

Caring for Paper and Photographs

Preserve Your Story Workshop Series

Workshop 1 | 31 October 2020
Women's Art Register

Presented by

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Aims of the workshop

We all have papers in our homes – certificates, family letters, ephemera or artworks – that we wish to preserve. Paper-based and photographic materials can be vulnerable, but by adopting some simple precautions we can prevent a great deal of damage to these collections.

- 1 How are paper and photographic prints made?
- 2 What are the common types of degradation?
- 3 How should I store and display objects?
- 4 What are some simple things I can do to preserve my objects?
- 5 What resources are available to me?
- 6 How should I care for my objects? - Q&A session

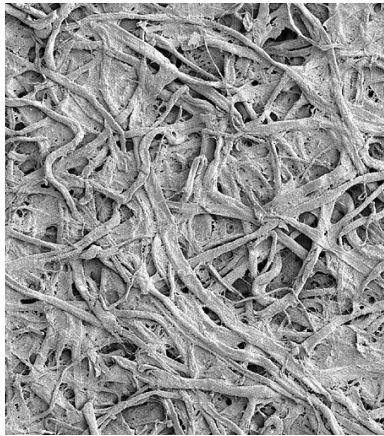
1 What is paper made of?

Paper is made up of cellulose fibres derived from plants.

Most permanent papers have:

- **High cellulose content**
- **Lignin free**

E.g. Cotton, linen rag, hemp, kozo/mulberry



Arches cotton rag paper; x100 magnification.
Image: <http://paperproject.com/samgallery.html>



Japanese washi papermaking fibres (from top): 1&2 Kozo; 3&4 Gamp; 5&6 Mitsumata.
Image: <https://printdayinmay.com/2019/04/04/which-washi-choosing-japanese-paper-for-printmaking/>

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The fundamental process of paper-making has not changed since paper was first produced in China around 200 BC. However, modern paper making has introduced chemical and mechanical processes to produce paper on an industrial scale.

Paper is made from cellulose fibres. Cellulose fibres are extracted from a variety of plants such as cotton, flax, hemp, mulberry, grasses and trees. The type of plants that paper is made from can affect the quality of the paper and how it will age.

Plant fibres have varying proportions of cellulose and other fibrous materials such as hemicellulose and lignin. The most permanent papers are those derived from fibres with a high cellulose content.

All paper up until the 19th century was hand-made, primarily from cotton and linen rags and hemp, which produced papers of great strength and permanence. As the need for paper increased, ground wood was introduced as a paper-making fibre. This resulted in the mass-production of papers which were weaker and less permanent due to the higher presence of lignin.

These lower quality papers are used particularly in newspapers. Newspapers often turn yellow over time due to the high lignin content in the paper. Over time, lignin can degrade and give off acids, which causes the cellulose in the paper to degrade more quickly. Therefore, the lignin content of your paper can affect how vulnerable your paper objects are to degradation.

1 How is paper made?

Paper is manufactured by:

1. **Pulping of fibres**
2. **Pulp combined with water and laid into a mould**
3. **Flattening and drying**

Additives are sometimes added to impart certain properties:

- Fillers and loadings
- Surface coatings
- Sizings to reduce absorbency



Traditional washi papermaking process
Images: <https://awanami.com/news/washi-paper-basics>

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Paper is broadly manufactured in three steps:

1. Cellulose fibres are extracted and converted to pulp by boiling, washing and beating
2. Pulp is combined with water and laid into a mold.
3. Molded pulp is flattened, dried, and cut into sheets and rolls

Besides fibres and water, paper usually contains additional products to impart certain properties. These include:

- Fillers or loadings to produce a smoother and whiter surface e.g. kaolin, talc, calcium carbonate and titanium dioxide
- Surface coatings to alter visual characteristics e.g. starch, various minerals
- Sizing to reduce the absorbency of paper e.g. gelatine, starch

