

Conservation and Preservation of Library Materials

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Abstract- The present paper assesses the need and importance of conservation and preservation of library material. It discusses the various methods of conservation and preservation of library material adopted by librarians through the ages. It illustrates in detail the different types of library materials and their deteriorating agents and preventive measures advocated. The researchers are of the opinion that the librarians are paying a very negligible attention for conservation and preservation. In addition the library staff is not well equipped and fully trained to carry out preservation and conservation activities in the library. Digitization is used as preservation technique in modern era. The brief information about various types of digitization tools required for the process of digitization is also described with their unique properties and technical details.

Key word- Rare materials; Conservation & Preservation methods; Digitization of library materials.

1. Introduction: -

Conservation is a term, which embraces three closely related ideas, "preservation, protection and maintenance." According to American Council of Learned Societies (ACLS, 1975) area of conservation commences with the creation of text, extends to publication thence to acquisition and then storage in the library for access and use. This means conservation concerns with authors, publishers, librarians and readers. But librarians have more responsibility of preserving the library reading material. The term conservation is two folded i.e. preservation and restoration. In preservation, preservative measures are taken to stop or to check or retard deterioration, and in restoration, special treatment is to be given to the reading materials in order to bring them back to their original shape. Restoration is a technical area and needs special skills, which may not be possible for every librarian to possess it. The library material is handled either by the library staff or the users.

Preservation of library material is most serious problem in today's librarianship. Libraries are more concentrating on dissemination of information than the preservation of library materials. Techniques for organizing and disseminating information are developing fast, but conservation field is still neglected. If due attention is not given for the conservation of library material, then there is every possibility that our cultural heritage and "nation's collective" memory may disappear. Our libraries are without trained personal in conservation. In this context, E. W. Browning (Browning, 1950) says, "Libraries have

asked for and library schools have trained assistants in book selection, in cataloguing, and classification but not in conservation and preservation. The terms 'preservation', conservation and restoration have been used interchangeably in library literature until last few years. Currently conservation is the more specific term is particularly used in relation, to specific objects, whereas 'preservation' is a broader concept covering conservation as well as actions relating to protection, maintenance and restoration of library collections. Christopher Clarkson (Clarkson, 1987) emphasizes this broader aspect when he states that 'preservation' encompasses every facet of library life, it is he says, preventive medicine.... The concern of everyone who walks into, or works in, a library for Clarkson conservation is 'the specialized process of making safe, or to a certain degree usable, fragile period objects' and restoration expresses rather extensive rebuilding and replacement by modern materials within a period object, catering for future of more robust use. He neatly distinguishes the three terms by relating them to the extent of operations applied to an item; restoration implies major alterations, conservation minimal and preservation none. Another British author, Diana Grimwood Jones (Grimwood-Jones, 1988) points out a further useful distinction between conservation and preservation, the former term is primarily concerned with ensuring that the original artifact is maintained and secure, whereas the latter form applies to various strategies for preserving the intellectual content.

The terms conservation, preservation and restoration are defined by various organizations. International federation of Library Associations

and Institutions (IFLA) (Harvey, 1993) has defined these terms as under.

Preservation: - Includes all the managerial and financial consideration including storage and accommodation provisions, staffing levels, policies, techniques and methods involved in preserving library and archive materials and the information contained in them.

Conservation: - Denotes those specific policies and practices involved in protecting library and archival materials from deterioration, damage and decay, including the methods and techniques devised by technical staff.

Restoration: - Denotes those techniques and judgments used by technical staff engaged in the making good of library and archives material damaged by time, use and other factors.

Harrods's Librarians Glossary (Harrod, 1977) has defined these terms as

Conservation (Archives): The use of chemicals and other physical procedures in treatment or storage to ensure the preservation of a document.

Preservation (Archives): - i the primary functions of an archive depository to provide adequate facilities for the care, protection and maintenance of the archives of whatever kind. ii Specific individual and collective measures taken for the repair, restoration, protection and maintenance of the archives.

Preservation is a broader term than conservation and is a management process; conservation is a technical and / or craft process. Conservation means the protection and wise use of our natural resources. Conservation means guarding these resources so the greater number of people may use them wisely.

J. R. Wit (Wit, 1959) mentions that natural resources are not only limited, but also many of them can also be easily damaged or destroyed. Men cut down trees and mine metals for use in building and manufacturing. They destroy forests to clear the land for farming. They pollute streams and make the water unfit for use. They overwork the soil and make it useless for growing more crops. Conservation is concerned not only with the resources we need today, but also with resources for the future. In each generation, every person's share of the world becomes smaller because our population is growing rapidly. Conservation also means, safeguarding human resources. Our well being depends not only on soil, trees, and minerals. It also depends on our health and on the services we receive. Conservation of human and natural resources help make and keep our homes, our country, and soil and our world better places in which we live.

