

PREFACE

In the curricular structure introduced by this University for students of Post - Graduate degree programme, the opportunity to pursue Post - Graduate course in any Subjects introduced by this University is equally available to all learners. Instead of being guided by any presumption about ability level, it would perhaps stand to reason if receptivity of a learner is judged in the course of the learning process. That would be entirely in keeping with the objectives of open education which does not believe in artificial differentiation.

Keeping this in view, study materials of the Post - Graduate level in different subjects are being prepared on the basis of a well laid-out syllabus. The course structure combines the best elements in the approved syllabi of Central and State Universities in respective subjects. It has been so designed as to be upgradable with the addition of new information as well as results of fresh thinking and analysis.

The accepted methodology of distance education has been followed in the preparation of these study materials. Co-operation in every form of experienced scholars is indispensable for a work of this kind. We, therefore, owe an enormous debt of gratitude to everyone whose tireless efforts went into the writing, editing and devising of a proper lay-out of the materials. Practically speaking, their role amounts to an involvement in invisible teaching. For, whoever makes use of these study materials would virtually derive the benefit of learning under their collective care without each being seen by the other.

The more a learner would seriously pursue these study materials, the easier it will be for him or her to reach out to larger horizons of a subject. Care has also been taken to make the language lucid and presentation attractive so that it may be rated as quality self-learning materials. If anything remains still obscure or difficult to follow, arrangements are there to come to terms with them through the counselling sessions regularly available at the network of study centres set up by the University.

Needless to add, a great deal of these efforts is still experimental—in fact, pioneering in certain areas. Naturally, there is every possibility of some lapse or deficiency here and there. However, these do admit of rectification and further improvement in due course. On the whole, therefore, these study materials are expected to evoke wider appreciation the more they receive serious attention of all concerned.

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POST-GRADUATE : LIBRARY AND INFORMATION SCIENCE
[MLIS]

Paper - VII E-1
Preservation and Conservation of Library Materials

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Notification

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MLIS –VII E-I

Module 1 Concept of Preservation and Conservation of Library Materials

Unit 1	□ Need for Preservation	7-12
Unit 2	□ Evolution of Writing Materials	13-24

Module 2 Different Types of Library Materials

Unit 3	□ Paper Documents	25-33
Unit 4	□ Physical Elements of Book	34-40
Unit 5	□ Non-Book Materials	41-49
Unit 6	□ Digital Objects	50-56

Module 3 Enemies of Library Materials

Unit 7	☐ Physical Agents	57-63
Unit 8	☐ Chemical Agents	64-70
Unit 9	☐ Biological Agents	71-79

Module 4 Control of Deterioration—Preventive Measures and Housekeeping

Unit 10	☐ Environmental Control	80-87
Unit 11	☐ Control of Micro-biological Agents	88-92
Unit 12	☐ Rehabilitation of Documents	93-110
Unit 13	☐ Repair and Restoration	111-123
Unit 14	☐ Preservation of Digital Objects	124-131

Module 5 Binding and Preservation Unit

Unit 15	☐ Different Types of Binding for Library Materials	132-139
Unit 16	☐ Binding Materials and their Varieties	140-146
Unit 17	☐ Binding Process	147-153
Unit 18	☐ Preservation Unit	154-160

Unit 1 □ Need for Preservation

STRUCTURE

- 1.0 Objectives**
- 1.1 Introduction**
- 1.2 Concept of Preservation and Conservation**
- 1.3 Librarian's Responsibility**
- 1.4 General Approach to Preservation**
 - 1.4.1 Preservation of the Physical entity and the Impression**
 - 1.4.2 Preservation of Information**
- 1.5 Summary**
- 1.6 Exercise**
- 1.7 References and Further Reading**

1.0 Objectives

After reading this unit you will be able to :

1. understand the concept of preservation and conservation.
2. know the role of the librarian in the preservation of library materials.

1.1 Introduction

The purpose and objectives of libraries may be divergent but the basic condition of the libraries is their role in the society as medium of communication. The library materials constitute the processes of communication and libraries, whose function is to store and make them available from the total system of communication. Libraries operate with one purpose that they will exist to facilitate the process of communication. The role of libraries has been expressed by Herman H. Fussler in this way, 'A distinguishing feature of

modern culture of non-primitive civilisation is its dependence on the written word as the principle device through which, (1) the knowledge over time is recorded for the future, (2) the state of contemporary knowledge and ideas is communicated, and (3) the knowledge of the past becomes available to contemporary man. If this is true, or even approximately true, the critical role of the library in relation to the advance and to the preservation of modern civilisation becomes obvious, for the library is the major social organisation that systematically acquires, organises and preserves, that makes the activities described above possible, and its role is a major one in connection with the communication of contemporary knowledge as well. The impact of library materials as medium of communication has been recognised in any society, primitive and modern. It is important that vehicle of intellectual contribution should be preserved in all seriousness and fairness to make them available whenever asked for.

The first unit introduces the subject "Preservation and Conservation of Library Materials". It is the responsibility of the librarian to preserve the collection of the library in his custody in a good and usable condition. For this purpose the librarian should have an adequate knowledge of preservation and conservation. This unit presents a general outline of the different methods and techniques of preservation and conservation.

1.2 Concept of Preservation and Conservation

Preservation is the umbrella term now applied to a wide variety of collection management responsibilities, intended to preserve collections of print and non-print materials for future generations.

Conservation concerns with the physical and chemical treatment of materials to retard their further deterioration. The purpose of conservation is to stabilize an object and to maintain it as close as possible to its original condition, not to attempt to restore it to resemble its original condition. Conservation as a profession has evolved from the craft of restoration. In common parlance 'preservation' concerns with the maintenance aspect and 'conservation' with the remedial treatment, and restoration of the original condition.

1.3 Librarian's Responsibility

The art of preservation materials is as old as human civilisation. In a way it may be said to derive from the instinct of self preservation, common to all animate beings. Documents have existed in one form or another since men invented the art of writing, and it was quite natural for mankind to attempt to preserve them. There are various types of media which have been used through centuries to carry ideas of information. There are media made of inorganic substance, and media created by modern technology. Books at present are the major constituent of library. It is the social responsibility of the librarian to keep all the books physically fit to be used by the readers at any point of time whenever required.

Preservation is a part of every librarians's responsibility to ensure that people, present and future, will have access to the information that constitute the documentary heritage. Knowledge of materials and preservation become more and more important in managing library collection, which will be indispensable to human evolution, knowledge and creativity.