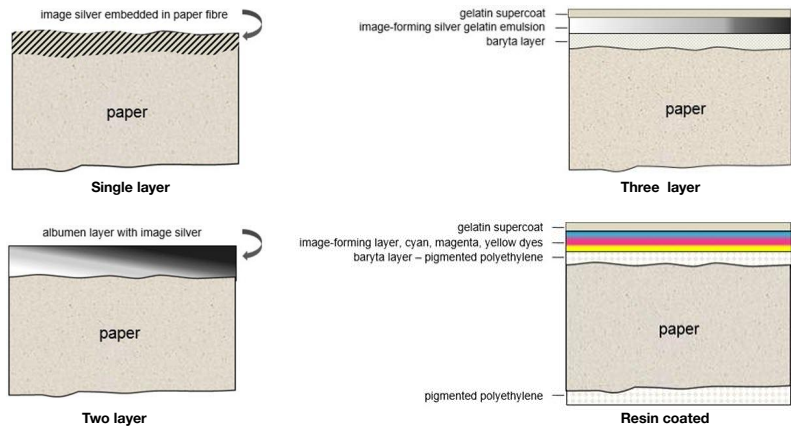
Most papers also contain impurities and unwanted chemicals— such as acids that limit their lifespan, stemming from the inherent lignin content of the fibres.

To overcome the problem with acids, there are now papers and paper-based products being produced that are free of acids and other impurities. These archival- quality products are made from various fibres, including cotton and specially-treated wood pulp. Many archival papers and boards also contain an alkaline buffer to help protect them from acidity.

1 Paper and photographs are composite objects

Photographic print types by their composition:

- **Single layer structure**
- **Two-layer structure**
- **Three-layer structure**
- **Modern resin coated**



Cross section structure of photographic print types

Images: <https://www.canada.ca/en/conservation-institute/services/preventive-conservation/guidelines-collections/photographic-materials.html>

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However, paper objects commonly do not consist of just paper but also have images or text. So when thinking about caring for paper objects, you need to also consider the degradation of any applied mediums such as watercolours, inks, gouache etc.

Photography describes an image that is captured by the use of light. They are then reproduced or printed onto a carrier or substrate such as plastic, glass, metal and paper. This presentation primarily focuses on traditional photographic prints on paper.

Prints consist of papers that are coated with silver salts, other metals or coloured dye layers that react to light to create the image. Therefore we can say that generally photographic prints have a paper substrate, with a varying number of applied layers which create the image.

Photographic prints can be classified broadly by how they are constructed:

- **Single-layer structure** where light sensitive material is within the paper e.g. salted paper prints, cyanotype and platinotypes from the early 19th C.
- **Two-layer structure** where light sensitive material is in the upper emulsion layer e.g. albumen prints and carbon prints from the mid-19th C.
- **Three-layer structure**, similar to the two layer structure except for an added baryta layer between paper and emulsion layer to provide a smooth white surface. E.g. gelatine and collodion printing-out papers from the late 19thC.
- **Modern, resin-coated paper** introduced from the 1970s. The paper is coated with polyethylene and a light sensitive gelatine emulsion or colour dye layer is on the top.

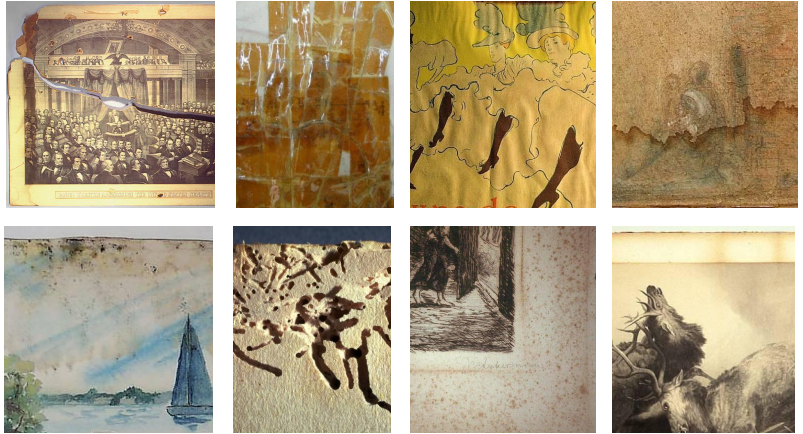
Paper objects and photographs are composite materials of varying complexity. In the case of flat paper materials, this may be some sort of applied media such as ink or watercolour. Or in the more complex case of photographs, the image consists of laminated layers of a varying number that include the light-sensitive image-producing layer.

2

Common types of degradation | Paper

Examples of paper degradation:
(from top-left; clockwise)

1. Tears and embrittlement
2. Darkening - tape stains
3. Cockling
4. Tidelines and staining
5. Acid burn / darkening
6. Foxing
7. Insect damage
8. Mould



Images: http://www.art-conservation.org/?page_id=1189

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Paper is particularly vulnerable to physical damage. However, because it is an organic material, it is also susceptible to the damage caused by chemical deterioration from pollutants, light, moisture and humidity and pests. Matte and porous surfaces like paper can hold dirt and dust, which is often acidic and attracts moisture. This can then cause chemical and physical changes.

