventive measures.
http://www.knaw.nl/ecpa/expo.htm

"They can destroy our cultural heritage"
Essential information and a database on insect pests harmful to museum, library and archival collections (Pages from the website of OCIM).
http://www.ocim.fr/htposter/presins.htm

Pest Management
A list of online information ressources on the effects of pests and fungi in libraries.
http://palimpsest.stanford.edu/bytopic/pest/

Mycological Aspects of Indoor Environmental Quality
An inexhaustible source of information on fungi (Website of the University of Minnesota).
http://www.dehs.umn.edu/fungus/myco.html

Risk management

Hazards and Risk Virtual Library - by Impacts - Cultural Heritage
A list of resources (projects, papers, reports...) on the management of natural and technology risks to the cultural heritage.
http://life.csu.edu.au/hazards/9CulturalHeritage.html

Disaster Preparedness and Response
List of online resources available on the CoOL website.
http://palimpsest.stanford.edu/bytopic/disasters/

Emergency Drying Procedures for Water-Damaged Collections
Emergency measures to be taken in case of lood damage to collections. (Website of the library of Congress).
http://lcweb.loc.gov/preserv/emerg/dry.html

Disaster Planning for Libraries and Archives : Understanding the Essential Issues
Paper presented by Jan Lyall during the Pan-African Conference on Preservation and Conservation of Library and Archival Materials. Nairobi (Kenya), June 21-25, 1993.
http://www.nla.gov.au/nla/staffpaper/lyall1.html

Cultural Heritage Fire Suppression Systems : Alternatives to Halon 1301
What are the alternatives to Halon 1301 gas (which is harmful to the environment) to fight the fire in museums ?
http://www.museum-security.org/halon-alternative.htm

Websites last visited : 2nd August 1999

Graphic Documents

Mass Deacidification

Mass Deacidification
A bibliography and list of documents available online.
http://palimpsest.stanford.edu/bytopic/massdeac/

Mass Deacidification. An update of possibilities and limitations
Report by Henk J. Porck on the advantages and limitations of the most frequently used deacidification treatments, published in 1996.
http://www.knaw.nl/ecpa/publ/porck.htm

Technology Helps Library Save Its Paper Collections
"Bookkeeper" - a new deacidification treatment based on impregnation of documents with oxide of magnesium, presented by Will Dalrymple in the Bulletin of the Library of Congress.
http://lcweb.loc.gov/loc/lcib/970421/web/deacid.html

Permanent Paper

International standard ISO 9706 : Information and documentation - Paper for documents - Requirements for permanence
http://www.iso.ch/catf/d17562.html

Discussion Lists

Book_Arts-L Archives
A list managed by the University of Syracuse and intended for art book specialists, curators etc. The list archives can also be consulted.
http://palimpsest.stanford.edu/byform/mailing-lists/bookarts/

ExLibris Archives
A discussion forum hosted by the University of California (Berkeley) on rare books and manuscripts. The list archives can also be consulted.
http://palimpsest.stanford.edu/byform/mailing-lists/exlibris/

Websites last visited : 2nd August 1999

Photographic Documents and Films

Organisations

International Federation of Film Archives (FIAF)
The International Federation of Film Archives brings together over 100 institutions devoted to the preservation of films.
http://orson4.filmtv.ucla.edu/FIAF/

National Film Preservation Foundation
Non-profit organisation which aims at preservation of the American film heritage.
http://www.filmpreservation.org/

American Film Institute (AFI)
AFI ensures the co-ordination of the organisations concerned with the motion-picture image as art. It has the National Centre for Film and Video Preservation, a database with information on film archives, and a collection of films. The website has pages on deterioration mechanisms, the craft of restoration, and restoration laboratories in the USA.
http://www.afionline.org/preservation/preservation.frame.html

Association of Moving Image Archivists
This non-profit professional association co-ordinates organisations concerned with collections, preservation, exhibitions and use of film archives.
http://www.amianet.org/

Image Permanence Institute
A laboratory working on photograph and film preservation.
http://www.rit.edu/~661www1/FRAMESET.html