1.4 General Approach to Preservation

Preservation of a document in a library, be it a manuscript or printed book or in the form of a non-book specimen, we think of the three components which constitute it :

- (a) The physical entity (the artefact)
- (b) The impression of the physical entity (the image)
- (c) The thought content (the information)

1.4.1 Preservation of the physical entity and the impression

Practically the physical properties arising from the base materials and their composition in construction of the physical entity of book and other library materials create problems of preservation. The physical entity of a book is composed of various types of paper, board, leather, thread, ink, adhesive, etc. Each of these materials is susceptible to natural decay, and deterioration are caused by various physical, chemical and biological conditions by atmospheric and environmental situation. These are the cases where the artifact is in an unhealthy condition. In extreme cases these become almost useless. Here we have used the generic term 'book' to include other reading materials. Deterioration of the physical entity and the impression on it is caused by the interplay of three basic factors :

- (a) Inherent characteristics of the library materials
- (b) The storage condition of the materials
- (c) The intensity of handling of the materials by the climate

(a) Inherent characteristics of library materials of the early writing materials, the most common were birchbark and palm-leaves. Birchbark better known as Bhujapatra, was the most popular of all early writing materials. It was nothing but the inner bark of the tree called Bhurja that grew plentifully in the Himalayan regions. Birchbark was cut into pieces of different dimension, generally one yard long, and as broad as outstretched fingers of the hand, or somewhat less according as the writer required and liked. In order to make its writing surface hard and smooth, it was rubbed with oil, and polished, and then written upon with a reed pen and ink specially prepared for it. Such leaves were then held together with a string through their middle portion, which was left unwritten. The compact book was then fastened to two wooden boards.

Palm leaves or Tala-patra is of two varieties: tala (palmyra) and sritala (talipot). Leaves of tala do not absorb ink, and stylus was used to inscribe characters on them. The leaves of sritala are thin, flexible and can be written on, like paper. Both birchbark and palm leaf are

natural organic materials and these possess inherent strength to withstand normal environmental effects for many centuries, if stored properly. The layers of birch bark tend to separate over a long period of time and the edges of palm leaf and birch-bark show a tendency of curling up, if exposed to prolonged dryness. Prolonged dampness is also responsible for their gradual deterioration.

(b) Paper

The largest single constituent of library materials is book. There are also various types of non-book reading materials. All these materials both in book form and non-book form are composed of paper. Mainly paper and other constituent of the book create perpetual problem in preserving.

Paper is a thin tissue of any fibrous material, the individual fibres of which, after being separated mechanically and suspended in water, are then matted into sheets by dipping into water suspension and lifting the fibres out. Paper can be made from animal fibres (wool, fur, hair, silk), mineral fibres (asbestor), synthetics (rayon, nylon, glass, etc.) and even ceramic, stainless steel and other metals, but it is normally made from the plant fibres (cotton, esparto, straw), wood, flax, hemp, bamboo, jute and many other reeds). The cells in plant fibres are rich in cellulose, a white substance insoluble in water carbon and oxygen. In paper manufacture the beating process is very important. If beating process is not done properly the paper will be deteriorated. Much water is used for paper manufacture. If the water is not free from iron, mineral and other impurities the paper manufacture will be deteriorated shortly. The alkalinity of the paper and the natural strength of long cotton fibres, commonly used, contributed toward greater strength and are responsible for the longevity of the handmade paper. But the machine-made paper produced since mid-nineteenth century use mechanical wood pulp and acidic chemicals for processing for the search of economy and speed of production. For acidic content the paper loses flexibility, splits, and turns yellow and brittle in a shorter time. The causes of deterioration of paper made during that period cannot be detected by seeking a book. It will be realised after the damage is done to some extent. Modern practices and manufacturing techniques have made it possible to obtain good quality paper from any fibre.

(c) Binding

Boards are used for making hard cover binding. Today's boards are usually made of paper and these are available in many weights and sizes. When these boards are exposed to atmospheric condition they deteriorate quickly. These are used as food particularly with starch glue, by insects, also as hideouts and breeding place. Leather provides the major strength and durability to library binding. Synthetic materials have been used recently with increasing frequency, either in place of leather bindings, which are expensive, or for the protection of cloth binding. Synthetic rubber adhesives have an important role in commercial book binding (that is, manufacture of paperbacks) where low cost, good binding strength, flexibility, but not long life, are required.

Whatever may be the method of bookbinding, the life of a book depends on the thread and other sewing materials apart from the paper. The leather and rexine may be used for

binding though these are not always of any prescribed standard. The workmanship is also concerned with good binding. In a loosely bound book, pages may be separated from the binding. Too tight binding encourages the reader to damage the spine of the book by random and ruthless handling.

(d) Other materials

Besides the paper of any type, other library materials are audio tapes and discs, films and photographs, magnetic tapes, electronic media.

The base of audio tapes is cellulose acetate, polyvinyl chloride, mylar and the like. The base of audio records may be shellac wax, cellulose nitrate, cellulose acetate, polyvinyl chloride, styrene or the like. All these elements used as base consist of high molecular weight organic compounds. These elements are produced by heat pressure, evaporation of solvent, or by the use of plasticizers. These elements are thermoplastic, which are repeatedly softened when heated, and hardened when chilled. The base elements of all these materials are susceptible to damage by environmental condition, particularly in tropical zone.

1.4.2 Preservation of Information

Preservation is a part of every librarian's responsibility to ensure that people, present and future, will have access to the information that constitute the documentary heritage. If the preservation of the artefact is not possible for certain consideration, the last way to preserve the image is by facsimile reproduction or microfilming. Knowledge of materials and preservation become more and more important in managing library collection which will be indispensable to human evolution, knowledge and creativity.

1.5 Summary

In this unit we have discussed the basic point about preservation and conservation. Preservation is a part of librarians' responsibility. We have pointed out the components in the general approach to preservation. The physical entities of books and other library materials have been highlighted. It is also the responsibility of the librarian to ensure access to information contained in the library materials.

1.6 Exercise

1. Explain the concepts of preservation and conservation.
2. Indicate the need for preservation in libraries.
3. What role does librarian play in preserving the library materials?

1.7 References and Further Reading

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Unit 2 □ Evolution of Writing Materials

STRUCTURE

- 2.0 Objectives**
- 2.1 Introduction**
- 2.2 Writing Materials of the past**
 - 2.2.1 Stone and Metal**
 - 2.2.2 Clay Tablets**
 - 2.2.3 Papyrus**
 - 2.2.4 Parchment and Vellum**
- 2.3 Early Writing Materials in India**
 - 2.3.1 Stone**
 - 2.3.2 Birch Bark**
 - 2.3.3 Palm leaf**
 - 2.3.5 Wooden Boards**
 - 2.3.6 Metal Plates**
 - 2.3.7 Other Materials**
- 2.4 Paper**
 - 2.4.1 Materials of Paper**
 - 2.4.2 Manufacture of Paper**
 - 2.4.21 Handmade Paper**
 - 2.4.22 Machine made Paper**
 - 2.4.3 Paper Sizes**
 - 2.4.4 Certain Kinds of paper**
- 2.5 Summary**
- 2.6 Exercise**
- 2.7 References and Further Reading**

2.0 Objectives

After reading this unit you will be able to :

1. know some important materials which had been used for writing during the period of early civilisation
2. get an overview of early writing materials used in India
3. have some basic ideas about paper which is the most important writing material all over the globe today

2.1 Introduction

Early writing materials were many and varied. The history of writing and the civilisation was there in Mesopotamia, at present known as "Iraq" on the land between two rivers, the Tigris and the Euphrates, more than seven thousand years ago. The land was known as Sumer. The first human habitation was there with settled life, agriculture produce, domestic animals and social bondage, meaning a family and social life.

