PAPER CONSERVATION

THEORY AND PRACTICE

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PAPER CONSERVATION : THEORY AND PRACTICE

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Rags make paper
Paper makes money
Money makes banks
Banks make loans
Loans make beggars
Beggars make
Rags

(Author unknown circa 18th Century)

FRONT COVER INSET : Hand set and printed on 100% pure rag paper from the Fabriano Mill in Italy.

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INTRODUCTION

In this thesis I propose to show how a move away from the traditional origins of papermaking in the east, to the mass production methods of manufacture in the west, led to a deterioration in paper quality. I will show how this marked the first beginnings of systematic research into the factors affecting paper and how this in turn led to the emergence of the development of conservation as a profession. I propose to describe by practical demonstration, basic conservation procedures and documentation through the conservation of a 18th century engraving which was carried out in the Conservation Department of the National Gallery of Ireland under the supervision of Maighread McParland, Senior Conservator. Finally I will analyze the responsibility of the Conservator in relation to ethical problems in conservation and the relationship of the Conservator to the artist.

CHAPTER I

Towards a philosophy of Paper Conservation

- Origins of Paper
- Early Conservation
- The Emergence of Professional Conservation Practice

THE ORIGINS OF PAPER

Paper, which superseded parchment as the material most used as a support for writing and works of art in paper, was invented by the Chinese before the second century AD. Apart from paper's rigid predecessors - wax coated tablets of wood clay (used for cuneiform writing) and stone - there were also a number of flexible materials, the primary of these being palm leaves and papyrus. [1] As early as 3000 BC papyrus was being used as a writing material, particularly in Egypt. Parchment was perfected as a writing material around 200 BC. [2] [Fig 1]

The date often cited for the invention of paper is AD 105 although today it is believed to be much older than that. It has been demonstrated by scientific evidence that paper, and what is sometimes called 'protopaper', forerunners to paper made of silk and other materials, existed before this date. [3] A Chinese dictionary dated AD 69 contains a character for paper, and samples of earlier paper have been excavated at burial sites that predate the life of Ts'ai Lun, the Chinese man credited with the invention of paper. [4] While it is unlikely that Ts'ai Lun invented paper in 105 AD, it does seem probable that he perfected the process of its manufacture and was the first to record its existence. It also seems probable that he was responsible for the use of 'Tapa', a textile made from mulberry bark, as a fibre source for papermaking. Other materials used by the early Chinese papermakings included bamboo and hemp.

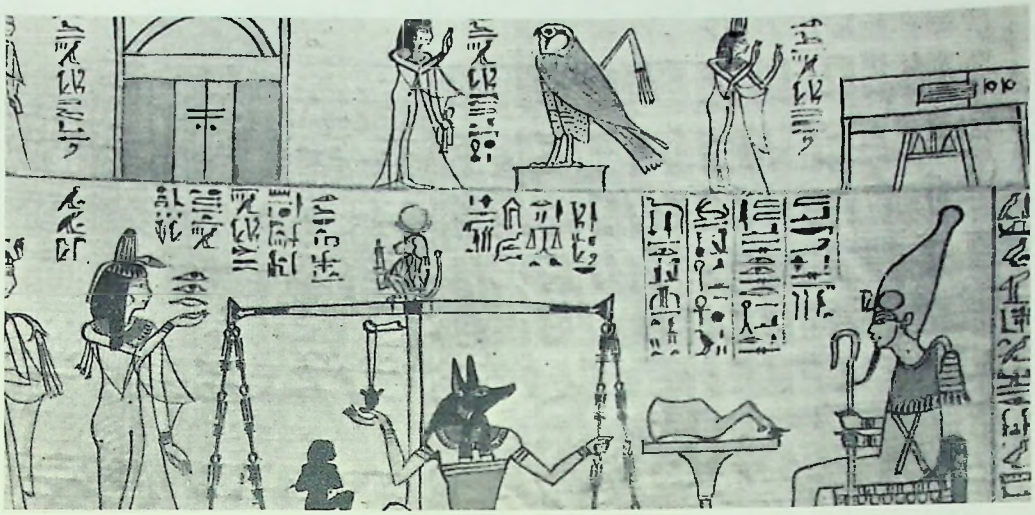
For about six hundred years the craft of papermaking remained in China. The secret of its manufacture eventually travelled from east to west by way of Samarkand, Baghdad, Egypt, Morocco, and by the 12th century to Europe. According to tradition, when the Arabs conquered Samarkand in 751 AD, they held among their captives a number of papermakers. It was with information presumably taken from these Chinese prisoners of war that the Arabs began to make paper in North Africa. [5]

From North Africa papermaking made its way to Europe through Spain. The first papermill to be established in Europe was in the Spanish town of Xativa in 1151. Between 1268 and 1275 the first Italian mill was built at Fabriano, still a papermaking town today. From there it spread to France by the mid-14th century, to Germany at Nuremberg in 1390 and so on to the rest of Europe. [6]

The information on early papermaking process is very erratic, as so much of the history of the process is conjecture. Historians have been able to piece together a pattern of development from fragments of paper, woven cloth, metal moulds, and watermark devices extant. Although paper has existed for over 2000 years, it was not until the 18th century that writers began to document the craft in any systematic way. The first oriental publication to cover the process is the Japanese papermaking manual 'Kamisuki Chohoki', written in 1798. [7] Prior to this a small illustration of the oriental papermaker by the Japanese artist Tachibana Minko appeared in a 'Book of Trades' made in 1784. [8] In 1712 Engelbert Kaempfer, a German writer, was the first to document Japanese papermaking methods in Europe. The French writers Lalande, Desmaret and Goussier began documenting the craft in their country during the mid 18th century. [9] [Fig 2]

The development of papermaking methods in the orient and the occident began to go in different directions as the uses for paper became more wide and varied. Early oriental paper was used mainly for writing as there was relatively little printing done at the time. The paper had a characteristically soft surface suitable for writing with a brush. [10] In Europe the use of water based ink, made with ox-gall and lamp black, and a quill to write, meant that a different surface was required and different papermaking techniques were employed. The western paper was made from cotton and linen rags as opposed to the eastern raw vegetable fibres. The use of size also varied. In the east papermakers sized with a vegetable mucilage whereas the Europeans used glue or gelatin. [9] The purpose of sizing is to harden the paper. The amount of size necessary in paper depends on its eventual use. Writing paper demands a hard surface so a lot is required; printing paper is softer so it requires less, and blotting paper requires almost none. The European use of the quill and ink meant that the paper had to be sized well to prevent the ink from the quill from feathering or bleeding out onto the sheet. Other differences between eastern and western papermaking techniques included the type of papermaking mould used and methods of drying the paper. [11]

With the invention of Gutenberg's moveable type in the 15th century [12] the demand for paper increased enormously. Huge quantities of paper were now needed to print the scores of books made possible by the newly available printing presses. Pressure



[FIG 1]

[FIG 2]

National College of Art and Design

Store Request Form

Student Name: ALICE CLARK

College Year and Course : _____

Email address: _____

Date: 4/8/10

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Call back to collect store requests from 5.00pm on the Tuesday or Thursday following submission. They will be held at the issue desk for one week.