Centre de recherches sur la conservation des documents graphiques (CRCDG)
This French research centre on preservation of graphic and photographic documents (run by the French Ministery of Culture and Communication, the CNRS (Centre national de la recherche scientifique) and the French National Museum of Natural History), carries out research programmes on photographic materials (e.g. the study of organic materials, of deterioration processes...)
http://www.culture.fr/culture/conservation/fr/laborato/crcdg.htm

Documents

Film/Digital/film
Latest information on different preservation methods and film preservation techniques, notably electronic imaging, by Michael Friend.
http://www.oscars.org/cmps/friend/friend.html

Discussion List

Microform Mailing List
To subscribe, send a message to : majordomo@lists.uoregon.edu *and indicate* subscribe microforms *in the body of the message.*

Websites last visited : 2nd August 1999

Magnetic and Optical Media

Records and Information Management Resource List
Links to Records and Information Management (RIM) and other related Websites.
A list of resources created by Alan S. Zaben.
http://home.earthlink.net/~survivoraz/infomgmt/medstr_f.htm

Electronic Storage Media
A list of information resources on the CoOL website.
http://palimpsest.stanford.edu/bytopic/electronic-records/electronic-storage-media/

Audio/Video Glossary
Searchable alphabetically and by subject.
http://www.soundsite.com/glossary/glossary.html

European audiovisual Conference
Speeches, papers and reports from the Conference. Birmingham (UK), 6-8th of April 1998.
http://europa.eu.int/eac/bg-intro_en.html

Websites last visited : 2nd August 1999

Electronic Publications, Virtual Information

Organisations and Resources

Preserving Access to Digital Information (PADI)
Information (documents, links to other resources, news, publications, glossary, discussion lists) useful for authors, editors, curators, researchers and those interested in the long-term availability of digital documents. (The PADI website is managed by the National Library of Australia; the PADI initiative has received support from several Australian national organisations in the libraries, archives and museums sector, and others.
http://www.nla.gov.au/dnc/tf2001/padi/

IFLA - Digital libraries : resources and projects
A list of resources on digital libraries (bibliography, list of electronic journals, conference calendar, survey of American and European projects).
http://www.ifla.org/II/diglib.htm

Digital Library Information Resources - Berkeley Digital Library SunSITE
The "Preservation resources" page on this site offers information (reports, articles, links to other resources) on the preservation of digital documents.
http://sunsite.berkeley.edu/Info/

The Association of Research Libraries (ARL)
The server provides information on ARL's programmes for the preservation of research library collections and digital documents in particular.
http://www.arl.org/

Council on Library and Information Resources (CLIR)
Commission on Preservation & Access
Cooperation programmes with China, Eastern and Western Europe, Latin America and South Africa, documents on preservation of the film heritage and digital documents. Report on digital imaging and on microfilm preservation.
http://www.clir.org/programs/cpa/cpa.html

Research Libraries Group (RLG)
RLG manages the PRESERV programme on preventive conservation dealing notably with digital documents.
http://www.rlg.org/

Getty Information Institute : Time And Bits
The focus of this site is the long-term preservation of digital documents. It has a selection of links on the subject.
http://www.ahip.getty.edu/timeandbits/index.html

Publications of Cornell University Library
Publications notably concerning digital images in the libraries and archives, evaluation of CD Kodak use, study on microfilms / digital images.
http://www.library.cornell.edu/preservation/pub.htm

Digital Preservation : a Guide to Web Resources
The "Arts and Humanities Data Service" (UK) website provides selected links to resources and commentary on the preservation of digital documents.
http://ahds.ac.uk/resource/preserve.html

Reports and recommendations

Preserving Digital Information : Final Report and Recommendations
Report of a working group set up in 1994 by the Commission on Preservation and Access (CPA) and the Research Libraries Group (RLG). The study aims at ensuring a long-term access to the national cultural heritage. It includes an analysis of digital information particularities and preservation sstrategy which helps to develop organisations and technical principles.
http://lyra.rlg.org/ArchTF/

Digitisation as a Method of Preservation ?
The final report of a working group of the Deutsche Forschungsgemeinschaft (German Research Association).
http://www.knaw.nl/ecpa/publ/weber.html