Historians believe that our ancestors started communications by using some signs and symbols on sand. But sand could not carry written impressions for long, nor could the message impressed on it be transported from one place to another. So began the human effort to search for suitable writing material.

2.2 Writing materials of the past

2.2.1 Stone and Metal

Probably the first writing material was stone, the first writing an inscription and the first pen a chisel. Indeed, the earliest writing material was rock or a stone on which rude scratchings were at first traced by scribes and then actually cut by stone-cutters who probably had no idea of their meaning. These rock or stone inscriptions seem to have been the world's early writing the evidence of which is still found on the pyramids in Egypt and on hill sides, columns and pillars of stone in India. The instrument with which this writing was done was a metal tool called chisel which had a sharp edged end. The **Rosetta stone** of Egypt which is more than 5000 years old, is one such example. Metal plates for writing purpose were introduced at a later date. But as the stone blocks were rather heavy and could not be carried from one place to another, the need of something lighter and more portable than stone as writing material was felt and as a result bricks or clay tablets came to common use at the hands of the chaldeans, a semitic tribe that flourished in ancient Babylonia.

2.2.2 Clay Tablets

In the history of mankind the Sumerians were the first people who invented and developed the writing system, the records of human mind for themselves and for the posterity. The first written records were the records relating to property, accounts and temple administration. The records were made on clay tablets mainly. The Babylonian people and the Assyrian people also used clay tablets. The library of Borsippa and the library of King Ashurbanipal collected many clay tablets. The tablets were made of soft clay and writing was made on them with sharp instruments. The soft clay tablets were dried and hardened by baking like bricks. The records were the royal documents, contracts, grants, code of laws, religious hymns, history, science, literature and the like. Clay tablets bore a style of writing known as cuneiform writing. The wedge shaped stylus which was used for writing on soft clay invariably created wedge-shaped marks and these wedge-shaped characters represented the typical style of cuneiform writing.

2.2.3 Papyrus

At a time when the Babylonians were creating clay tablets with cuneiform writing, the Egyptians began to learn to make beautiful writing material from papyrus plant. In fact, the ancient Egyptians discovered a light, soft and convenient material for writing known as papyrus. The clay tablets were heavy and inconvenient to handle. Papyrus was manufactured in Egypt from the stem of flowering plant which was available abundantly in the Nile valley. The stem of the plant is 3 feet to 10 feet in length, triangular and tapering in shape. The papyrus as writing material, had to undergo a series of steps for preparation. The papyrus plants were collected and the stalks were cut into length of about 12-16 inches. The soft pith of the plants were then slit into thin strips and were laid flat side by side. A second layer of these strips was then laid over the first layer at right angles. Then the two layers were treated with gum-like solution and pressed, pounded and smoothed until the surface became suitable for writing. Papyrus was used as writing material about five thousand years back and was in vogue for four thousand years. The ink used was black and red, and thick point pen or reed pen was used for writing.

Alexander the Great, established the famous library of papyrus books at Alexandria. At present, the largest collections of papyri is that of the Archduke Rainer in Vienna. Egyptian literature was mostly written on papyrus. 'The Book of the Dead' is perhaps the earliest Egyptian book, a copy of which has been preserved in the British Museum. Papyrus remained in use right upto the 11th century, but gradually it was supplanted by parchment and vellum. Probably it was no longer available in plenty needed for book production.

2.2.4 Parchment and Vellum

Parchment was equivalent in older language to vellum but in strict modern use there is a difference. Except that both are animal skins, they are equal neither in quality nor in the texture, not in the methods of their preparation. Vellum is a finer material than parchment and is prepared

in a different way. Papyrus plants were not available outside Egypt and the export of papyrus was restricted. An alternative to papyrus was sought for; parchment became the substitute and succeeded papyrus as a writing material. Though parchment was used as early as 1500 B.C., it did not gain popularity and extensive use until the beginning of the Christian era. Parchment has probably taken its name from the city of Pergamum which was then the centre of its trade.

Parchment was the skin of animals-usually goat or sheep. To make the writing material as parchment, the skin was treated, tanned, and processed like leather. Skin has two sides, the hair side and the inner side, the inner side was used for writing surface. Parchment was first used in Asia minor as writing material. From time to time the processing of skin was improved for splitting, tanning and bleaching. The material was durable than papyrus and was lighter too. So it became popular. Parchment was widely used as the writing material by the fourth century A.D. in Europe. It had an impact over the style of writing. Because of its thin, smooth and durable surface broad-pointed pen was used for writing instead of reed pen.

Parchment, however, proved to be a better medium for writing than papyrus and hence it was more expensive because it was smooth on both sides, stronger and more durable. Parchment with two smooth surfaces ensured the development of a form of book called codex, where sheets were written on both sides and stitched together to form a book. This form replaced the roll form.

Vellum is also animal skin but not of goat or sheep. It is the calf-skin. Vellum as its name implies (old French velin (vel which means calf) is a writing material made from the skin of newborn calf. Vellum, when treated and processed, gave finer, smoother and whiter surface than parchment did. It requires much treatment before its surface can be written upon. After cleaning it in a long exposure in lime it is stretched in the sun and dried and rubbed smooth with pumice-stone. The finest vellum known as **Uterine Vellum** was made from the small skins of calves which were unborn or died at birth. It was used only for the most expensive manuscripts. The oldest Illuminated manuscript written on vellum is the Virgil which is now in the Vatican. Many books written on parchment and vellum have been preserved and housed in different libraries of the world.

2.3 Writing Materials in India

India has a glorious heritage of writing materials. It has been traced that writing was in about five thousand years back. The civilisations of Mohenjo-daro and Harappa created some sort of scripts on the seals which have not yet been deciphered. The Indus valley clay seals, sealings and pottery were the materials on which writing was made. Writing materials commonly used in ancient India were of two kinds: (1) some were durable and more or less permanent while (ii) others were perishable by nature. To the first group belonged such materials as stone, copper, iron, gold and silver while to second belonged such soft and perishable materials as birch bark, palm leaves, cotton and silk cloth and so on.

2.3.1 Stone

Due to its durable and lasting nature stone was used as writing material from ancient times. The great emperor Asoka issued many rock edicts and pillar inscriptions. Usually there were called *Silalipi* and *Silalekha*. When rough stone was used for writing purposes, the ground was often prepared by rubbing and polishing before writing was incised. A good scribe or artist then wrote the text with ink or dye on its smooth surface, which was then incised by an engraver. Complete literary works were also written sometimes on stones. Dramas written by Chauana King Vighraha IV and his court poet Somadeva are found carved on slabs of stone at Ajmer.