2. Artefact Versus Content Preservation

A key concept central to the preservation effort is that of distinguishing between the intellectual properties of an item and its physical properties for example, a book's intellectual properties lie in the text and its meaning, while its physical properties are carried in its construction, materials and design. If the content (the intellectual properties) of a book is to be preserved, then photocopying or microfilming, or even reading the text onto a cassette tape will suffice. For many items in library collections this kind of preservation is all that may be required, both for current use and in the future. If, however, the artifact itself (the book's physical properties) is to be preserved, then different methods will need to be applied to that item. It may need to have its paper deacidified then strengthened to improve its ability to be handled, its binding refurbished, and it may require enclosing in a custom made archival quality box.

One of the key decisions to be made in a preservation program is what to conserve, there is not yet a clear consensus about when the content should be conserved in preference to the artifact. Artefact conservation may be appropriate for national heritage collections with a legislative and moral responsibility to retain objects for as long as possible (e.g. legal deposit collection), it is probably not appropriate for most other libraries, whose aims are usually more immediate and are often defined in terms of availability to users.

3. Conservation and preservation methods-

According to Ross (Harvey, 1993) preservation can be achieved by two methods, one is preserving the artifact, and the other is preserving the intellectual contents.

Preserving the artifact (Physical)

- I) Refurbishing and collection maintenance
- II) Fumigation
- III) Protective enclosures.
 - a) Encapsulation
 - b) Phase (Phased) boxes
 - c) Other Boxes.
 - d) Document folders
 - e) Slipcases
 - f) Shrink-wrapping
- IV) Binding
 - a) Recessing
 - b) Sewing through the fold
 - c) Double-fan adhesive Binding
 - d) Over sewing
 - e) Other binding methods
 - f) Strengthening paperbacks.

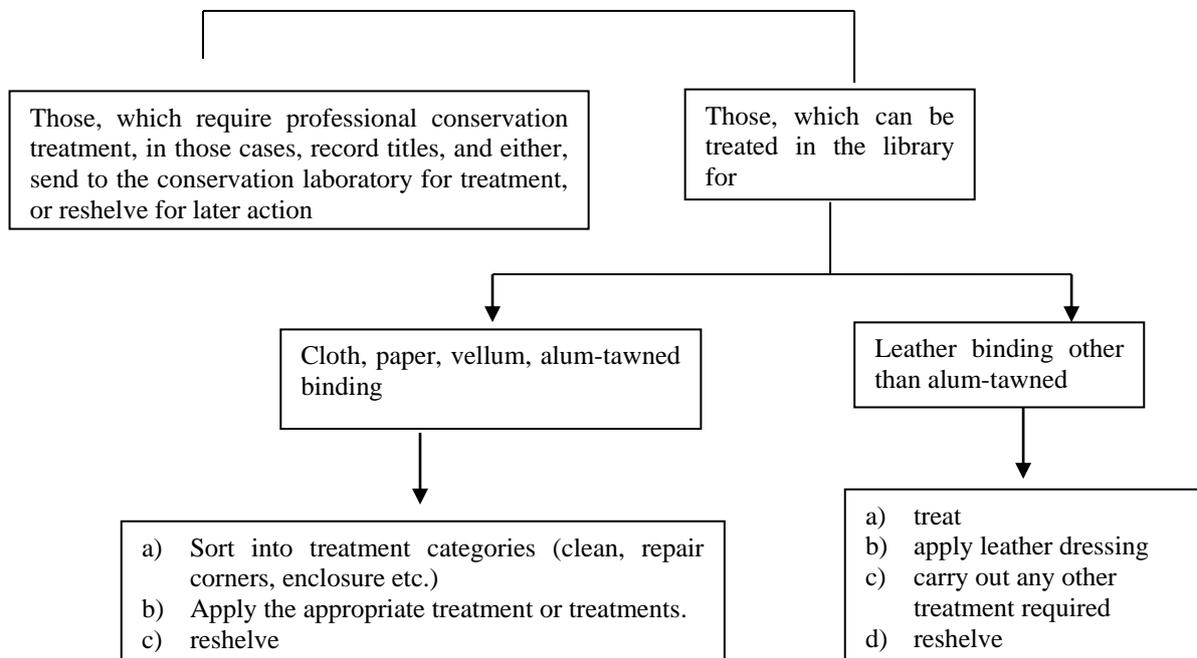
Preserving the intellectual content:

- Reformatting.
- a) Photocopying
- b) Microfilming

- c) Photography Film
- d) Digitization

Carolyn Horton (Harvey, 1993) has described the procedure for refurbishing the collection. According to her following steps are necessary:

- a) Set up a work area and obtain equipment and supplies.
- b) Establish do cementation procedures.
- c) Remove the books from the shelves.
- d) Dust the books.
- e) Sort the books into two categories



The following conservation and preservation methods are normally used in the libraries.