Using Kodak Photo CD Technology for Preservation and Access. A Guide for Librarians, Archivists, and Curators
A guide written by Anne R. Kenney and Oya Y. Rieger, Department of Preservation and Conservation, Cornell University Library.
http://www.library.cornell.edu/preservation/kodak/cover.htm

Programmes

Programme JTOR
A programme on long-term preservation of journals (notably in the humanities) initiated by the Andrew W. Mellon Foundation in 1994.
http://www.ifla.org/ifla/IV/ifla63/63genr.htm
From project to independant organisation
http://www.dlib.org/dlib/july97/07guthrie.html

Bibliographies

Bibliographies
Recent texts (starting 1990) on the management of electronic media by Richard J. Cox (presented in alphabetical order).
http://www.gslis.utexas.edu/~lis389/coxbib.html

Online Journals

RLG DigiNews
Preservation of digital archives.
http://www.rlg.org/preserv/diginews/edu/timeandbits/

Discussion Lists

DigLibns Electronic Discussion
A discussion list on digital libraries.
http://sunsite.berkeley.edu/DigLibns/

Electronic Archives in Europe : DLM Forum
This forum for public authorities and national archives deals with issues of management, storage, preservation and dissemination of computeised and digital data.
http://www.dlmforum.eu.org/

Websites last visited : 2nd August 1999

Digitization

Directory of resources

Digital Library Information Resources - Berkeley Digital Library SunSITE
http://sunsite.berkeley.edu/Info/
Image and Multimedia Database Resources - Berkeley Digital Library SunSITE
http://sunsite.Berkeley.EDU/Imaging/Databases/

Digital Libraries : Resources and Projects
Discussion list on digital libraries (bibliography, list of electronic journals, programmes of conferences, inventory of American and European projects) set up by IFLA.
http://ifla.inist.fr/II/diglib.htm

Directories of resources
Digital Libraries : a Selected Resource Guide by Katharina Klemperer and Stephen Chapman
http://www.lita.org/ital/1603_klemperer.htm
Building Digital Libraries
http://www.texshare.edu/Services/Professional/digital.html
Electronic Collections Development (mirror site on the ENSSIB server).
http://www.enssib.fr/miroir/okerson/ecd.html

Time & Bits : Managing Digital Continuity
List of resources on preservation of digital documents.
http://www.ahip.getty.edu/timeandbits/links.html

Scholarly Electronic Publishing Bibliography
http://info.lib.uh.edu/sepb/sepb.html

Projects for electronic access to library collections

– ***Developing countries and mediterranean countries***

Memoria - Memory - Mémoire
"Memory of the world" is a programme launched by UNESCO to promote the preservation of library and archival heritage collections throughout the world and ensure widest possible access to them.
http://www.unesco.org/webworld/mdm/index.html

MEDLIB Internet-based virtual library network for the Mediterranean region
Project of a virtual library for the Mediterranean region,launched by UNESCO,MEDLIB aims to built up a network of libraries and information centres by making use of the latest information technologies, notably the Internet. The network is open to all the interested institutions North and South of the Mediterranean. Links to other relevant websites of libraries and archives in this region are also provided.
http://www.unesco.org/webworld/mediter/medlib.htm

– ***Europe and North America***

Berkeley Digital Library SunSITE
Berkeley Digital Library SunSITE handles digitisation of collections and dissemination of information to leaders of digital library projects. Digitised collections are available particularly in American history and in literature.
http://sunsite.berkeley.edu/

ARTFL Project
ARTFL - American and French Research on the Treasury of the French Language (Trésor de la langue française), is a joint project of the University of Chicago and the French "Institut national de la langue française (InaLF). It includes a corpus of texts from the 13th to the 20th century (novels, poetry, theatre, correspondance...). It uses PhiloLogic search software.
http://humanities.uchicago.edu/ARTFL/ARTFL.html

Athena
The texts digitised by Athena include classical literature, texts from Geneva, and university research work. A list of links is provided to digitised texts accessible on other servers.
http://un2sg1.unige.ch/www/athena/html/authors.html