2.3.2 Birch Bark

Birch bark better known as Bhurjapatra was the most popular of all early Indian writing materials. [The birch trees grow abundantly in the Himalayan region.] The inner bark of the trees available in the form of sheets were cut into appropriate sizes and used for writing. In order to make its writing surface hard and smooth it was rubbed with oil and polished, and then written upon with a reed pen and ink, specially prepared for this purpose. Such leaves were then held together with a string through their middle portion which was left unwritten. The compact book was then fastened to two wooden boards, which not only protected its leaves but also served as its get-up.

Birch barks were used from the time of Alexander's invasion down to the Mughal period. The earliest specimens are the *Kharosthi Dhammapada* from Khotan and Border Manuscripts. A few manuscripts on birch bark belonging to the 15th or 16th century A.D. have come from Kashmir and found shelter in different libraries in India and abroad and a few more are still found in Kashmir, Orissa and other parts of India.

2.3.3 Palm-leaf

Palm-leaf or talapatra was a very common writing material all over India in ancient and medieval times. According to Rajasekhara there are two kinds of palm leaves. One is *tadipatra* for writing with pen and ink, which is the common practice in northern India, the other is *taladala* for incising with metal stylus, the common practice in south India. The former variety is called sritala and the latter, tala. Sritala leaf is thin, flexible and can be handled like paper. Tala leaf is thick. It does not absorb ink and therefore, characters had to be inscribed with stylus. One of the most ancient Buddhist works—the *Tripitakas* was written on palm leaves. The palm leaf manuscript of Godfrey collection was written in fourth century and the Horiuzi manuscripts in sixth century. The length of palm leaves may vary from one foot to three feet and the width varies from one inch to four inches. The leaves are to be treated by water and dried for several times and finally to be polished to make them suitable for writing surface.

There were two ways of writing on palm leaf. In south India and Orissa the letters are incised

with the sharp-pointed stylus in the form of dots. While the holes are made in the size of letters, coloured ink or charcoal was applied to these holes to make the writing as visible letters. In northern India simple writing was made on the palm leaf like the writing on paper. In Orissa, palm leaves were cut into various non-conventional sizes to make them artistic crafts.

The use of palm leaf as a writing material, however, declined only with the introduction of paper, nevertheless it is used even now in the country-side by the beginners in the primary schools for writing the alphabet.

2.3.4 Cotton and Silk Cloth

Cotton and silk cloth had also been in use in India for writing purposes since ancient times. It was then called 'Pata' or 'Patika'. A silk band containing a list of Jain sutras written with ink was discovered by Buhler at Jaisalmer and a manuscript of the Jain work.

Dharmabidhi written on cloth dated 1361-62 A.D., was found by Paterson at Anhilavadi Patan. But manuscripts written on cloth or silk cloth prior to this period have not survived mainly because such materials could stand neither the onslaught of weather, nor the onslaught of moths and worms.

2.3.5 Skin

As the ancient Indians did not like to write the 'immortal word' on such impure materials like skin except that of tiger, and deer, skin was used very sparingly for writing purposes. There is, however, reference to it in some Buddhist works as also in a Sanskrit work, *Vasavadatta* by Subandhu, that skin was sometimes used as writing material in those days. Though very few manuscripts on skin are found in India to-day, that should not lead us to the conclusion that the use of skin as a writing material was universally condemned. As other writing materials like leaf, tree-bark, cloth, etc, were abundantly available, the use of leather was largely disfavoured. About a dozen documents on leather written in Kharosthi were, however, discovered by Stein in Chinese Turkistan, which proved beyond doubt that it was used at times as a substitute for other varieties.

2.4 Paper

Paper is the most inexpensive and convenient writing material used all over the world with the development of human civilisation and culture. The prime advantages are that, paper is light, easy to handle and to transport; it takes minimum space to store and need not depend directly on nature for its supply. Paper can be manufactured easily according to desired specification. Although paper was invented in 105 A.D. in China, it took centuries to make use of it as medium of transmission of thoughts. But as soon as the people learned the manufacture of paper in quantities, it became universally accepted writing material. Paper replaced all other writing materials because of its many advantages. In particular, the invention of printing by movable types made the paper

essential and indispensable material as vehicle of printing. The enormous multiplication of the number of copies of documents and the exponential growth of literature were possible only with the paper, the most convenient material. Since then, we have been living in the age of paper.

In India paper first came to Gilgit in Kashmir in the sixth century. There are not much evidences of using paper for writing during the following centuries. The craft and trade of paper making, spread from Kashmir to the south in Punjab. Sialkot was one of the earliest places for paper making after Kashmir. Paper making, then, went to different places like Lahore, Delhi, Multan, Muthura, etc. During the Mughal period, paper-making was in the highest esteem and various kinds of paper were manufactured. Paper-making became an object of art.

The paper used for writing the manuscripts was handmade paper. The early paper mills were not mechanised. The handmade paper was used. The first paper mill was established in modern India in 1711 at Tranquebar. The first paper mill in eastern India was set up in 1825 at Serampur.

2.4.1 Materials of Paper

Paper is primarily composed of cellulose fibre from the vegetable product. The raw materials are disintegrated and reintegrated in water through various processes. The primary raw materials and other materials may vary for the manufacture of different kinds of paper. But the cellulose fibres of the primary raw materials determine the quality and longevity of paper; certain chemicals are used for various purposes for the manufacture of paper. Such chemicals often affect the quality and longevity of paper. The primary raw materials are given below:

Cotton has ninety one percent cellulose content and it is considered to be the best raw material. High quality paper is made of cotton materials. But cotton, in original, is not used for the manufacture. Cotton fibres are longer as well as stronger. Cotton rags, cotton linen and other cotton-produced materials are used for paper-making :

Another material with stronger and longer fibres as the hemp. There are a number of varieties of hemp cultivated almost all over India. The particular type of hemp used for paper-making is called sans or sunn. Another type is jute. But sans is lighter and stronger than jute. These are used for durable and special type of paper.

Flax is used in India and this material has longer and stronger fibres. Flax is called atasi or tisi. The plant is meant for oilseed. But the plants are good raw materials. This material is stronger enough to be pounded. Stampers are used for a long time. This is prepared with potash and lime by keeping the mixture for some time. It is used for superior kind of paper.

Another primary raw material is wood. The demand of paper is so high that raw materials in bulk are to be used. Wood pulp is used for this purpose. The cellulose content in wood is slightly more than fifty percent. This pulp is used for ordinary paper. The pine fir, birch and such other soft-wood trees are used at their young age. There are two kinds of good pulp, mechanical and chemical. Mechanical wood pulp is derived from the saw dust with its impurities. In the process of chemical wood pulp, the wood is cut into pieces and-boiled with chemical reagents. It is thus devoid of impurities. Paper produced from chemical wood pulp is better than that from mechanical

wood pulp. Among other materials bamboo grass, paddy and wheat straws, etc. are generally used. Paper made from chemical wood pulp is comparatively strong and does not fade so easily. Such paper is generally brighter and whiter than paper made of mechanical wood. It is largely used for the printing of every-day books.

For a century now, these raw materials have been in use in paper-making. The other raw materials essential for paper manufacturing are dyes of various kinds, rosin, and alum for surfacing purposes, China clay and titanium oxide as loading agents.