Physical forces can result in:

- Tears and losses;
- Dents and punctures;
- Creases and folds
- Abrasion and thinning of paper

Pollutants from the air or from other materials can subject the paper to acids. These acids can also be found in poor quality framing materials like mountboards or sticky tape that are in contact with the paper object. This can result in:

- Embrittlement of the paper
- Acid burn or darkening
- Yellowing

Light can also produce chemical changes such as:

- Fading
- Embrittlement

Incorrect relative humidity and exposure to moisture can result in:

- Cockling or buckling
- Tidelines and staining

When there is a good source of water and food, these conditions attract biological attacks. This can result in:

- Insect attacks that produce losses and weaken the paper
- Foxing - which are reddish brown dotted stains caused by the metal particles in the paper being

- attacked by microorganisms
- Flyspecks and frass - which are the excretions of insects on the paper. These can cause more chemical degradation
- Mould

2

Common types of degradation | Media

Examples of media degradation on paper:
(from top-left; clockwise)

1. Flaking and loss
2. Smudges of powdery media
3. Cracking
4. Cracking and cleavage
5. Fading of pigments
6. Iron gall ink corrosion



Images: http://www.art-conservation.org/?page_id=1189

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As well as the paper substrate, image and text media are vulnerable to deterioration, damage or loss.

Physical forces can cause:

- Abrasion
- smudges
- losses of media, particularly if it is a friable or powdery media like pastel or charcoal

Light can cause fading of pigments, especially organic pigments, for example any Lakes or Madders.

Thicker paints such as gouache can be affected by incorrect relative humidity, temperature or light, which can cause:

- Delamination
- Cracking
- Flaking and loss

Even the media itself may contribute to the chemical deterioration of the paper object. For example, iron gall ink was a prevalent permanent ink used until the invention of synthetic pigments in the later 20thC. On some objects, the presence of iron gall ink has caused ink corrosion with subsequent degradation to the paper.

2

Common types of degradation | Photographs

Examples of degradation of photographic prints on paper:
(from top-left; clockwise)

1. Creases
2. Sticking to glazing
3. Losses from fusing with other surfaces
4. Cracking of coatings
5. Colour shift and dye loss
6. Sulfiding - yellowing and fading
7. Silver mirroring
8. Formation of colloidal silver



Images: <https://www.canada.ca/en/conservation-institute/services/preventive-conservation/guidelines-collections/photographic-materials.html>

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Photographic prints suffer from the same physical and chemical damage that paper is vulnerable to. Physical forces can cause:

- Tears
- Creases
- Losses

However, photographs also have the added vulnerability of the image layers being susceptible to deterioration. The gelatine and emulsion layers are very absorbent, and the reactive silver or coloured dyes that make up the image can undergo chemical changes.

Even small amounts of water will cause the softening or dissolution of the gelatin, creating a sticky surface. Exposure to water can cause:

- Sticking of the emulsion to other materials it may be in contact with, such as the glass in a frame or the backs of other photographs
- Staining
- Embedding of dirt in the softened gelatin layers
- Mould

High humidity can make gelatine layers more permeable, which then makes the image layer more vulnerable to deterioration. The image silver can oxidise, producing silver ions which are highly reactive and able to migrate and disperse themselves through the gelatin emulsion, ultimately resulting in the total loss of the silver. This is due to exposure to strong oxidizing agents, such as peroxide bleaches from poor-quality paper boxes and sulfur dioxide from air pollution, in the presence of moisture.

Three things can happen:

- Sulfiding - where the silver turns to sulfides and results in brown or yellow staining and fading of the image
- Silver mirroring - where silver ions can migrate to the surface of the gelatin and combine with other silver ions to form a layer of visible metallic silver
- Formation of colloidal silver - which appears as orange coloured tint or patches in the image.

- This is particularly prevalent in resin-coated papers.