Electronic Text Center
The Electronic Text Center of the University of Virginia provides several thousand texts in English, French, German, Japanese and Latin in SGML format according to the recommendations of the "Text Encoding Initiative".
http://etext.lib.virginia.edu/

Project Gutenberg
One of the earliest projects for a library of digitised texts, started by Michael Hart. It includes selected literary texts and reference materials in the public domain..
http://promo.net/pg/

Canadiana
A virtual library on Canadian history (16th century to 19th century) developed jointly by four Canadian organisations (The "Institut canadien de microreproductions historiques" (ICMH), The National Library of Canada, Laval University Library and the University of Toronto Library).
http://www.canadiana.org/

Prototype for electronic access to theses of the University of Montreal
Full texts of doctoral theses are available in various formats (PDF, SGML, HTML...).
http://www.pum.umontreal.ca/theses/index.html

Elise Project (Electronic Library Image Service for Europe)
A projet supported by the European Commission (DG XIII) within the framework of the "Telematics for Libraries" Programme ELISE I (1993-1995) was followed by ELISE II (1996-1999).
http://severn.dmu.ac.uk/elise/

Digital libraries in the United Kingdom
e-Lib : Electronic Libraries Programme
http://ukoln.bath.ac.uk/elib/intro.html
Ariadne : journal on digital library projects
http://www.ariadne.ac.uk/back/

GALLICA
A website providing experimental distance access to the digitised collections of the Bibliothèque nationale de France, BnF (French National Library) : full texts of French literary classics from the Middle Age to the 19th century, scientific texts, photographs and audio documents.
http://gallica.bnf.fr/

Computerization Project of the Archivo General De Indias, Seville, Spain
Strategies and Results
The project to digitise the "Archivo General de Indias" (Archives of the Indies), in Seville, Spain; introduced by Pedro González, 1998.
http://www.clir.org/cpa/reports/gonzalez/contents.html

MUISTI Project documents
A Finnish project for digitisation in cooperation between archives, libraries and museums.
http://linnea.helsinki.fi/memory/raporte.html

Retrospektive Digitalisierung von Bibliotheksbeständen
A virtual library project for researchers, created by the network of German libraries.
http://www.sub.uni-goettingen.de/ebene_2/vdf/einstieg.htm

Building up a digital library

– ***Methodological texts, guides and standards***

Digitisation of rare library materials. Storage and access to data
A CD-ROM edited by Adolf Knoll, Library of the Czech Republic, 1999, available also on the website of UNESCO. Deals with the topics of digitisation, description and document formats.Note in particular the section on digitisation of rare and precious documents.
http://www.unesco.org/webworld/mdm/czech_digitization/index.html

Digitisation of the cultural heritage
Texts and recommendations for those involved in the digitisation of heritage collections (curators, documentalists, photographers...) : general policy of the French Ministry of Culture and Communication, notes on information technology methods and materials, legal texts, model contracts, technical specifications.
http://www.culture.fr/culture/mrt/numerisation/index.htm

The Multimedia Library
An extract from the publication " Bibliothèques et informatique *" by the Direction du livre et de la lecture (French Ministry of Culture and Communication) : digitisation of cultural heritage collections (texts, images, sound).*
http://www.culture.fr/culture/mrt/numerisation/fr/dll.htm

Protection and enhancement of the library heritage
Contains technical specifications for the preservation of heritage documents (see especially chapter 13 : digitisation of heritage documents).
http://www.culture.fr/culture/conservation/fr/preventi/guide_dll.htm

Introduction to Imaging
This clear and concise guide published by the Getty Institute gives essential information for constructing an image database, with a glossary.
http://www.gii.getty.edu/intro_imaging/

Documents of the Library of Congress
Methodological and technical information about digitisation projects of the Library of Congress (e.g. 'American memory', digitisation of manuscripts...)
http://lcweb2.loc.gov/ammem/ftpfiles.html
Digital formats
http://lcweb2.loc.gov/ammem/formats.html
Report on the digitisation of manuscripts
http://lcweb2.loc.gov/ammem/pictel/index.html
Access and interoperability
http://lcweb2.loc.gov/ammem/award/docs/interop.html