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Book Request:

Title: THESIS NO: 758

Author: Tafina Flood

Shelf No. _____

Periodicals:

Title: _____

Vol/Month/Year: _____

Thesis:

Title: Paper Conservation: theory v practice

Author: _____

Thesis Number: _____

Library use only

Request date..... 4/8/10

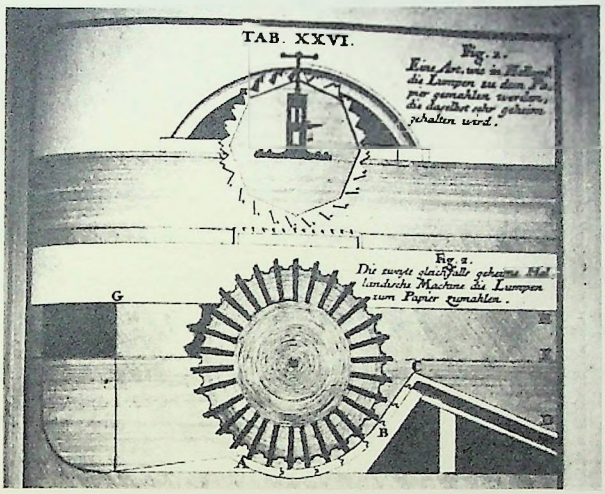
Available.....

Collected.....

was on the papermaker to keep pace with the demand and overcome the two main problems, labour cost and the scarcity of raw materials. It was within this period that western papermaking became dramatically different from its eastern counterpart. The oriental papermaker continued to use traditional tried and tested methods which is why many eastern papers have great permanence and durability. So while the european's mechanical and chemical innovations helped to solve many of the papermakers difficulties, they also posed new ones for those concerned with the permanency of paper. More often than not technology improved quantity at the expense of quality.

Early Conservation

Since the invention of paper is generally accredited to the orient, it is there also that we would expect to find the earliest references to conservation as we understand the term today. In the fifth century AD Chia Ssu-hsieh expressed concern at the conservation practices at the time. The points raised by the writer are very similar to the concerns of paper conservators today. They included care in handling objects, choice of materials for conservation, exposure to correct levels of humidity, light conditions for examination of objects, correct storage, and vigilance against infestation. [13] The Chinese writer Chang Huai-kuan [14] in 760 AD, mentions that during the Chin Dynasty (AD 265-420), autographs were mounted but were not properly arranged, so the paper with which they were backed developed creases. Apart from literary references there also survives actual pieces of ancient conservation. Among these is a 9th century AD drawing on paper from Dunhuang in Western China, now in the British Museum. The conservation work, which is approximately 1000 years old, consists of the replacement of missing areas of the paper support by 'infilling' the areas with pulp made from similar fibres to the original paper. [15] As early as the beginning of the Christian era, paper from the east was being dyed with a yellow extract from the Amur cork tree. [16] The extract acts to prevent insects from attacking the paper. A Roman scientist Gaius, Plinius Secundus (23-79 AD) recommended, as a protective measure for books in storage, ground glass as an additive to paste to discourage the damage caused by rodents. Another western scientist, a Greek named Pedanius Discordes, was responsible for the addition of ferrous sulphate to the commonly used 'atramentum scriptorum' or ink composed of carbon, gum and water, in 60 AD. The importance of this was to make ink insoluble


TAB. XXVI.
Fig. 1.
Eine Art, wie in Holland die Lumpen zu dem Papier gemahlen werden, die daselbst sehr geheim gehalten wird.
Fig. 2.
Die zweyte claar stallt gehaime Holländische Machine die Lumpen zum Papier zumahlen.
G
C
B
A

[FIG 3]

caused entire stacks of paper to disintegrate before they could be used. A bible printed on over-bleached paper in Cambridge in 1816 fell to bits by 1823 without ever being opened. [21] By 1800 more than 135 substitutes for rags had been suggested, among these were asbestos, thistles, potatoes, cabbage stalks and linden leaves. [22] It was wood however that showed the greatest promise. Groundwood pulp is what newspapers and inexpensive books are made of today but due to the way it is prepared it has a very fast rate of deterioration. The fibres produced are extremely short and a large amount of lignin, the material that holds the fibre together within the tree, is retained. It breaks down easily into acidic components which attack the paper and produce the familiar yellowing effect. The introduction of a cheap paper for printing ephemera posed a fundamental problem for the modern conservator as there was no way of knowing historically what would become important and should therefore be preserved.

Despite all the disastrous papermaking methods over the centuries quite a large proportion of paper has survived. These methods were not used by all papermakers, perhaps because the latest technology was unavailable or perhaps because they realised the wisdom of using methods that had withstood the test of time. By the beginning of the 18th century in Europe there is evidence of a questioning of the papermaking practices prevalent at the time. The French scientist Father Imberdis expressed concern for the quality of many of the papers being produced in 17th century French mills. In order to avoid contamination of the paper, he recommended that the mill be placed on a stream above the city or village and suggested that the water would only be pure 'when across its crystalline waves shine numerous pebbles and abundant speckled trout leap about and frolic in close schools'. [23] The French writer Joseph Lalande [24], who documented papermaking in the mid-18th century, was also concerned for the purity of the water. He felt that if the papermaker was careful to obtain fresh water free from iron and debris his paper would be of a higher quality. Another practice which was questioned by contemporary writers was the use of camouflaging agents such as blueing, used as an additive to give discoloured paper a whiter appearance. [25] The effects of high acidity were unknown until the mid-18th century when an English scientist, Dr. William Lewis, made a study of iron gall inks. He discovered that high concentrations of this ink contained such large amounts of sulphuric acid that holes would be eaten into the paper in a relatively short time. [26]

By the end of the 19th century evidence of the deterioration of contemporary paper was well established and documented and in 1898 the first international conference on the preservation of manuscripts was held in St Gallan. Although the results of the conference were partly forgotten in the following years, its significance was that it marked the official recognition of the problems of conserving paper. The conference was organised by Dr Franz Ehrle - then head of the Vatican Library and responsible for restoration work carried out there. [27]

The Emergence of Professional Conservation Practice

During the past fifty years or more there has been an increasing departure from existing perceptions and practices concerned with the care of paper. The primary ideal of the early conservator was the repair of an object in such a manner that the viewer would be unaware of it. This was accomplished by skilful facsimile work or by substantial reconstruction in what the restorer considered to be the style of the original. Today however, it is considered that restoration should be kept to the minimum and there should be no destruction of constituent materials and structure merely to improve its appearance. Restoration work should only be carried out after extensive consideration of the object's historical context. [28] During the 1930s the Fogg Art Museum at Harvard University published Technical Studies in the field of Fine Arts (1932-42). These studies examined the role of the conservator as distinct from those of the restorer and the scientist. The use of the term conservation refers to the care and treatment of artifacts and in this specialised sense has two functions : firstly the control, whenever possible, of environmental conditions in order to minimise decay and secondly, their treatment to arrest decay and to stabilize them against further deterioration. Restoration is the continuation of the latter process, and is only carried out when conservation treatment is thought to be insufficient. [29] In order to cope with some of the ethical considerations of conservation the International Institute for Conservation approved a "Code of Ethics and Standards of Practice" in 1963. [30]

The formation of the International Institute for Conservation of Historic and Artistic Works (ICC) in 1950 was the first step in the development of the profession termed 'conservation' and the subsequent appearance of its journal 'Studies in Conservation'

in 1952 which provided practical information for conservators and was an essential part of the formulation of a common conservation policy. [31] In 1959 the "International Centre for the Preservation of Cultural Property" (ICCROM) was established in Rome. Its aims were to advise internationally on conservation problems, co-ordinate conservation activities, and to establish training courses for conservators.