2.4.2 Manufacture of paper

Since the very early days, paper has been manufactured by hand, a manual method. Later mechanical methods have been applied and machines are used in large paper mills to manufacture huge quantity of paper as required by the human society. But the methods of paper-making and the processes attached to them have been changed very little since the early days. The broad outline of paper-making is that the raw materials are disintegrated, pounded and reintegrated with water in the form of pulp, stretched over wire mesh or mould forming sheets of thin layers, and dried by whole operation is done manually and for the machine-made paper the processes are performed mechanically for output in large quantities.

2.4.2.1 Handmade paper

From its invention in 105 A.D. to the year 1798 when machine process was invented by one Nicholas Louis Robert, all paper was made by hand. The raw material such as linen rags, hemp, plants, etc. are cut into pieces and pounded for a long time, then the material is macerated in water. The material, then, kept in a cloth is tied up and placed in water of flowing river or pool to cleanse and remove impurities. Some kind of alkaline solution is mixed up with this material and then pounded to make it in the form of pulp. When the pulp is ready, it is mixed with warm water and constantly stirred with a pole till it is ready for paper making in a large tub or vat.

The mould is wire mesh having a frame for strengthening the borders. Over the top of this frame, fits another called the deckle which restricts the area of the mould over which the pulp can flow. The deckle usually determines the size of the sheets of paper. The mould with deckle is plunged into the vat full of liquid pulp perpendicularly and then turned to a horizontal position keeping a thin layer of pulp over the mould. The mould is lifted up with a soft layer and moved in one direction, then moved in another direction in right angles. This process makes the fibres of the pulp move both the directions and thus strengthen the paper, interlocking the fibres. It is a delicate and subtle craft and it is upon this the strength of the paper chiefly depend. While the sheet is dried to some extent and matted, the deckle is removed, the uneven edge of the paper is known as 'dickle edge'. When the sheet is more or less in a solid form, the mould is faced down, or a piece of woollen cloth or felt. Another felt is placed over the sheet of paper. The next sheet of paper is kept over the felt. In this way a pile of sheets of paper is kept within felts, separated by them. The pile of paper is pressed by a screw press to drain as much water as possible from

the pressed repeatedly, to give them a smooth surface. The sheets of paper are finally dried by hanging four or five sheets together over hair cords. Single sheet may wrinkle, so a number of sheets are placed.

The next process is to give it a non-absorbent surface, on which printers of writing ink will not run. For this it has to be sized. It means the sheets of paper are dipped into a gelatinous liquid, then pressed and dried. The fibres of the paper are kept behind the gelatinous cover making them non-absorbent. The sheets of paper are finally pressed and smoothed by conch-shell or stone piece and are given glazing. Now the paper is ready for use.

A very important point regarding paper-making is the 'Water-mark.' It depends on mould. The mould may be a 'laid' mould made with fine close wiremesh having thick wires at intervals. The 'Wove' mould is made with fine wiremesh closely woven. It does not have the thick wire netting. Handmade paper is usually 'laid' paper, prepared in laid mould. These wire lines can be seen as whiter and more transparent than other portion if seen against the light. The watermark may also be seen in a pattern if in the mould, the wires are twisted or soldered. The paper-maker and the manufacturing place may be identified by the watermark. The watermark is particularly useful in determining format, in dating the undated work. Therefore, Watermark is very important tool for the collation of the books and an important tool for historical bibliography. The first known example of a watermark has been found on paper produced about 1282.

2.4.2.2 Machine-made paper

The methods of paper manufacture are almost the same both in manual process and machine process. The change that has been made in the later process is the application of machinery in paper manufacture. The paper-making machinery was invented by Louis Robert in 1798 in France. The machinery was introduced in England by Henry Fourdrinier.

At the first stage the raw materials-rags, waste paper wood, bamboo, grass, hemp, etc. according to the kind of the paper, are cut, sorted and dusted. The raw materials are boiled in large vessel with water containing alkaline reagents. Thus the non-cellulose materials are separated and the impurities are removed. The mechanical wood is grinded and washed by constant flow of water and the chemical wood cut into slices is boiled in water with alkaline solution. Usually calcium bisulphite, magnesium bisulphite and sodium sulphate are used according to requirement.

The pulp, then, goes through the 'breakers' to separate fibres from each other by the Hollander machine. Then the pulp moves to another machine for 'beating'. At this stage the sizing materials and filling materials for loading are added to the pulp. At this stage bleaching is also made. While the processed pulp is in the machine to produce paper, it is placed on an endless belt of wire-mesh to flow continuously. The belt of wiremesh is constantly shaken from side to, and moves forward. The water in the paper drops out and the thin sheet of paper is on the wiremesh belt. The sheet, then, with a roll of felt, goes through steam-heated drying rollers. These rollers have double actions. The rollers press the sheet and evaporate the moisture of the sheet. While the sheet is strong enough, it is detached from the felt, roller, and continues to go through further

drying rollers. Then the sheet is pressed for smoothness and finish. As regards finish, this can be done in a variety of ways. Papers can be either machine-finished or super-calendered or machine glazed. Machine finished paper requires no further treatment and as such, is directly sent for use. But papers that require a still smoother surface are passed through a supercalender machine that has eight to twelve rollers arranged one below the other, those in the middle being covered with cloth or paper and the rest heated in steam. The pressure and heat of the rollers thus impart to the resultant sheets a very fine and smooth surface, a gloss and sparkle.

2.4.3. Paper Size

The size of a book depends on the size of the paper used, because the sheet of paper is folded for several times to make the format of a book. In a library the sizes of the books are very important factor for shelving, storage and other aspects of library administration. There are some over-sized books such as, atlas, books on art, reference tools, medical and engineering books, etc. The height of the book shelf depends on the size of the books to be kept. The normal sizes of the books are 8 vo of demy and crown. A slightly bigger sizes are 8 vo of royal and imperial. The sizes of paper sheets and the sizes of 8vo as book sizes are given below in inches.

	Sheet	Double	8vo
Fool Scape	13 $\frac{1}{2}$ " × 17"	17" × 27"	6 $\frac{3}{4}$ " × 4 $\frac{1}{4}$ "
Crown	15" × 20"	30" × 20"	7 $\frac{1}{2}$ " × 5"
Demy	17 $\frac{1}{2}$ " × 22 $\frac{1}{2}$ "	22 $\frac{1}{2}$ " × 35"	8 $\frac{1}{4}$ " × 5 $\frac{1}{4}$ "
Medium	18" × 23"	23" × 36"	9 × 5 $\frac{3}{4}$ "
Royal	20" × 25"	40" × 25"	10 × 6 $\frac{1}{4}$ "
Imperial	22" × 30"	30" × 44"	11 × 7 $\frac{1}{2}$ "

As regards ordinary papers 24 sheets as a rule form a quire and 20 quires form a ream. Most calculations are based on units of 500 sheets in a ream. The weight of the paper is expressed in GSM (grammes per square metre of a sheet).