Documents of the University of Virginia
These web pages of the Special Collections Digital Center provide information on digitisation through links to online publications on technical matters, sites dealing with the description of digital documents, digital data files, websites for legal information, organisations and associations working on digitisation (mainly museums), commercial websites, information on graphics file formats and image colour...
http://www.lib.virginia.edu/speccol/scdc/scdc.html
Links to web pages presenting standards (SGML, XML, HTML, TEI, EAD).
http://etext.lib.virginia.edu/standard.html

eLib standards guidelines
From the UK Office for Library and Information Networking (UKOLN)
http://www.ukoln.ac.uk/services/elib/papers/other/standards/

Guide for digital information
How to treat digital documents. Guide published by the European Union, 1998, full document downloadable in PDF format.
http://www2.echo.lu/dlm/fr/gdlines-fr.pdf

Text Encoding Initiative
Requirements for the creation and exchange of electronic documents (an international project).
http://www-tei.uic.edu/orgs/tei/

– ***Specialised magazines***

D-lib Magazine
The Magazine of Digital Library Research
http://www.dlib.org/

Document numérique
Summaries of articles in the journal published by Hermès - print edition. Access to the electronic edition is by paid subscription.
http://www.editions-hermes.fr/dnp.htm

Network Notes
An electronic journal of the National Library of Canada, dealing with networking projects and technologies.
http://www.nlc-bnc.ca/pubs/netnotes/fnetnote.htm

Journal of Digital Information (JoDI)
An elecronic publication of the British Computer Society and Oxford University Press.
http://jodi.ecs.soton.ac.uk/

Preservation & Access International Newsletter
http://www.clir.org/pubs/pain/pain03.html

Association of Research Libraries, Transforming Libraries Issues and Innovations
A specialised magazine for technical developments in libraries.
http://www.arl.org/transform/

Informations about digital libraries
The "News" page of the EPIC website (European Preservation Information Centre).
http://www.knaw.nl/ecpa/ecpatex/news.htm

Discussion List

DigLibns Electronic Discussion
A discussion list on digital libraries.
http://sunsite.berkeley.edu/DigLibns/

Websites last visited : 2nd August 1999

Where to turn for advice

Abbey Publications Inc
7105 Geneva Drive, Austin TX 78723, USA
Phone : + 1 (512) 929 3992
Fax : + 1 (512) 929 3995
e-mail : Abbeypub@flashnet
<http://palimpsest.stanford.edu/byorg/abbey/>
Publications : *Abbey Newsletter* and *Alkaline Paper Advocate*.

American Institute for Conservation of Historic and Artistic Works (AIC)
1717 K Street NW, Suite 301, Washington DC 20006, USA
Phone : + 1 (202) 452 9545
Fax : + 1 (202) 452 9328
e-mail : InfoAic@aol.com
<http://palimpsest.stanford.edu/aic/>
Publications : *AIC News* and *AIC Journal*.

Bibliothèque nationale de France (BnF)
Services de Conservation
Quai François Mauriac, 75706 Paris cedex 13, FRANCE
Phone : + 33 (0) 1 53 79 41 65
Fax : + 33 (0) 1 53 79 41 61
<http://www.bnf.fr>

The British Library
National Preservation Office (NPO)
Great Russell Street, London WC1B 3DG, UK
Phone : + 44 (0) 171 412 7612
Fax : + 44 (0) 171 412 7796
e-mail : npo@bl.uk
<http://www.bl.uk/index.html>

Canadian Conservation Institute (CCI)
1030 Innes Road, Ottawa, Ontario K1A OM5, CANADA
Phone : + 1 (613) 998 3721
Fax : + 1 (613) 998 4721
e-mail : cci-iccpublications@pch.gc.ca
<http://www.pch.gc.ca/cci-icc>
Publication : *Bulletin de l'ICC* bilingual (French and English), biannual and free of charge.