Exposure to visible light and UV can discolour and weaken paper and begin processes of photochemical degradation, resulting in:

- Fading of photographic dyes
- Discolouration and colour shifts
- Yellowing
- Weakening of coatings causing them to be brittle and crack

3 Ideal storage and display conditions



Ideal museum conditions are difficult to achieve at home, so choose a space to store your objects that is:

cool - dark - dry - stable

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	PAPER		PHOTOGRAPHIC PRINTS	
	Storage	Display	Storage	Display
Temperature	18–22°C	21°C ± 4°C	2–16°C	21°C ± 4°C
Relative Humidity *temperate locations	45-55%±5 RH	45-55%±5 RH	30-50% RH	30-50% RH
Light	Dark storage preferred	50 lux or less	Dark storage preferred	50 lux or less

Refer to: AICCM Environmental Guidelines, <https://aiccm.org.au/conservation/environmental-guidelines/>

Paper is an organic material and therefore, is particularly vulnerable to humidity, temperature and light. Photographic prints are more vulnerable and in institutions are often stored separately in lower temperatures and relative humidity conditions, and even in cold storage.

In museums, objects are displayed in low lighting conditions and the amount of time they are subjected to light is closely monitored. Objects are often put on display and then cycled back into dark storage so that exposure can be limited. Museum lighting is fitted with UV filters to prevent UV exposure.

However, in a non-museum settings these conditions are difficult to achieve. Therefore, the aim is to provide as stable an environment as possible and avoid extreme fluctuations.

Aim to store items in cool, dark and dry conditions with stable humidity and temperature:

- Avoid using an attic or basement as a storage area. Use a storage location in the centre of a building as these areas experience less fluctuations in temperature and relative humidity (RH).
- Avoid strong light sources and direct sunlight
- Keep material away from heat sources
- Avoid contact with any potentially damp locations such as bathrooms, kitchens, laundries and external walls.
- Keep storage areas off the ground, clean and ventilated to reduce the risk of pests and mould.

Sort through your paper and photographic collections and group them according to their media and type. This will help you choose storage environments that are more nuanced to suit each material type.

If you have mixed types of paper and photographs, you may have to find a compromise and store objects in average conditions that broadly suit most of your collection. It might be advisable to store the most significant and vulnerable objects separately or develop special storage approaches for just those items.

3 Storage wrappers and enclosures

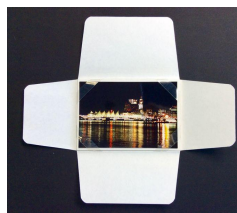
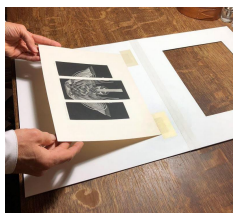
Primary aims:

- **Objects are not in contact with each other or other degrading materials**
- **Provide protection from the environment and physical damage**

Enclosures can be made or bought from archival supplies stores

Do not apply directly on objects, even if 'archival quality' without conservator advice:

- Any tapes
- Paper clips and paper fasteners
- Laminating
- Any adhesives



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It is recommended that you store paper away in archival enclosures or keep them mounted and framed.

Storage enclosures are things like boxes, folders and sleeves that aid in the protection, organization, and identification of collection items. Their primary function is shielding those items from dust and physical damage. While providing protective enclosures is a desirable aspect of preservation practice, improving the storage climate is more effective overall.

The key approach to storage is:

- 1) **Make sure objects are not in contact with each other (to prevent abrasion) or other degrading materials.**
Interleave objects with archival tissue paper, or put each individual item in their own paper envelope, folder, or plastic sleeve in a binder.
Paper clips, adhesives or sticky tapes should not have any direct contact with the objects, even if they are of 'archival quality'.
- 2) **Provide a buffer from the environment and physical damage with an enclosure.**
This is achieved by storing binders or folders either vertically in flip-top archival boxes or flat in shallow print boxes. Make sure you have enough space around the edges of the interior so that you can fit your fingers in to pick them up without damaging the edges.

If you have any old magnetic photo albums, it is best to rehouse them in new archival binders with mylar photo corners. Magnetic photo albums contain adhesives that oxidise and degrade your photos over time.

You can wrap loose photographs individually or a few photos interleaved with paper in a four-flap wrapper made from good-quality materials such as photographic storage paper

Enclosures can be made or can be bought from specialty archival suppliers. For example, Archival Survival here in Melbourne have a wide range of conservation grade storage solutions for a variety of paper-based materials.