Prior to the late 1960s the scale of the conservation profession was such that it could be accommodated under broadly based organisations and publications which encompassed a whole range of conservation activities. However, in the late 1960s and 1970s, due to the profession's growth, it became necessary to set up independent organisations to specialise in the sub-disciplines of conservation. It was felt by conservators working within the subdiscipline of paper conservation, that while there had been advances in fields of conservation such as painting and archaeology, more research was needed in the area of paper. One of the most important contributions was made by William J Barrow whose research into permanence and durability and the protective effects of de-acidification appeared in the 1960s. [32]

Another milestone in the development of paper conservation was as a result of the Florence flood of 1966. The disaster, which destroyed huge quantities of books, documents and works of art, had fortunate consequences for the future conservation of such material. The flood rescue team consisted of conservators from many countries, amongst these were leaders of modern book and paper conservation thought and practice. This meeting and collaboration of these conservators enabled the interchange of ideas and encouraged the formation of an international consensus of paper conservation procedures which up until then did not exist. Due to the wide recognition of the importance of the Florentine collections, the flood rescue was very much in the public eye and provided an opportunity for greater public awareness of the necessity of conservation. [33]

In the 1960s a common problem facing the conservator was one of status. With few exceptions the conservator was a person coming from a trade or craft background via an apprenticeship. He had low levels of formal education and qualifications and was therefore in a low hierarchial position within the library or archive. Due to this

problem it was often difficult for the conservator to convince authorities of the need for even basic levels of conservation. The situation was further complicated in the 1970s by the entry of increasing numbers of conservators with an advanced formal education, having graduated from the recently established conservation courses at third level. The graduates expected to be accorded professional status and remuneration.

The first publication which dealt exclusively in paper conservation was the Danish journal 'Restaurator' which was founded in 1968. But it was not until 1976 that an organisation was set up to address fully the problems I have mentioned. British paper conservators formed a paper group as a section of the British group of the 'International Institute for Conservation of Historic and Artistic Works'. In December 1977 this became the independent Institute of Paper Conservation. Its journal 'The Paper Conservator' was set up to confront the working realities of the paper conservator and to document new discoveries and advances in scientific research. [34]

FOOTNOTES - CHAPTER I

1 SCHLOSSER, Leonard B. 'History of Paper' Paper, Art and Technology
San Francisco 1979
World Print Council

2 COLLINGS, Thomas. MILNER, David
'A new chronology of Papermaking Technology'
The Paper Conservator Vol. 14 1990
Journal of the Institute of Paper Conservation

3 ibid 400-300 BC 'Silk used as a writing material'

4 ibid 179-141 BC 'Fragment (26 x 55mm) of a map drawn on paper discovered in 1986 at a tomb near Transhui City, Gansu'

5 SCHLOSSER, Leonard B

6 COLLINGS, Thomas. MILNER, Derek

7 HUNTER, Dard Papermaking - The History and Technique of an Ancient Craft New York 1978

8 SCHLOSSER, Leonard B

9 Part One 'Early European Papermaking methods 1400-1800'
- The Paper Conservator Vol. 13. 1989.
'LALANDE, Joseph Jerome, Jean, Le Francais de "Art de Faire Le Papier". Description des Arts et Metiers, 4. Paris Academie Royale des Sciences 1761. Translated by Richard MacIntyre Atkinson as 'The Art of Papermaking, Ireland 1976.
GOUSSIER, Louis Jacques, 'Papetiere', Encylopedie ou Dictionaire Raisonne des Sciences, des Arts et des Metiers, 11, Paris 1765.
DESMARET, Nicolas, Art de Fabriquer Le Paper Enclyopedie Methodique; Art et des Metiers, 5.

10 HUNTER, Dard

11 SCHLOSSER, Leonard B

12 DOLLOFF, Francis W. PERKINSON, Roy L. 'History of Paper'
How to Care for Works of Art on Paper
Boston 1971
Museum of Fine Arts

13 WILLS, Paul 'New Directions of the Ancient Kind: Conservation Traditions in the Far East' The Paper Conservator Vol. 11. 1987.
CHIA Ssu-hsieh wrote in the fifth century AD:-
Those who unroll a scroll should not roll the protecting cover too tightly for this may cause creases which may develop into tears, with li-fang paper the repairs will be hard and will make the surface of the scroll uneven. They will cause creases to appear in the scroll and there new holes will develop, if however, one uses for the patches, thin paper, these will merge with the scroll itself so that they can hardly be distinguished. In the cupboard where you keep your scrolls there should be placed, musk to prevent insects from breeding there. Scrolls should be aired on a clear day, in a spacious room which is airy and cool. They should not be exposed to the sun as the sun will burn them, giving them a brown colour. Rainy or humid days should be avoided. If you take care of your scrolls in such a way they will last for centuries.

14 GULIK, R.H. Van Chinese Pictorial Art as Viewed by the Connoisseur
Rome, Istituto, Italiano per il Medio
Reprinted by Hacher Art Books
New York 1981

15 WILLS, Paul

16 ibid

17 BARROW, W.J. Permanence/Durability of the Book - II
Richmond Va, 1963-1969
W.J. Barrow Research Laboratory

18 WILLS, Paul

19 SCHLOSSER, Leonard B
Hollander Beater, 1650 in The Netherlands

20 DOLLOF, Francis W. PERKINSON, Roy L.

21 ibid

22 HUNTER, Dard Papermaker in Maine, I, Augustus Stanwood 'Imported mummies from Egypt for the sole purpose of stripping the dried bodies of their cloth wrappings and using the material for making paper'. An outbreak of Cholera amongst the mill workers put a stop to the idea.

23 BARROW, W.J. IMBERDIS, Jean. Papyrus, Sive Ars Conficiendae Papyri ... Le Papier ou e Art de fabriquer le paper. Traduction par August Blanchet, Paris 1899

24 See 7

25 BARCHAM-GREEN, Simon
Conservation, The Papermaker's perspective
The Paper Conservator Vol 19 1986
In 1786 a contributor to the Hannoverisches Magazine wrote:-
Won't the blued paper now produced so frequently by papermakers be a problem in the future in archives and won't the corrosive dye destroy ink and paper over the course of time - for lime, which is additionally contained in paper, combined with oil of vitriol, with which the dye is dissolved, may well permit such conjecture, especially in moist places