Canadian Council of Archives (CCA)
1009–344 Wellington Street, Ottawa, Ontario K1A ON3, CANADA
Phone : + 1 (613) 995 0210
Fax : + 1 (613) 947 6662
e-mail : dubeau@fis.utoronto.ca
<http://www.fis.utoronto.ca/groups/aao/index.htm>

Conservation on Line (CoOL)
<http://palimpsest.stanford.edu>
Full-text searchable database of articles and reports, as well as numerous links to a wide range of resources including conservation-related organisations, vendors and library preservation department home pages.

Council on Library and Information Resources (CLIR)
1755 Massachusetts Avenue, NW, Suite 500
Washington, DC 20036, USA
Phone : + 1 (202) 939 4750
Fax : + 1 (202) 939 4765
e-mail : info@clir.org
<http://www.clir.org/cpa/>

European Commission on Preservation and Access (ECPA)
PO Box 19121, NL-1000 GC, Amsterdam, THE NETHERLANDS
Phone : + 31 (20) 551 0807
Fax : + 31 (20) 620 4941
e-mail : yola.de.lusenet@bureau.knawl.nl
<http://www.knawl.nl/ecpa/ecpatex/welcome.htm>

European Register of Microform Masters (EROMM)
Phone : + 49 (551) 39 34 68
Fax : + 49 (551) 39 95 25
e-mail : eromm@mail.sub.uni.goettingen.de
Is an inter national database to help libraries co-ordinate microfilming and other reformatting activities aimed at the preservation of the printed information which is threatened by brittle paper. It also serves as an instrument for ordering service copies of reformatted books.

Fédération Internationale des Archives du Film (FIAF)
1 rue Defacqz, B-1000 Bruxelles, BELGIUM
Phone : + 32 (2) 538 3065
Fax : + 32 (2) 534 4774
email: fiaf@mail.interpac.be
<http://www.cinema.ucla.edu/fiaf/enfiaf.html>
Brings together institutions from all countries dedicated to the collection and preservation of films of both cultural and historic interest.

Fédération Internationale des Archives de Télévision (FIAT)
Elmfield Mansions, Elmfield Road, Balham, London SW17 8AA, UK
Phone and Fax : + 44 (0) 181 675 5941
e-mail : gosta@msn.com
<http://www.nbr.no/fiat/fiat.html>

Fundaçáo Nacional de Arte (FUNARTE)
Rua São José 12° andar - Centro, CEP 20010-020, Rio de Janeiro, BRAZIL
Phone : + 55 (21) 533 8090
Fax : + 55 (21) 262 4516
e-mail : zuniga@omega.eincc.bc
Among other things FUNARTE has set up a national programme for photographic preservation and research in Brazil. It is conceived as a network of working centres throughout the country.

Getty Conservation Institute
1200 Getty Center Drive, Suite 700, Los Angeles, CA 90049-1684, USA
Phone : + 1 (310) 440 7325
Fax : + 1 (310) 440 7702
<http://www.getty.edu/gci>
Publications : Newsletter three times a year in English and Spanish, free of charge.

Image Permanence Institute (IPI)
Rochester Institute of Technology,
Frank E. Gannett Memorial Building, PO Box 9887, Rochester, NY 14623-0887, USA
Phone : + 1 (716) 475 2736
Fax : + 1 (716) 475 7230

Institute of Paper Conservation (IPC)
Leigh Lodge, Leigh, Worcester WR6 5LB, UK
Phone : + 44 (1886) 832323
Fax : + 44 (1886) 833688
e-mail : clare@ipc.org.uk
<http://palimpsest.stanford.edu/ipc>
Publications : *Paper Conservation News* is issued quarterly. *The Paper Conservator* is published annually.