2.4.4. Certain kinds of paper

Usually the books are printed in white wove paper known as white print of various weights according to thickness of paper. Now-a-days expensive books are printed on a paper known as map litho, a glazed and smooth white paper. There are also some special kinds of paper either made of some special materials, or given some special kind of finishes. Such papers as China paper, India paper, Japanese vellum, etc. are made of some special materials, or given some special kind of finishes. Such papers as China paper, India Paper, Japanese vellum. etc. are made of some special materials, which Antique or Feather wright paper, Art paper, etc. are given some kind of finish.

(i) China Paper: It is a kind of paper made in China from bamboo fibres. It is a fine soft brownish paper which gives fine impressions of engravings. It is sometimes known as Rice Paper.

(ii) India Paper: It is very thin and strong paper. It is made of fine rags and opaque for judicious loading. Sometimes it is known as Bible paper.

(iii) Japanese Vellum: It is made of Japanese shrubs. The paper is very delicate and used for engravings. Its surface is smooth and creamy-white like vellums.

(iv) Antique Paper: It is a rough surface paper and light weight in comparison to thickness of paper. This paper is not durable.

(v) Featherweight: This paper is very rough and puffy, it picks up dirt easily, often clogs the type in the printing press, occupies needless space on the shelf, and is easily cut by the binding thread.

(vi) Art paper: It is a super glossy paper coated with china clay or similar materials. This paper is used for printing of halftone blocks particularly coloured. The durability is poor and easily damaged by moisture.

(vii) Blotting Paper: It is a kind of unsized paper for drying ink. It is very soft and absorbent. Blotting paper of superior quality is generally made of cotton and hemp.

2.5 Summary

This unit highlights the materials used for writing from early civilization till date in India. In the early days stone, metal, clay tablets, papyrus, parchment and vellum were used as writing materials. Later the typical Indian materials such as birchbark, palm leaf, textiles, wooden boards, metal plates were extensively used. Finally paper has become the principal writing material of the modern society.

Composition of paper, ingredients of paper, handmade and machine made paper have been discussed in detail. Finally paper size and certain kinds of paper have been indicated.

2.6 Exercise

1. Mention important early writing materials used for centuries.
2. Indicate the early writing materials used in India.
3. Describe the ingredients of paper and its varieties.
4. What is water -mark ?
5. When machine-made paper was invented ?
6. Discuss the manufacturing process of machine-made paper.

2.7 References and Further Reading

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Unit 3 □ Paper Documents

- 3.0 Objectives.**
- 3.1 Introduction**
- 3.2 Composition.**
- 3.3 Ingredients**
- 3.4 Processing of Raw Materials**
 - 3.4.1 Handmade Paper**
 - 3.4.2 Machine made Paper**
- 3.5 Modern paper**
- 3.6 Special kinds of Paper**
- 3.7 Durability of Paper**
- 3.8 Summary**
- 3.9 Exercise**
- 3.10 Keywords**
- 3.11 References and Further Reading**

3.0 Objectives

After reading this unit you will be able:

- (1) to know the composition and ingredients of paper documents which constitute largest single constituent of library materials
- (2) to know the process of paper making longer
- (3) to have an idea about the modern paper with longer durability

3.1 Introduction

Paper exists in many different forms, but the common underlying feature is that they all consist of fibrous elements bounded to one another. Although in the late twentieth century there are rapid advances in the electronic storage of information, there is no doubt that paper will continue to be widely used because of its relative cheapness and convenience.

Much of one existing stock of information and other aspects of cultural heritage is in the form of print on paper, which needs paper care and preservation.

The largest single constituent of library materials is book. There are also various types of non-book reading materials. All these materials both in book form and nonbook form are composed of paper. Mainly paper and other constituents of the book create perpetual in preservation. So we should take of composition and ingredients of paper.

3.2 Composition

A paper – like sheet can be made from many different types of fibre, but virtually all the paper encountered in libraries is made from naturally occurring vegetable fibres freely inter-twined with each other in water in such a way that a sheet is formed. The fibres are the bone structure of the plants from which they are obtained and when they are treated with caustic soda in order to remove their juices and natural colour, they are reduced to cellulose which is the best constituent of all papermaking. The strength and durability of paper naturally depend upon the length of fibres of which it is made and its quality is dependent on the original material from which it is cellulose is derived. The most important unifying feature of conventional papers is as follows: on dispersion in water, cellulose-based fibres absorb moisture and become swollen and pliant. When a mat is formed by driving the suspension through a fine, flat wire mesh, the wet fibres tend to be otherwise in layers parallel to the plane of the wire, but otherwise in more or less, but not quite random directions. On drying this wet, a profound change takes place. A special type of chemical bond the hydrogen bond-forms in the regions where fibres overlap and make contact. This self banding is the key to producing a coherent strong, stiff sheet of paper. No extra adhesive is required and paper can be made simply by drawing with cellulose fibre and allowing the web to dry.

Today most of the paper produced contains fibres derived from wood. The remainder is mostly made from vegetable fibres such as straw, bamboo.

3.3 Ingredients

The principal ingredients of which paper is generally manufactured are cotton and linen rags, esparto, straw, hemp, bamboo and wood. Of these cotton rags yield the purest cellulose and therefore, the finest grades of paper are made from them. Their fibres are nearly an inch long on the average, very fine and strong. Rag paper can stand a good deal of wear and tear and can retain the original colour for several years without showing any sign of fading. They are the most durable of all papers.

Linen rags yield also high-quality cellulose. But linen is very scarce, it is often mixed with cotton for making ledger paper and thin bank paper and is hardly used as the sole material of paper-making.

Esparto or alfa grass is a strong bladed grass that grows in North America and South Spain. It is neither strong nor durable as it has dry short fibres whose length does not exceed 1.5 mm. It cannot retain the colour for a long period. It has, however, a fine smooth and clean surface and can be suitably used for writing and printing. It is chosen for the body of art paper.

Straw came into common use at the hands of paper-makers for making ordinary printing owing to the paucity of suitable quantity of esparto during the second world war. Hemp is used for making thin but opaque paper. It is very expensive. It is sometimes used in printing the Bibles and the prayer books.

Bamboo is largely used for manufacturing paper in India. As its fibres are short and brittle, good paper cannot be made from it.

But wood is the principal raw material of paper through-out the world. It has fifty percent cellulose content. It, however, produces ordinary paper. Trees such as spruce, pine and fir yield best fibres, whatever variety may be chosen as the raw material, it is reduced to pulp prior to paper-making.

This pulp is of two kinds—mechanical wood pulp and chemical wood pulp. Mechanical wood is ground in water into saw-dust instead of being chemically disintegrated and as a result it retains all the impurities the inter-cellular matter. Hence paper made from mechanical wood lacks strength and turns brown and brittle under long exposure to light. Chemical wood on the other hand is better from of wood pulp. Here the wood is cut into pieces, usually about an inch square. These pieces are then reduced to pulp by boiling them in water with soda or sulphite, which removes impurities, but keeps length and strength wood is, therefore, stronger and does not fade so easily. Such paper is generally whiter than paper made from mechanical wood. It is largely used for the printing of books.