26 BARROW, W.J.

27 CHRISTIANSON, Paul A
Supplement No. 1, 1969
Restaurator 1969

28 PETHERBRIDGE, Guy Conservation of Library and Archive Materials and the Graphic Arts
Butterworths 1987

29 THOMPSON, Garry The Museum Environment
Butterworths 1987

30 ASHLEY-SMITH, Jonathan
'The Ethics of Conservation'
The Paper Conservator Vol 6. 1982.

31 THOMPSON, Garry

32 BARROW, W.J.

33 PETHERBRIDGE, Guy

34 ibid

CHAPTER II

Basic Causes for Deterioration in Paper

- Introduction
- Internal Sources
- External Sources

INTRODUCTION

An appreciation of the inherent physical and chemical properties of paper is essential to an understanding of its ageing characteristics. The life span of a sheet of paper is determined by the way it is made and by its subsequent use and abuse. The stresses and treatments applied during printing, handling, and storage all affect its permanence. Because it is impossible to anticipate all the conditions to which the paper will be exposed, even the finest traditionally produced all-rag paper may develop problems. Although a fragile commodity, paper is not necessarily short-lived, as the existence today of samples of eastern paper which date back fifteen hundred years have shown. There are, of course, many types of paper that are by nature short-lived : newspapers and inexpensive books have a life span of only a couple of decades primarily because the paper used for these publications is made from wood-pulp. Although the use of wood-pulp as a papermaking material is relatively new and its permanence has not yet been tested fully, early indications have shown it to be a very unstable material. Using artificial ageing methods, the National Bureau of Standards has predicted that the majority of books printed in the first half of the century will be unusable by the year 2000. [1] While the deterioration of paper used to print ephemera may not appear initially to be of major concern, it highlights a particular problem for the conservator. Firstly, there is no way of knowing what may eventually become historically or artistically important and therefore need to be preserved and secondly, ephemera because of its nature, printed on fugitive materials, often acquires a rarity value which in turn demands its preservation. Many book publishers, librarians, and art collectors have become aware that because so little attention has been paid to the many dangers to paper, large numbers of books, documents, and works of art, which may be of historical interest in the future do not have great longevity. This situation has resulted in a questioning of what constitutes paper permanence and what are the main factors that may affect it.

Internal Sources

As I have already discussed, many of the inherent faults in paper result from so called technical innovations used in its manufacture. General discolouration accompanied by a marked decrease in the papers strength and an overall darkening and embrittlement are usually evidence that destructive internal sources of deterioration such as poor quality pulp, bleaching residues, and unstable sizings are breaking down the cellulose molecules of the paper. It is worth looking at some of these sources of deterioration in greater detail.

Poor Quality Pulp

Paper supports are made from cellulose type fibres. The longer the fibres the more they will be interlaced during manufacture and the more resistant to damage the sheet will be. Cellulose is a chemically sound material and pure cellulose papers, such as cotton, or linen rag papers, have great longevity when kept in a neutral environment. There are of course exceptions to this as even the finest handmade papers are sometimes disfigured by stray pieces of wood or rusty metal, marks from ropes in the drying loft, or buckling caused by hasty drying and curing. The addition of non-cellulose materials, however, can have much more serious affects on the stability of the paper. Lignin, which is commonly found in 19th and 20th century wood-pulp paper is chemically unstable and becomes acidic as it breaks down, attacking the cellulose around it. Another disadvantage of wood-pulp produced mechanically is that its very short rigid fibres do not mat well and decrease the papers strength. [2]

Bleaching Residues

The damage to paper from bleaches is caused by the chemical residues they leave behind. Almost all traditional bleaches developed at the turn of the century contain chlorine which remains in the paper as a harmful residue. Even small amounts of bleach are highly reactive and can form hydrochloric acid. [3]

Apart from bleaching there are other ways of whitening paper that can cause deterioration. Since the 1950s the use of optical whiteners has been widespread. Their effect is to convert the incident ultraviolet rays from daylight on fluorescent lamps into visible white light so that the surface appears to be radiantly white. Aside from the initial unnaturally white appearance, the use of optical whiteners causes paper to yellow more quickly and intensely and so eventually defeat the purpose of its use.

Unstable Sizings

The most commonly used sizing agent for paper has been rosin size. It was developed in the early 19th century to give paper a better surface for printing. The size requires a precipitating agent to disperse the solution evenly over the paper. The chemical used for this purpose is Alum (potassium aluminium sulphate) which has been used as an additive to size since the 17th century. When Alum is used with rosin size, it can produce sulphuric acid within the paper. [4]

External Sources

Many of the internal sources of disintegration; discolouration; embrittlement and high levels of acidity are exacerbated by external elements acting on the paper. Paper is a permeable material and therefore greatly influenced by its environment. Contact with grime, pollutants, excessive light, acidic framing materials, or fluctuating levels of humidity and temperature often result in a breakdown of even good quality paper supports. Other external factors include infestation by insects, and perhaps the most common source, careless handling.

Contact with Acidic Materials

Because it is highly absorbent, cellulose can take in any liquid or gas that surrounds it and is therefore greatly influenced by materials it comes into contact with. As a result of poor quality framing materials (the most common problem being the use of wood pulp mounts and backing boards) acid can attack the paper from the outside through a process called acid migration. Mat burn, the dark stain often seen just inside the window of a wood-pulp matted object, is as a result of acid migration. [5] [Fig 4]

(i)

(ii)

[FIG 4]

Pollution

Pollutants carried in the air are an ever increasing problem. The damaging effects of air pollutants have been recognised for some time. For example, books in urban libraries deteriorate faster than their counterparts in the country. Common industrial pollutants that affect paper include sulphur dioxide which bleaches and embrittles paper, and hydrogen sulphide which darkens pigments. Airborne soot and dirt create stains and carry moisture. [6] [Fig 5]

Light

Because light and heat are catalysts, papers exposed to daylight often discolour as their dyes, sizings and impurities absorb radiant energy. For this reason art works on paper should not be exhibited in direct sunlight. Acidic papers and fugitive pigments are more susceptible to the affects of light than rag papers or carbon inks. Ultra violet light is very damaging so it is advisable to minimise the exposure of paper to it. This can be done using ultraviolet filtering sleeves over light fixtures and ultraviolet filtering plexiglass over art objects. [7]

Temperature and Humidity

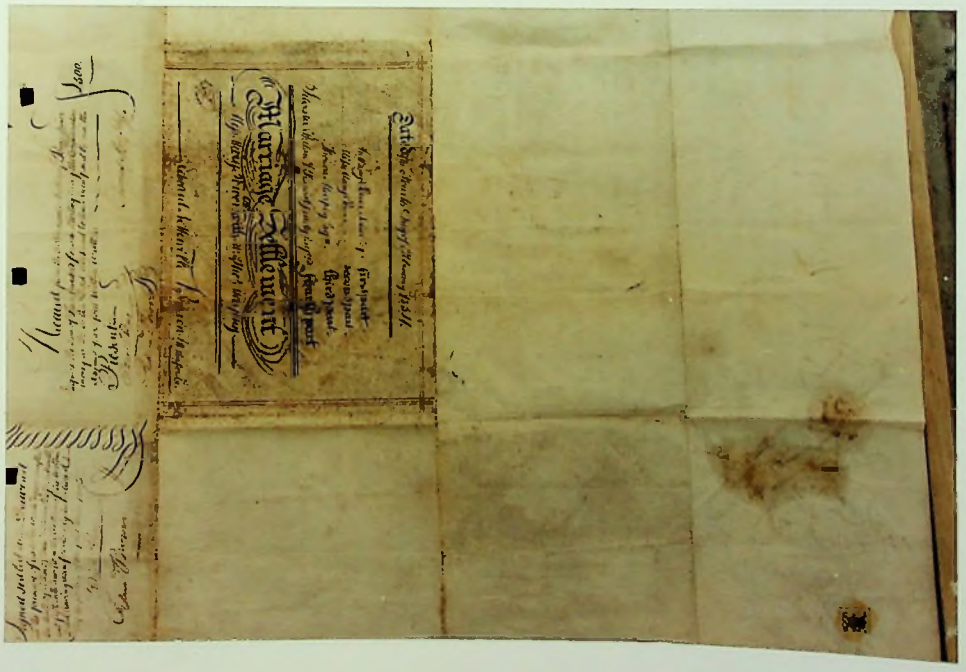
Fluctuations in temperature and humidity are interrelated factors that affect paper permanency. Increases in relative humidity occur when the temperature drops. If the relative humidity rises above 70% paper becomes vulnerable to damage from two sources, mould growth and buckling. Foxing, the familiar brown spots seen on many papers is identified as selective mould growth. It develops when micro-organisms in a sufficiently humid atmosphere act on papers. Mould decreases the strength of the paper because it feeds on the sizing, gum, or glue based media of the paper. The mould action can be stopped by a fungicide, and the stains can be removed to some extent by bleaching, although this is not always advisable. The ideal temperature for paper is between 60° and 70° Fahrenheit and the range of relative humidity should be in the region of 45% to 55% RH. [8] [Fig 6]