3

Materials used for storage

Use cardboard and paper that are:

- Archival quality and acid free
- Pure cellulose, lignin free
- Buffered (for paper objects), Non-buffered (for photographs)
- Has passed the Photographic Activity Test (PAT) standards*



Use plastics that are stable

- Polyester - Mylar[®], Melinex[®]
- Polypropylene
- Polyethylene - Tyvek[®], Cell-Aire[®], Ethafoam[®]

No chloride or sulphur: PVC, rubber

[*https://www.naa.gov.au/information-management/store-and-preserve-information/preserving-information/preserving-photographs/about-photographic-activity-test](https://www.naa.gov.au/information-management/store-and-preserve-information/preserving-information/preserving-photographs/about-photographic-activity-test)

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Wrappings, enclosures and mount boards should be made from materials which are chemically inert, that is, they will not cause chemical damage to the object. Materials should be archival quality and acid- and lignin-free. Particularly for storing photographs, materials need to have passed the Photographic Activity Test. The National Archives of Australia has a list of products which have passed the PAT standards.

Preferred papers and boards are those made from cotton rag or linen.

Plastics used widely are archival-quality polyester such as Mylar and polypropylene. Tyvek, a spun, bonded polyethylene is also suitable for wrappers or paddings in enclosures.

Materials to avoid are:

- Poor-quality papers.
Many poor-quality papers become acidic over time so avoid ordinary cardboard boxes.
- Sulphur-containing materials.
Rubber cements and rubber bands also contain sulphur and should be avoided; and
- Unsuitable plastics, especially PVC.
Poly vinyl chloride in folders and storage sleeves breaks down in the presence of atmospheric moisture, to produce hydrochloric acid, which can cause damage to your items. (EG. standard plastic pockets)

3 Display and handling

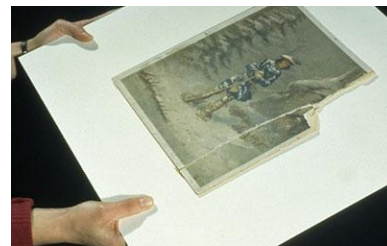
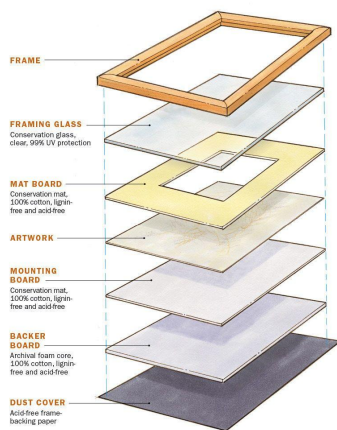
Conservation quality framing and mounting should:

- Use archival quality materials
- Be reversible - avoid dry mounting

When handling objects, ensure:

- Hands are clean or wear nitrile gloves
- Objects are physically supported - support boards, folders, trays

Consider digitising or copying objects that are handled or referred to regularly.



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When on display, it is recommended that your significant objects are framed or mounted on boards with good conservation principles. This means using archival quality materials like acid free mat boards and sometimes UV filtering glazing, and sealing all edges with tape to protect the object from dust, moisture and light.

However, it is also recommended that the method of presentation is reversible and can be removed without damaging the object. For example, avoid dry mounting paper objects as the adhesive and backing boards are almost impossible to remove. It is best to hinge mount paper objects using Japanese tissue paper and starch paste. This is standard for conservation grade framing.

Damage commonly occurs when objects are improperly handled.

It is important to have clean, dry hands or wear nitrile gloves when handling paper-based material.

When handling and transporting unframed artworks and documents, use a thick support paper underneath or place your item inside a folder.

When carrying a framed work do not lift by the top edge, hold both sides of the frame.

If a valuable or fragile item is going to be handled frequently, consider creating a copy or duplicate which can reduce handling of the original and ensure its preservation.

4

Preserving paper and photographs

Simple preservation techniques:

- Regularly monitor condition
- Housekeeping and pest control
- Dusting and dry surface cleaning - hake brush, smoke sponges, Staedler Mars eraser crumbs
- Contact a conservator - AICCM 'Find a Conservator'

Do not apply any liquids, water, solvents or adhesives onto objects.