International Association of Sound and Audiovisual Archives (IASA)
Phone : + 49 7221 929 3487
Fax : + 49 7221 929 2094
e-mail : albrecht.haefner@swr-online.de
<http://www.llgc.org.uk/iasa>

International Centre for the Conservation and Restoration of Cultural Property (ICCROM)
13, via di San Michele, I-00153 Roma, ITALY
Phone : + 39 (6) 585 531
Fax : + 39 (6) 5855 3349
e-mail : iccrom@iccrom.org
<http://www.iccrom.org>

International Council on Archives (ICA)
60, rue des Francs-Bourgeois, F-75003 Paris, FRANCE
Phone : + 33 (1) 40 27 63 06
Fax : + 33 (1) 42 72 20 65
e-mail : 100640.54@compuserve.com
<http://www.archives.ca./ica>

International Federation of Library Associations & Institutions (IFLA)
PO Box 95312, 2509 CH The Hague, THE NETHERLANDS
Phone : + 31 (70) 31 40 884
Fax : + 31 (70) 38 34 827
e-mail : IFLA.HQ@IFLA.NL
<http://www.ifla.org>

IFLA Section on Preservation and Conservation
National Library of Canada, 395 Wellington Street, Ottawa
Ontario K1A ON4, CANADA
Phone : + 1 (613) 943 85 70
Fax : + 1 (613) 947 29 16
e-mail : ralph.manning@nlc-bnc.ca
e-mail : mskepast@it.teither.gr

International Institute for Conservation (IIC)
6 Buckingham Street, London WC2N 6BA, UK
Phone : + 44 (171) 839 5975
Fax : 44 (171) 976 1564
e-mail : 100731.1565@compuserve.com
Publications : *IIC Bulletin*, bimonthly, free to IIC members.

Joint IFLA-ICA Committee for Preservation in Africa (JICPA)
Kenya National Archives and Documentation Service
Moi Avenue, PO Box 49210, Nairobi, KENYA
Phone : + 254 (2) 22 89 59
Fax : + 254 (2) 22 80 20

Library of Congress
Preservation Directorate
LM-G21, Washington, DC 20540, USA
Phone : + 1 (202) 707 5213
Fax : + 1 (202) 707 3434
<http://www.lcweb.loc.gov/preserv/>

National Library of Australia
National Preservation Office
NIAC, Canberra Act 2600, AUSTRALIA
Phone : + 61 (6) 262 1571
Fax : + 61 (6) 273 4535
e-mail : claw@nla.gov.au
<http://www.nla.gov.au/archive/npo/html>

Northeast Document Conservation Center (NEDCC)
100 Brickstone Square, Andover, MA 01810, USA
Phone : + 1 (978) 470 1010
Fax : + 1 (978) 475 6021
e-mail : nedcc@nedcc.org
<http://www.nedcc.org>

Research Libraries Group (RLG)
1200 Villa Street, Mountain View, CA 94041-1100, USA
Phone : + 1 (800) 537 7546 (North America)
Phone : + 1 (650) 691 2333 (outside North America)
Fax : +1 (650) 964 0943
e-mail : bl.ric@rlg.org
<http://www.rlg.org/toc.html>

Solinet Preservation Service
1438 West Peachtree Street, NW, Suite 200, Atlanta, GA
30309-2955, USA
Phone : + 1 (404) 892 0943 or + 1 (800) 999 8558
e-mail : helpdesk@solinet.net
<http://www.solinet.net>

UNESCO – Memory of the World
1, rue Miollis, 75015 Paris, FRANCE
Phone : + 33 (0) 1 45 68 44 96
Fax : + 33 (0) 1 44 49 00 58
<http://www.unesco.org/webworld>

Standards

International and national standards are documented agreements containing technical specifications or the precise criteria to be used consistently as rules, guidelines, or definitions of characteristics, to ensure that materials, products, processes and services are fit for their purpose. Although it is recommended that they are followed, they may have to be adapted for local requirements.

If we are to be fully confident about our preservation efforts, then we need to know that our practices, procedures, and purchases conform to established standards. While adherence to some standards is mandatory, electrical standards for example, in other cases compliance is voluntary. This puts the responsibility on the practitioner or consumer to be aware of, and to insist on, conformance with all standards governing an activity or product.