(i)

(ii)

[FIG 5]

(i)



(ii)

[FIG 6]

Infestation

The most common insects that cause deterioration in paper are silverfish and cockroaches, who feed on glue sizing and starch paste,and woodworm who attack the cellulose. Insects are often a major problem for storage because they prefer a warm dark environment and are very difficult to detect.

Careless Handling

Many commercial galleries and framers are ignorant of the handling of works on paper and are unaware of suitable framing materials. Many works are glued or fixed to their backing support which in many cases is made of acidic materials. When considering framing only fully reversible hinges should be used and the work should only be mounted on acid free conservation board.

FOOTNOTES - CHAPTER II

1	STRUHRKE, Richard A	The Development of Permanent Paper Process Chemicals Division, Hercules, Inc 1977. The National Bureau of Standards accelerated-aging Technique (72hr @ 100°c ═══ 25yr)
2	KUHN, Hermann	Conservation and Restoration of Works of Art and Antiquities. Vol 1 Butterworths 1986 'Paper' Chapter 22
3	ibid	
4	ibid	Use of optical whiteners began in 1940s and were widely used after 1950s
5	ECKMANN, Inge-Lise	'Care and Conservation of Works of Art on Paper', Paper : Art and Technology. World Print Council 1978
6	KUHN, Hermann	
7	ibid	
8	THOMPSON, Garry	The Museum Environment. Butterworths 1987
9	DOLLOFF, Francis. PERKINSON, Roy L	'The Enemies of Paper' How to care for works of Art on Paper. Boston 1971. Museum of Fine Arts.

CHAPTER III

THE ETHICS OF CONSERVATION

- Responsibility of the Conservator
- Conservation and Contemporary Artistic Practice
- Future of Conservation

Responsibility of the Conservator

> Conservation of historic and artistic works is a pursuit requiring extensive training and special aptitudes. It places in the hands of the conservator, cultural holdings which are of great value and significance. To be worthy of this special trust requires a high sense of moral responsibility. [1]

An art work is made up of a unique combination of materials constructed in a specific way. After its creation, the work will have been exposed to various environmental conditions. Conservation is a palliative for the abuse to which paper is subjected and it is the purpose of the paper conservator to examine the object and determine what changes have occurred and to propose a form of treatment that is applicable to the object. The conservator's first priority when considering the repair of an object should be its preservation and restoration, compensation for loss should only be carried out as a secondary consideration. A number of ethical problems arise from this secondary consideration. Economic processes, for example, could suggest a course of action that while dramatically improving the appearance of an object may nevertheless be at the expense of longevity. [2] If damage is to be treated, the intention of the conservator should be to reduce the distraction created by the damage but not to an extreme that would change the true nature of the object. This last point is of particular importance in that restoration in the past was often carried out so as to be invisible. This division between conservation and ethical restoration was seen as central and the desire to provide official guidelines and standards within the profession prompted the American Institute for Conservation (A.I.C) to approve in 1967 a "Code of Ethics and Standards of Practice". This was followed by the United Kingdom Institute for Conservation (UKIC) which formed an ethics sub-committee and in 1981 a draft document "Guidelines for Conservation Practice" was issued. [3] Both the UKIC and the A.I.C documents share the same areas of concern which include the principle of reversibility, the importance of proper examination of an object, the desirability of a single standard of practice, the limitations on restoration work, and complete documentation of any treatment used.

The difficulty with any form of conservation, and more importantly restoration work, is that it is bound to be a product of the individual's skill and the information available at the time. It is for this reason that all additives, fillings and retouches should be easily removable without damage to the original object. How reversible any technique is depends very much on the restorer's skill and some methods of reversal may not always be applicable. For example, a soluble varnish may only be driven further into a porous surface by applying solvent. If a conservator cannot reverse a process without causing damage, he should not employ it. [4] The A.I.C guideline on reversibility states that the conservator

> Should avoid the use of materials which may become so intractable that their future removal could endanger the physical safety of the object. He also should avoid the use of techniques the results of which cannot be undone if that should become desirable.

In the repair of tears and holes in paper acid-free Japanese paper and fully reversible starch paste should be used, and bleach for the removal of stains such as mat burn and foxing should be used with caution only if the stains are extremely disfiguring. Bleach, apart from being completely irreversible, exposes an already damaged paper to extreme chemical stress. When considering the conservation and restoration of an object it is important to carry out a thorough examination to determine what constitutes the true nature of the object and to what extent it has aged. Only an experienced conservator can understand the materials and changes that have occurred well enough to determine the form of treatment that is applicable to the object. It is for this reason that the A.I.C stresses the importance of continued self education

> It is the responsibility of every conservator to remain abreast of current knowledge in his field and to continue to develop skills so that he may give the best treatment circumstances permit.

The proper course of treatment for an object is to preserve it with the minimum interference to its true nature which is defined by the UKIC as

> Evidence of its origins, its original constitution, the materials of which it is composed and information which it may embody as to its maker's intentions and the technology used in its manufacture.

In a work of art on paper where there are areas of lost media and limited reversible restoration would serve to reduce the destruction, the conservator can ethically carry out this restoration as long as there is sufficient evidence as to the true nature of the original. The best evidence comes from the object itself, from the symmetry and repetition within the work, and from an analysis of the materials used to create the image. So, in addition to being reversible, all restoration work should be detectable, fully documented and most importantly should not interfere with the preservation of the object. This may arise because of the commercial value of an object when coming up for sale, for example. In these circumstances an object may undergo severe treatment in order to improve its appearance. The problem here is that the ultimate purchaser may not know what he is buying and has not got the option of asking for ethical restoration as the damage may already have been done. This gives rise to further complexity. To what extent does ownership confer the right to radically alter a work in the name of restoration? In this situation the conservator's only recourse is to advise truthfully the proper course of treatment and if necessary to refuse to carry out unethical restoration. The A.I.C states that 'The necessity and quality of the treatment should be more important to the professional than his remuneration'.