3.4 Processing of Raw Materials

The early paper-makers produced lasting and durable paper. Early papers were produced by stamping or beating hemp, linen rag and ropes in mortars, with water until a smooth paste of fibres was obtained. The paste was then diluted with water to a suitable consistency, mixed thoroughly and poured over a linen fabric stretched on a wooden frame mould. This mould was kept in constant vibration in all directions to ensure that the fibres were distributed uniformly. The greater part of the water filtered through, leaving a thin layer of wet and matted fibres on the fabric. This matted fibre sheet was dried in the sun and then detached from linen fabric base and cut to size and flattened. Latter moulds were made of bamboo strips tied together with silk threads. Samples of paper so made are still in good condition; some of them are almost white, while others have discoloured with the passage of time. This process of paper-making has not yet changed. The modern hand-made paper manufacturing technique employs a wooden mould with brass wires lead in parallel or woven across the frame. The newly formed sheet is stripped from the mould when slightly wet to economise on the number of moulds in use. The paper

formed in this way is sized with animal glue or starch to provide greater mechanical strength and the required surface characteristics. The size prevents the ink from feathering on the paper and acids in the bonding of fibres.

Paper continued to be made from pure rags until the 17th century—the use of new and strong rags was confined to the best grades of writing and printing papers, while worn and discoloured rags were used for manufacturing inferior quality of paper.

Towards the end of the 17th century, the demand for paper became great and soon the supply of new white rags was insufficient to meet requirements. As a result, rags of all kinds were treated in various ways to produce fairly white stuff for making paper, and the quality deteriorated. During the nineteenth century, even the linen wrappings of the ancient mummies of Egypt were sold for the purpose. Many of the rags and wrappings were of low physical strength, quite a few contained almost every type of foreign matter, some of which was washed out during the paper-making process. The indiscriminate use of chlorine as bleaching agent is one of the factors in the deterioration of the quality of paper. The blueing of paper made of yellowed and deteriorated rag is another, bluing tender the yellowed paper a relatively white appearance and made it possible to use low-grade rags for the production of writing and printing paper. The use of alum as a moderating agent resulted in paper which was acidic in nature.

3.4.1 Handmade paper

From its invention in 105 A.D to the year 1798 when machine process was invented by one Nicholas Louis Robert all paper was made by hand. Handmade paper used rags, the cleaner the latter, as its source of vegetable fibre. The rags were soaked in water and then beaten to flatten the fibres, the soaking swelled the fibres and promoted their chemical bonding and the beating flattened fibres and caused the separation of fibres. The general procedure has always been to make a pulp, dip a mould in the pulp and bring it to the surface laden with fibres, and mat the fibres by shaking as the water drains out of the mould. The newly formed wet sheets are then laid in a pile and more water squeezed out before drying sheets on boards in the sun or by hanging them in a drying room. The paper sheet is formed through several kinds of bonding : mechanical bonding through the fibrilles tangling together, chemical bonding of cellulose molecules, and surface tension between fibres. The sheets, at this stage between felts, were stacked and pressed, then removed from the felts and air dried. Sizing was added by dipping the paper sheets into gelatine or animal glue to give them non-absorbent surface—they were again dried, smoothed and glazed.

3.4.2 Machine made Paper

Papermaking by machine is essentially the same process, but fully mechanised in a continuous sheet matter, than in single sheets. A moving screen scoops the slurry, which goes through various stages such as drying, calendaring (passing through rollers to give the paper a smooth surface), sizing and glazing. Machine-made paper is characterised by fibres which are aligned in the

direction in which the screen moves whereas hand-made paper has no grain. The machine by which the paper was first manufactured is called the fourdrinier which was first patented in 1798.

Increasing demand for paper led to greater mechanisation of the papermaking processes. Subsequent improvements in technology have been such that once logs enter a modern paper mill, they are reduced to a pulp, cooked, treated with chemicals picked up in continuous sheet on drums, coloured, sized, dried and packaged for delivery by a continuous automated process.

3.5 Modern Paper

Most paper made in modern days is impermanent. Its life is measured in decades rather than in centuries. To last for longer time paper should have permanence and durability. Permanence is the ability to remain stable and resist chemical action with from internal impurities or the surrounding environment. Durability is defined by the degree to which paper retains its original strength, especially under conditions of heavy, sustained use. If paper is to survive for any length of time in libraries, it should be strong on it in library collections.

Modern methods of papermaking can produce paper as permanent and durable as that made by earlier methods by using long fibres, by removing all chemical residues left from the pulping process, by using acceptable sizing and by removing all bleaches from it. Generally, paper for library use should be made from chemical wood pulp.

Paper quality declines owing mainly to the increased use of alum-rosin sizing and mechanical wood pulp which raises intrinsic acidity levels. Acid is also introduced into paper by residual chemicals used for bleaching, by some types of ink, air pollutants and acid transfer or acid migration. Much acid comes from polluted atmosphere, with car exhausts a major source. The effect of this acid on books is particularly noticeable in the discolouration and brittleness on the edges of pages. It is mainly caused by sulphur dioxide (SO_2) in the air with metallic impurities in the paper to form sulphuric acid (H_2SO_4). Nitrous oxide (NO_2) which reacts to form nitric acid (HNO_3), is also present in polluted atmosphere and has been identified as another source of deterioration of library materials. The presence of lignin in paper is also not conducive to its permanence.

The most important measure of whether a paper is permanent is its PH, a measure of the acidity or alkalinity of solution taken from it. PH is measured on a logarithmic scale from 0 to 14, with 0 being totally acidic, 14 being completely alkaline, and 7 being neutral.

To obtain a finished paper of the desired properties a number of variables have to be controlled and taken into consideration. These include the type of fibre used, the extent of cooking and bleaching, and the degree of bonding between fibres which determine to large degree the physical properties of paper. The amount of fibre treatment, formation on the wire, the amount of wet processing, methods of drying and the amount of calendaring affect the degree of bonding.

Modern practices and manufacturing techniques have made it possible to obtain good quality paper from any type of fibre. Modern machine made paper is to be classified in terms of its use.

One of those most frequently encountered by librarians is news-print which is mostly machine finished ground wood pulp. It is not intended to last long and it begins to deteriorate in a few months. Book papers are made of inexpensive chemical wood pulp in a wide range of weights and finishes. They are intended for text books and others of short life expectancy. Text papers are designed for high grade printing such as expensive books, booklets and brochures. They are appreciated for their texture and attractive colours and because of rather stiff sizing, are better suited for offset printing than for letterpress. Cover papers are similar to text stock, but are heavier. As their classification, they are primarily for booklet covers and come in a wide range of textures, colours and special finishes. Bond paper, commonly used for better and business forms, often shows up in libraries in typed manuscripts.