by silk hat, whose rather brim two large
stained with whitish blotches that defied the
silk covering of the hat, having been, as
applied to the paneboard shape, was pen-
ny, and seemed, in spite of the careful hand
sewing after morning, to be suffering from
age.
It, thus precariously worn, stretched a sheep-
skin as you may see upon the shoulders of a
lad nowhere else. This vast visage, which
as a skimming-hale is full of holes--of pits
actually cast shadow--resembled a Roman
the earth, and violated every rule of anatomy.
As you might, your eye discovered not a
crack in them. Hence the face seemingly had
they should have been, your eye encountered
eyes of flesh, and wandered thence, to find
noles usurping the place of what, in any ordi-
nary, would have been a hollow; while, like some
at commands a plain, a huge Don Quixote
nose which (as Cervantes must have noticed)
that devotion to noble aims, that is apt to de-
bility--stood boldly out, the most prominent
protuberant prominence, through which, as
at foot-steps, peered a pair of sad gray eyes,
we red lines that did duty for eyebrows.
His old man, however (all comic as it was),
saw, the extreme melancholy that welled
a fellow's faded eyes appealed directly to the
d from the joke upon his lips. The thought
agent itself, that Nature had, peremptorily
e creature, under pain of exciting a woman's
at, to breathe a single syllable of love. In
th a misfortune a Frenchman is dumb; for,
the most cruel of all misfortunes is--to lack
a woman's favor!
a man, thus branded by the hand of Nature,
gentlewoman--a class which, (23 x 22 x 25)

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The key things you can do to maintain your paper and photographic collections are:

- Regularly monitor and check the condition of your objects.
- Housekeeping is important; storage areas should be kept clean and inspected regularly for mould and insect activity. Cleaning materials containing chlorine bleaches, ammonia, insecticides and fungicides should not be used near photographic collections. These are active chemicals which could adversely affect photographs, especially in an enclosed storage environment.
- Simple drying cleaning techniques can help maintain objects. Dust objects with a soft hake brush. Special conservation grade erasers and sponges can be used to gently clean embedded dirt off surfaces. Grate up a PVC-free eraser like a the Staedler brand Mars eraser, and use the crumbs to softly rub the surface. Gently wipe the surface with cosmetic sponges or smoke sponges. Do not apply any liquids to your objects such as water, solvents or adhesives. We will show you some simple techniques in the demonstration after our presentation.
- Call a conservator for advice and to conduct any treatments.

5

Useful resources

Collections care advice

- State Library of Victoria:
<https://www.slv.vic.gov.au/search-discover/conservation-guides>
- State Library of QLD:
<https://www.slq.qld.gov.au/how-do-i/preserve-your-collections>
- State Library of NSW:
<https://www.sl.nsw.gov.au/research-and-collections-building-our-collections/caring-collections>
- National Archives of Australia:
<https://www.naa.gov.au/information-management/store-and-preserve-information/preserving-information/preserving-paper-documents-and-artworks>
- reCollections:
<http://culturalmaterials.net/wp/>
- Australian Institute for the Conservation of Cultural Materials (AICCM):
<https://aiccm.org.au/conservation/collection-care/>
- Image Permanence Institute:
<https://www.imagepermanencemuseum.org/>
- Canadian Conservation Institute:
<http://www.canada.ca/en/conservation-institute/services/care-objects.html>
- US National Parks Service, Conserve-O-Grams:
https://www.nps.gov/museum/publications/consveogram/cons_toc.html
- The Conservation Starter YouTube Channel, 'How to Care for your Family Treasures' Series:
<https://www.youtube.com/playlist?list=PLon0hKQ4e-FeRITpKQyBIU8TyUfHw7cZu>

Find a Conservator

- AICCM directory:
<https://aiccm.org.au/find-a-conservator/>

5

Useful resources

Preservation techniques

- State Library of QLD 'Caring for Collections' Series:
<https://www.slg.qld.gov.au/how-do-i/preserve-my-collection/caring-collections>
- Cleaning photographs:
<https://youtu.be/Bv9a6upaK-E>
- Brush vacuum cleaning:
<https://youtu.be/KUUtQEnMS3I>
- Making storage enclosures for books and documents:
<https://youtu.be/zUGu-OHCwc0>
- Making a four- and three-flap wrapper for books:
<https://youtu.be/c0nsSWZXkKo>
- Making protective enclosures for flat paper:
<http://culturalmaterials.net/wp/28-2/cultural-material/paper/>
- Making storage boxes:
<http://culturalmaterials.net/wp/28-2/cultural-material/paper/>
- Removing photos from sticky photo albums:
<https://youtu.be/fcDIbNi-9D0>
- Making enclosures for photographs:
<http://culturalmaterials.net/wp/28-2/cultural-material/photographs/>

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Conservation supplies

- Archival Survival:
<https://archivalsurvival.com.au/>
- Larson Juhl:
<http://www.larsonjuhl.com.au/>
- Conservation Supplies Australia:
<https://conservationsuppliesaus.com.au/>
- Good quality art stores e.g. Melbourne Etching Supplies

Thank you

Contact Us

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