Both the A.I.C and the UKIC codes underline the importance of a single standard of practice :

> With every object he or she undertakes to conserve regardless of any opinion of its value or quality, the conservator should adhere to the highest and most exacting standard of treatment. Although circumstances may limit the extent of the treatment the quality should never be lowered. (UKIC).

The professional conservator has a role as a technical historian and the documentation of the condition of the object both before and after treatment is important for several reasons. First, should an object deteriorate the method of treatment can easily be

ascertained. Secondly, conservation techniques which have been applied need to be recorded so that subsequent judgements can be made about their effectiveness. Thirdly, if a conservator is obliged to document any work done he is less likely to engage in unethical restoration.

When looking at a Code of Ethics it must be said that, while a single standard of practice is of paramount importance, to some extent each case history must be judged on its own merits and the flexibility of a Code of Ethics can only be assessed in practice in everyday work. Such guidelines as these are open to interpretation but they do put a limit on extreme unethical practice and make the conservator both responsible and accountable for his methodology. It is important to remember that conservation as a scientific practice is still relatively young and its first code of ethics has existed for only 24 years.

Conservation and Contemporary Artistic Practice

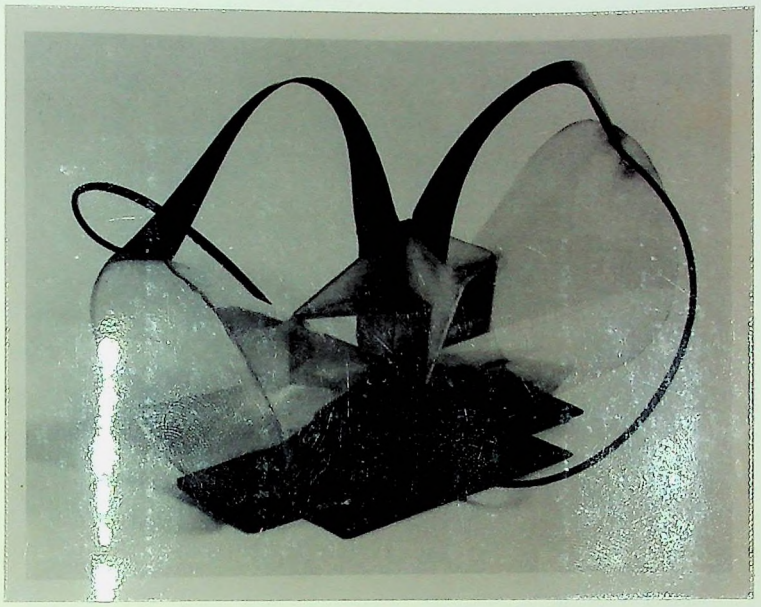
The expansion of manufacturing technology and the rapid development of artists' and graphic supplies has meant that artists now have an increasing array of new media and materials available to them. In addition, or perhaps because of this, contemporary artists often incorporate many unproven materials and novel techniques into their work. The use of often non-artistic materials for artistic purposes has presented serious problems for conservators as artists are often unaware, or are not concerned, with the potentially damaging effects of a material or process. In the preservation of contemporary art the conservator must deal with the ephemeral as well as the durable object, because the aesthetic quality of an object, which makes its preservation desirable, is often at odds with its longevity. Much of the impact of Paul Klee's 'Handbill for Comedians', for example, comes from the newspaper advertisement that the artist used as a support for the painting. As an expatriate New Yorker living in Ireland, the painter Charlie Brady often paints on pages from the New York telephone directory. The conservator's duty in this respect is to repair the damage caused by the particular choice of materials and he must assume that the chosen materials are an integral part of the work itself.

The point to mention when considering the artist's responsibility is awareness. Artists should be aware, as far as is possible, of the possible consequences of using unstable materials. It is more problematic, however, if the artist welcomes the unpredictable deterioration resulting from his original techniques. When commenting on the development of drying cracks on his painting 'Three Dancers' of 1925, Picasso said

> Some people might want to touch them out but I think they add to the painting. On the face you see how they reveal the eye that was painted underneath. [6]

If an artist knows or suspects that he is using fugitive materials, then he must decide whether or not he is concerned with the potential durability of the work. This implies a responsibility towards the materials he uses. If this is important to him then it is arguable that he make his public aware so that the potential buyer will be aware of it too. Naum Gabo's models from the 1920s were constructed from the then recently developed cellulose plastic sheeting. His 'Two Cones' were first made in 1927 from cellulose acetate sheets, later found to be completely unstable. Within 12 years they had shrunk and warped. Invited to remake them in 1968, Gabo reconstructed them using the same material which he went to considerable lengths to obtain from old stock, even though there were several safe alternatives available. By the 1980s the first signs of deterioration had begun again. What is the conservator to make of this? [7] [Fig 7]

Many of the works of Tapies derive their particular poignancy from the use of fragile materials. Helen Frankenthaler often uses oil on unprimed paper and incorporates the bleed effects of the oil from the pigment as an integral part of her work. [Fig 8] The conservator must assume that this kind of work is made in the full knowledge of its impermanence and his responsibility here is curative rather than preventative since the artist has chosen to create it in this particular way. There are many more artists whose work is directly concerned with its deterioration. Yves Klein for example in 'The Wind of Travel' (1960) exposed a newly painted canvas to the action of the wind on the roof of his car on a drive between Paris and Nice. 'Cosmogony of Rain' of the same year was made by the action of rain drops on pigment. [8]

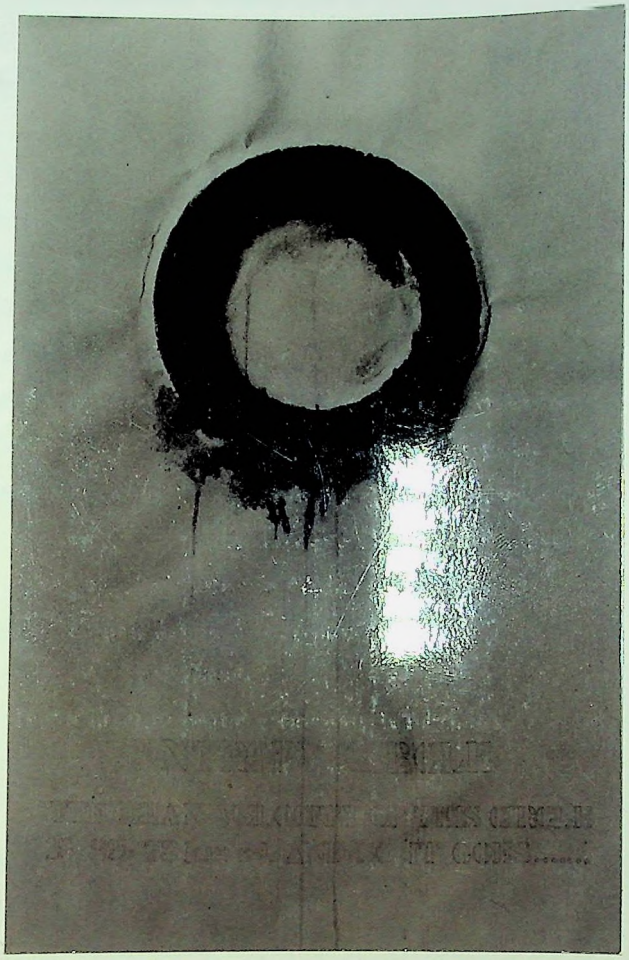


[FIG 7]