Some relevant ISO Technical Committees :

ISO JCT 1	:	Information Technology
ISO TC 6	:	Paper, Board and Pulps
ISO TC 21	:	Equipment for Fire Protection and Fire Fighting
ISO TC 35	:	Paints and Varnishes
ISO TC 37	:	Terminology (Principles and Coordination)
ISO TC 42	:	Photography
ISO TC 46	:	Information and Documentation
ISO TC 47	:	Chemistry
ISO TC 61	:	Plastics
ISO TC 92	:	Fire Safety
ISO TC 94	:	Personal Safety – Protective Clothing and Equipment
ISO TC 120	:	Leather
ISO TC 122	:	Packaging
ISO TC 146	:	Air Quality
ISO TC 171	:	Document Imaging Applications

International Organisation for Standardisation (ISO)

1, rue de Varembe
CP 56, CH – 1211 Genève 20
Switzerland
Phone : + 41 (22) 749 0111
Fax : + 41 (22) 733 3430
<http://www.iso.ch/welcome.html>
ISO conducts its work through technical committees that work on specific materials, methods, systems, terminologies or technologies.

American National Standards Institute (ANSI)

11 West 42nd Street, 13th Floor
New York, NY 10036
USA
Phone : + 1 (212) 642 4900
Fax : + 1 (212) 398 0023
<http://www.ansi.org/>
ANSI is the USA representative to ISO and principal national standards organisation in the USA. It is a private organisation that co-ordinates work of committees and organisations that it has accredited as standards developers.

Standard for permanent paper

Permanent paper is free of any substance leading to self-deterioration. It has a life-expectancy of several hundred years according to accelerated ageing tests. Permanent paper characteristics are described in the ISO standard :
ISO 9706:1994 – Information and Documentation – Paper for Documents – Requirements for Permanence.

- pH between 7.5 and 10
- Alkaline reserve (calcium carbonate equivalent) : 2 %
- Kappa number (resistance to oxidation) : under 5
- Tear resistance : 350 mN for all papers over 70g/m^2

This symbol should appear on any publications printed on permanent paper : 

The PAC Programme

The IFLA-PAC Programme has one major goal : to ensure that library and archive materials, published and unpublished, in all formats, will be preserved in accessible form for as long as possible. Since 1986, this programme has set up a network of Regional Centres in order to deal with preservation issues around the world. The IFLA-PAC Programme publishes a newsletter, International Preservation News, three times a year in English, French and Spanish, free of charge. Please contact your Regional Centre for further information.

International Centre and Regional Centre for Western Europe, the Middle East and Africa

Bibliothèque nationale de France
2, rue Vivienne
75084 Paris cedex 02
France
Phone : + 33 (1) 47 03 87 26
Fax : + 33 (1) 47 03 77 25
e-mail : marie-therese.varlamoff@bnf.fr
<http://www.bnf.fr>

Regional Centre for USA and Canada

Library of Congress
Conservation Division
Washington, DC 20540
USA
Phone : + 1 (202) 707 74 23
Fax : + 1 (202) 707 34 34
e-mail : mroo@loc.gov
<http://loc.gov/preserv/preserve.html>

Regional Centre for Latin America and the Caribbean

Biblioteca Nacional de Venezuela
Centro de Conservación Documental
Edificio Rogi
Piso 1
Calle Soledad
Zona Industrial la Trinidad
Caracas 20
VENEZUELA
Phone : + 58 (2) 941 4070
Fax : + 58 (2) 941 4070
e-mail : dconsv@bnv.bib.ve

Regional Centre for Asia

National Diet Library
Preservation Planning Office
10-1 Nagatacho
1 Chome
Chiyoda-ku
Tokyo 100
JAPAN
Phone : + 81 (3) 3581 2331
Fax : + 81 (3) 3592 0783
e-mail : pacasia@ndl.go.jp

Regional Centre for South-East Asia and Oceania

National Library of Australia
Coordination Support Branch
Canberra ACT 2600
AUSTRALIA
Phone : + 61 (26) 262 1 503
Fax : + 61 (26) 273 2545
e-mail : claw@nla.gov.au
<http://www.nla.gov.au/3/npo/nophome.html>

Regional Centre for Eastern Europe and Commonwealth of Independent States

Library for Foreign Literature
Nikolo – Jamskaya Street, 1
Moscow 109-189
RUSSIA
Phone : + 7 (095) 915 3621
Fax : + 7 (095) 915 3637
e-mail : gkislov@libfl.msk.su
<http://www.libfl.ras.rv>