The advent of the halftone process and the printing of illustrations in colour necessitated the development of china clay or coated papers. The paper normally used for book work was not smooth enough even when calendared, and super-calendared for the new printing processes. To have clear impressions china clay mixed with barites was added to the wet pulp. The resulting glossy, smooth, glaring, white material was excellent for the fine printing but for bookbinders and librarians, it was a disaster. Although 10% clay was sufficient for excellent illustration and art work, these 'art papers' were all too often made with higher percentages of filler. Consequently some are little more than sheets of clay supported by a skeleton of wood, straw and espart fibres. This paper is difficult to bind and being hygroscopic is easily damp stained. Furthermore, it sticks together when stored in humid atmosphere for any length of time.

During the last six decades, paper technologists have made perceptible strides in improvement of the quality and appearance of machine-made paper. An event of particular significance to librarians has been the development of a permanent durable wood pulp paper that is guaranteed to have a life span of hundreds of years. The wood permanent here stands for the property of paper to retain its original characteristics. The wood durable means resistance to deterioration by use.

3.6 Special kinds of Paper

There are some kinds of special kinds of paper—either made of some special materials or given some special kind of finishes. Such papers are Japanese hand made paper, China paper, India paper, European handmade paper and the like.

Japanese handmade paper considered by some to be the finest in the world, are produced by craft techniques that have not changed in hundreds of years. They are made by farmers as part-time occupation in remote mountain villages where there is a plentiful supply of water and of natural vegetable fibres. Strength and permanence are the chief characteristics of these sheets. The most common vegetable fibres used are a wild mountain shrub: Kozo, a tough sinewy shrub of the mulberry family.

China paper is a kind of paper made in China from bamboo fibre. It is a fine, soft brownish paper which gives fine impressions of engravings.

The so-called rice paper of the Orient is not a true paper nor is it made from rice. This material, so well suited for Chinese paintings, is cut spirally from the pith of Formosa and (Jaiwan's) *Fatsia papyrifera*. The sheets of pith when first cut and dried are quite brittle, but when saturated with water, become tough and somewhat pliable.

India paper is a thin, soft absorbent paper of Chinese or Japanese origin which is used in taking the finest proofs called India proofs, from engraved plates. It is made of rags and rendered opaque by judicious loading. This paper is thin but tough and is used for printing the Bible when it has got a new name Bible paper by which it is sometimes known. It is suitable for printing pocket editions.

Antique paper, though known by the name 'Antique' has little resemblance to old paper. In its extreme form it is called Featherweight. It is a very rough paper and is very light, composed with its bulk. This paper lacks strength and absorbs dirt easily due to its fluffy surface.

Art paper is a quality paper—its basis material being a web of esparts which is not loaded but coated with china clay satin or pearl hardening. These substances which are coated on the surface of the web are mixed with such adhesives as glue or casein of gelatine and are then compressed on to the surface of the web by rolls. As an adhesive, casein is much better than gelatine because the former is insoluble while the latter sets up decay. This paper has a shiny surface necessary for printing fine half-tone blocks. It however, suffers from serious drawbacks and hence it is unsuitable for public library use.

European handsome paper, although lacking the variety available in those from the East, are generally excellent. Some of these are produced in mills. Most of these mills only pure rag pulp made from the finest linen and cotton rag. The rags are cleaned by boiling, followed by raising in clear water when bleach is used. Great care is exercised to eliminate residual chlorine. Although there have been many refinements in the preparation of the pulp and in the later pressing and drying of the sheets, there is still no substitute for the paper. European handmade paper have been shrunk naturally and their behaviour when wet is most predictable. They are excellent for restoration of old volumes and for luxury printing but are not suited for modern bookmaking.

Blotting paper is a kind of unsized paper for drying ink. It is very soft and absorbent as it is not sized. Its cheap variety is made of chemical wood pulp. Blotting paper of superior quality is generally made of cotton and hemp and it can suck up not only a considerable quantity of wet ink but can also absorb it quickly.

Bond paper is a kind of unglossed paper which is used for typing as also writing letters and correspondence.

Tissue paper is a kind of thin, soft, unsized, white or coloured semi-transparent paper used for wrapping or protecting delicate articles, engraving in books.

Decorated papers are used for book covering and end paper fall into three categories—marbled, paste and printed.

Hand marbling is done today almost exactly as it was hundred years ago. The combinations of hues and design obtainable are infinite.

Paste papers were often made by early bookbinders in their own shops. These “pulled” papers were made by applying coloured paste to the surfaces of two sheets of paper, placing them together face to face and then pulling these apart. Variations in designs were obtained by rubbing the backs of the sheets when they were together or placing string or other objects between pasted sheets.

Printed paste papers were more professional and required more elaborate equipment. In making these, coloured paste was applied to a sheet of paper and then a metal plate or wood block impressed on it. When the block designs were cut in relief the design forced the paste through the paper.

3.7 Durability of Paper

The durability of paper depends not so much on how it is made as on what material is used. That is why Dard Hunter in his book [‘Paper Making’, 1947] has noted that “the preparation of the stock rather than the method employed in its formation influences the life and durability of paper, be it by hand or by machine”. Paper practically started to deteriorate in respect of both quality and permanence since the introduction of such raw materials as esparto, straw, mechanical wood pulp. Hence papers made from them become weak and brittle and turn brown so soon. Paper made before the introduction of power into this industry retained their strength and durability for a long period. Some of the causes of deterioration of paper are as follows :

- (a) Some of the machines for paper making damage the fibres during the process of manufacture.
- (b) Paper manufactured by machine obtains strength in one direction only in which the fibres interlock as a result of the shake of the machine in that direction.
- (c) Excessive bleaching causes damage to fibres.
- (d) Excessive mineral loading brings about decay.
- (e) Fibres of straw and esparto are very short and mechanical wood, ground up as it is, has no length of fibre and they yield inferior paper, which fades so soon.

Paper manufactured from cotton, flax and hemp is the most durable of all papers. Next to it, in respect of permanence, is the paper made from chemical wood. Grade I paper is all rag paper made by hand or machine. If absolute permanence is desired, paper should be made of white, cream or unbleached linen of cotton rags of best quality without adding any mineral matter in loading, and it should be hand-made and tub-sized with gelatine.

3.8 Summary

In this unit we have discussed the ingredients and composition of paper documents in libraries. The paper making process has been discussed in detail. Defferent kinds of paper have been highlighted.

3.9 Exercise

1. How would you obtain good quality paper?
2. How would you measure the acidity of paper ?
3. Why does the paper quality decline?
4. Distinguish between hand-made paper and machine made paper.
5. What are the principal ingredients of paper?

3.10 Keywords

1. **Japanese Paper:** A highly absorbent, strong, quality paper made from plant fibres.
 2. **Kraft Paper:** A tough, strong paper made entirely from wood pulp
 3. **Machanical wood Paper:** Cheap paper made by grinding raw wood into pulp (newsprint). All impurities and acid substances remain in the paper, causing its deterioration.
- Nawsprint:** A generic term used to describe paper of a type generally used in the publication of newspapers. It is usually of a high groundwood content.

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