[FIG 8]

Marcel Duchamp experimented with dust falling on paper over a fixed time-span. Much of Brian King's work of the 1970s focuses on similar formal concerns. He describes his work of this period as 'biodegradable', that is incorporating its own destruction. To describe his obsession with time and disintegration he used handmade paper, but then made a series of relief prints in which iron fillings were left on a wet area of the sheet and then rinsed off leaving a residue of rust. The rust stain would corrode the paper over a relatively short period of time. Developing on from this he made a series in which the metal was beaten into the sheet causing even more rapid disintegration. When speaking about the work now, Brian King feels that deterioration is inherent in most art work and his work speeded up and exposed the process. He asserts that his buyers are aware and are unconcerned with the limited life of the work and that the work would simply age with the buyer. [9] However, it is conceivable that a museum for example, would view this in a different light, and any attempt to delay or stop this process of deterioration in the interests of posterity would pose an interesting moral problem for the conservator. [Fig 9]

A tragic example of unintentional deterioration is the fate of the Rothko paintings at Harvard. The five large paintings were completed in 1962, had faded dramatically by 1968 and had to be withdrawn from display in 1979. The main cause for their deterioration was the use of a single fugitive pigment, Lithol Red. The pigment faded due to inadequate protection from daylight and the original colour remained only where the work was covered by staples and along the edges in shadow. Colour photographs taken soon after the installation of the paintings in 1963 show a predominance of reds, oranges, pinks, red golds and purples. Twenty-five years later, some of the reds, originally mixed with brown, have turned muddy, others have disappeared altogether and left violet and mauve areas in their place. [10] It would appear with hindsight that this disaster could have been prevented if Rothko had been more selective in his choice of pigments; it is said that when Rothko was busy painting, he would sometimes rush down to Woolworths and buy a can of commercial blue or red. At any rate the fading might have been slowed down by shielding the paintings from direct sunlight. In the same way Camille Souter in her early work employed impermanent commercial paints, the eventual effects of which she was unaware.



[FIG 9]

If the 20th century has witnessed a renaissance of creativity in the visual arts, it has also marked an unprecedented development of the commercial art market with its emphasis on rarity and the consequent need to preserve. As some of the examples I have indicated have shown, there is a very complex relationship between artist and conservator. If deterioration of the art work was not originally envisaged as an integral part of the work then it is the legitimate task of the conservator to preserve. The collages of Kurt Schwitters for example, are composed largely from ephemera and disposable fragments. To what extent should these be preserved from further deterioration? We have no way of knowing the artist's intention in this regard. Another aspect of 20th century art is the formal dialogue it sets up with itself. The subject of the work may be the technique, the medium may be the message. Hence even the deterioration of the work itself may be the legitimate subject. Conservation here would be a distraction from the true essence of the work.

Some artists have overcome the problems of creating enduring works by separating the concept of the work from its physical reality, allowing it to be recreated indefinitely. Sol Lewitt's wall drawings and paintings are a case in point. They can be created anywhere following his instructions giving them a relationship to the viewer similar to a score and its performance.

With contemporary works where we can see the initial rapid changes occurring, we are very aware of how the alterations affect our perception of the work - hence our preoccupation with conservation. However in the long term, changes in the cultural context of a work may affect our appreciation of the work as much as any normal physical changes inherent in the ageing of the work. The admiration we profess for the 'Venus De Milo', as it now is, for example, would be inconceivable to the ancient Greeks. In the same way the removal of varnishes from antique paintings often affront the viewer with the reality of the remaining original underneath. The recent cleaning of the Sistine Chapel frescoes is an example of this kind of controversy. We are unable, because of the passage of time, to visualise accurately what has altered. Can we apply these lessons to contemporary theories on conservation? Has Rothko's power of expression in the Harvard paintings been lost by the fading of the pigments or can their ability to capture the imagination transcend the physical changes, especially where the viewer may be unaware of it?

Where there is broad agreement, is that where it can be established reasonably that this is in keeping with the original intention of the artist, a work should be protected from deterioration. Any work carried out to the fabric of the object should be reversible, detectable, and fully documented. If these guidelines are adhered to, contemporary practice can be satisfied without hindering any developments to the future of conservation.

FOOTNOTES - CHAPTER III

1 'A.I.C Code of Ethics and Standards of Practice'.
The American Institute for Conservation of Historic and Artistic Works.

2 ASHLEY-SMITH, Jonathan
'The Ethics of Conservation'
The Paper Conservator. Vol 6, 1982, Page 1.

3 ibid
The article also contains quotes from the UKIC draft document. Jonathan Ashley-Smith is a member of the sub-committee that issued the document.

4 In the text "he" and related pronouns are used in the classical sense to denote the person, male or female.

5 HOLBEN-ELLIS, Margaret
'Media of Prints and Drawings'
The Care of Prints and Drawings
AASLH Press 1986

6 PERRY, Roy 'Conserving change: Conservation and Modern Art'
Art Monthly Sept 1990

7 ibid

8 HENRI, Adrian Environments and Happenings.
Thames and Hudson 1974

9 Conversation with Brian King, 2nd March 1991.

10 SAUSSY, Haun 'Mark Rothko' Arts Magazine
Vol 63, Pt 3. November 1988

CHAPTER IV

Presentation and practical documentation of the conservation of an 18th century engraving under the supervision of Maighread McParland, Senior Conservator in the National Gallery of Ireland

- Identification of the Print
- Initial Examination of Print
- Record of Treatment

Identification of the Print

In the 18th Century social and political satire opened a field which attracted the energies of some of the most important English artists of the period. One of the most notable of these was William Hogarth. Although his achievement in the history of engraving is of secondary importance he remains an artist whose special gift for dramatic situation and satire gives him a notable place in his medium.

The print selected for repair is an impression taken from a steel engraving plate published in August 1763. The plate itself has undergone extensive revision and exists in eight different states, of which this is the seventh state. This plate has been worked from an earlier one which shows a portrait of Hogarth with his dog, palette and engraving tools. Hogarth burnished out all but the dog, the curtain and the palette, and in the empty oval space engraved a portrait of the English satirist, John Churchill, as a bear. Churchill had earlier attacked Hogarth in a pamphlet entitled "Epistle to William Hogarth". Hogarth shows his dog urinating over this in the foreground of the new print. Churchill he depicted as a bear with a pot of beer in one hand and a club in the other, a reference to his brutal satires. Hogarth himself appears in the framed picture in the foreground as a showman whipping Churchill, the dancing bear. The print may also be read as the symbolic replacement of one of Hogarth's best known self-portraits by his satiric depiction of his contemporary. In the world of 1763 Churchill and all he stands for has replaced Hogarth. This reflects the increasing pessimism that Hogarth felt for the social changes taking place around him. [Fig 10]

Initial Examination of Print

Description of the Art Work and its Components

A steel engraving print, the work has a sheet size which measures 56.8 x 45cm and a plate size of 37.8 x 28.3cm. Evidence of previous framing materials include three masking tape hinges along the top of the sheet and a number, 3965, on the reverse of the sheet which is possibly a framing notation.

[FIG 10]

Description of Condition

There is surface dirt on both the front and the reverse of the sheet. Marks and flaws include a price in pencil in the bottom right hand corner, two small marks also on the bottom right hand corner, probably caused by discoloured fibre within the paper, and a small worm hole in the bottom right hand corner. There is also slight discolouration on the image and along the edges of the sheet. On the top right hand edge there is a tear. There is a brownish stain corresponding to the image area on the reverse of the sheet, this was probably caused by linseed oil in the carbon black ink used. In the same area there is also a water stain due to contact with moisture [Fig 11] and [Fig 12].

Proposed Treatment

The removal of the masking tape hinges. The removal of surface dirt by dry cleaning and the subsequent removal of any remaining dirt by washing. The repair of the tear and worm-hole using Japanese paper and reversible starch paste and finally the mounting of the print on acid-fee conservation board.

Record of Treatment

The purpose of dry cleaning is to remove surface dirt such as soot, dust, textile fibres, accidental marks, and other foreign matter which are inevitably deposited on the paper as a result of air pollution and human contact. Apart from being disfiguring, dirt is also abrasive and may also be acidic and hydroscopic, helping to nurture mould spores, which it also carries. The first step in the dry cleaning process was to remove loose surface dirt with a soft Japanese brush. Next, a powdered eraser, drafting powder, was used to remove the remaining surface dirt. The crumbled eraser was applied using the fingertips, taking care to use gentle pressure as too vigorous dry cleaning can cause skinning, or removal of layers of paper. In the dry cleaning process the eraser is never used on the image area and care is always taken not to remove any identification marks such as signatures, dates or artists' inscriptions. In this case the price in pencil was removed.


NB
THE BRUISER C CHURCHILL
— But he had a Club
Or he had never dont I warrant yr

[FIG 11]

[FIG 12]

Washing

After carefully removing all traces of the powdered eraser, the print was washed in a bath of luke warm (40°) de-ionised water for an hour. Regular checks were made in order to keep the temperature constant. A support was used for the print when removing it from the bath because the paper is very fragile when it is moist and is prone to damage. After it dried there was still some discolouration so the print was rewashed in the same manner.

Removal of the Masking Tape Hinges

Following the second wash the print was pressed, taking care that the pressure was not too great as this might remove the plate mark. The removal of the masking tape [4] was attempted using a solvent, Acetone. [5] The print was placed on a suction table [6] the purpose of which was to prevent the solvent spreading and causing a tide mark. The table absorbs the moisture from the solvent quickly taking glue stains with it. Using a small brush, dipped in Acetone, and a tweezers, the masking tape was eased off slowly making sure skinning did not occur. The Acetone removed the masking tape but left some glue, which had cross-linked with the paper and was proving difficult to remove without damaging the paper. Another solvent Xylene [7] was used. The glue was eventually removed using Xylene and Acetone alternated.

Deacidification

Also called acid neutralisation or buffering the procedure of deacidification involves depositing an alkali mixed with water, calcium hydroxide solution, $Ca(OH)_2$ on or within the paper, to protect it from either internal or external acidity. The print was placed face down in the solution, so a deposit would not form on the image, and was left for approximately an hour. It is important to note that deacidifation is not suitable for all papers as it may cause increased yellowing. [8]

Repair of Tear and Worm Hole

The repair of the tear and worm hole were done from the reverse of the sheet using a Japanese paper similar in weight and colour to the sheet and a mixture of starch and tylose paste. [9] After the edges of the tear were cleaned, using the powdered eraser, and aligned, a small amount of paste was applied along the tear line on the front of the sheet. On the reverse a thin strip of Japanese paper was glued on one side and placed over the tear. The edges of the strip were torn rather than cut to produce a feathered edge that will meld into the sheet. The worm hole was repaired using a small amount of macerated pulp from the Japanese paper melded into the hole.

Mounting and Framing of the Print

After the repairs were dry the print was given a final pressing. It was then mounted on conservation board. The hinges were made from Japanese paper and were glued using starch paste.

[Fig 13] and [Fig 14]


AN EPISTLE TO HOGARTH BY C. CHURCHILL
Great George Street
North Briton
N B
THE BRUISER, C. CHURCHILL (once the Rev.d) in the Character of a Russian Hercules, Regaling himself after having Kill'd the Monster Caricatura that so Sorely Gall'd his Virtuous friend, the Heaven born WILKES.
— But he had a Club this Dragon to Drub.
Or he had ne'er don't I warrant ye. ——

[FIG 13]

THE BRUISER C CHURCHILL from the Real Life in the Character of a Russian Hercules Regaling

[FIG 14]

FOOTNOTES - CHAPTER IV

1 HIND, Arthur M 'Papermaking in the 18th Century' Page 233
A History of Engraving and Etching : From the 15th Century to 1914. Dover 1963

2 PAULSON, Ronald Hogarth's Graphic Work. Revised Edition
Yale University Press 1970

3 HOLBEN-ELLIS, Margaret
'Basic Conservation Procedures'
The Care of Prints and Drawings.
AASLH Press 1986
Drafting Powder (opaline, skum-x)

4 SMITH, Merrily A. JONES, Norvell PAGE, Susan L. DIRDA, Marian Peck
'Pressure Sensitive tape and techniques for its removal from paper' The Journal for the American Institute for Conservation.
Vol 23, No 2, Spring 1984
Masking Tape, a pressure sensitive tape, so called because light pressure causes it to stick to most surfaces. Pressure sensitive tape first developed in 1845 by a Surgeon Dr. Horace Day.

5 MARSDEN, C Solvents Guide. Distillers Co Ltd, London
Seymour Mann 1963
Acetone : Dimethyl keytone, Propanone - 2
$CH_3.CO.CH_3$. Colourless mobile liquid.
Somewhat hydroscopic.

6 SMITH, Merrily A. JONES, Norvell, PAGE, Susan L. DIRDA, Marian Peck
Suction or Vacuum Table 'consists of a flat porous surface, sealed on top of a plenum chamber that is connected to a vacuum pump. The reduced pressure below the surface allows liquids to be drawn through the art work placed on top. Soluble stains and adhesives can be removed in the process'.

7 MARSDEN, C 'Xylene : Xylol, Xylole, Dimethyl Benzene $C_6 H_4 (CH_3)_2$. Commercial Xylene consists of a mixture of three ionisers, M-xylene being usually the predominating constituent. Impurities often present are Tolvene, Ethyl-Benzene, and occasionally Cycloparaffins. Xylene is a colourless liquid with a characteristic odour.

8 PETHERBRIDGE, Guy 'Aqueous Deacidification of Paper'. An essay by Vincent Daniels. Conservation of Library and Archive Materials and the Graphic Arts Butterworths 1987
'Paper is immersed in the liquid and when it is removed, the calcium hydroxide reacts with carbon dioxide in the air to form calcium carbonate, a substance which is often present in well preserved paper.
$Ca(OH)_2 + CO_2 \longrightarrow CaCO_3 + H_2O$

9 McPARLAND, Maighread
Conservation Laboratory, National Gallery of Ireland. Glue for repair made from starch and 3% tylose (methyl cellulose, a derivative of starch). 10 grams of starch to 100cc of heated distilled water, mixed to a creamy consistency. Tylose used to dilute when glue becomes too thick.

10 ibid

11 ibid

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