3.1 FUMIGATION

There are several chemicals which are volatile i.e. they evaporate, either in normal room temperature or with slight rise in the same. As the vapour of some such volatile chemicals are poisonous to the insects, fungi etc, those can be used for protection against enemies of the library collections. This method is known as fumigation. Gaseous poisons used to kill insects etc are called fumigants. The chemicals, which are normally used for this purpose, are either liquid or solid in normal condition. In those libraries where the problems of fungi and insects attack are moderate to high, or where there is enough possibility of such problems, fumigation will prove to be an extremely effective measure.

There are two types of fumigation, which are mentioned by Mukhopadhyaya (Mukhopadhyaya & Guha, 1990), one is ordinary and the other is vacuum fumigation. Vacuum fumigation is recognized as most effective system for this system a special type of steel fumigation chamber is necessary. Generally, these chambers have a capacity of 10 cu. Meter. Within the chamber, books which are to be fumigated-are kept either on book trolley or on shelves. The door of the chamber-which is airtight, is locked properly and

air from the chamber is pumped out. After removing the air about 4-5 kgs of ethoxide gas is introduced with the help of electric pump. Ethoxide gas is prepared by mixing 1 part ethylene oxide with 9 parts of carbon dioxide. This gas can destroy both fungi and insects within a very short period and can enter in all parts of the books / documents easily.

Another very significant factor of this system is that it destroys not only fungi and adult insects but also spores and eggs, this facility is not available in most fumigation systems. The ethoxide gas does not have any adverse effect on library collection. This system requires about three hours to complete the fumigation.

Thymol has been widely used in the past to fumigate infested library materials, although its use is now prohibited in the United Kingdom. It is applied by placing affected materials in an airtight chamber with a dish of thymol crystals, which is then heated by being placed near a low wattage light bulb. The material being fumigated is exposed to thymol vapour for periods of varying from three days to one week. The thymol vapour must not be inhaled and care must be taken to avoid this, especially when opening the thymol chamber at the completion of the treatment. Skin contact with the thymol crystals must also be avoided.

Ortho-phenyl phenol has been widely used despite some doubts about its effectiveness as a fungicide. It can be applied in several ways, for example, by mixing it with alcohol and applying it as a tog or spray, or by mixing it with alcohol and allowing it to evaporate in a sealed chamber or other enclosed space. As with thymol, care must be taken to avoid inhaling the vapour of ortho-phenyl phenol or allowing skin to come into contact with it.

Tissue paper can be coated or soaked with a fungicide and placed inside books, which need to be treated; the book with its tissues is then placed in sealed plastic bag for several months. Chemical controls such as fumigation, and the application of pesticides and fungicides, usually offer only temporary relief of the problems they are intended to control for example, when a chemical spray is applied, only the mould which is present is killed, and after a short time new mould spores will drift in and begin to grow if the conditions are right. Similarly fumigation in an enclosed chamber has no residual mould control effects, although it should kill the mould already growing on the items fumigated. Parker goes so far as to state that much of the fumigation that is done in libraries is not warranted considerable expertise is required to apply chemical control methods, there can be health risks associated with their use, and legislation strictly limiting the use of one-common chemicals has been enacted in recent years. For these reasons it is very strongly recommended that expert advice be sought before any fumigation or other application of chemical control measure is carried out. It must be reiterated that untrained personnel this includes all librarians – should not attempt to apply any chemical fumigation methods without first seeking expert advice.

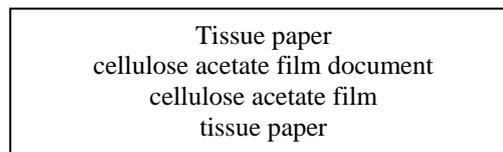
3.2 ENCAPSULATION

Ross Harvey (Harvey, 1993) has described encapsulation as one of the preservation methods. Single sheet item can be encapsulated between sheets of a chemically inert transparent plastic such as Mylar. Encapsulation is usually used for very fragile items or where heavy use is expected. Items enclosed in this manner can be handled and can easily be removed from the encapsulation should this be required. Two Mylar sheets at least 2.5 centimeter larger than the item to be encapsulated are cut, the item is laid on one sheet and the other placed on the top, and edges of the Mylar are sealed together. Sealing can be done either by using double-sided adhesive tape, by sewing or by a more expensive process, using an ultrasonic welder. About eight minutes per item is the time needed for this procedure?

3.3 LAMINATION

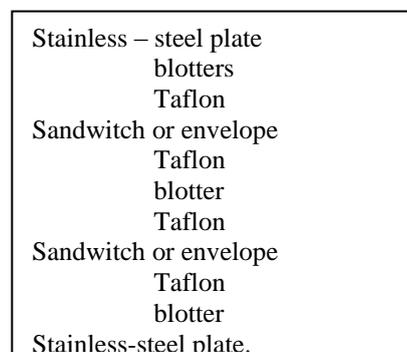
This process involves hot-sealing a deacidified document with cellulose acetate film of 23 microns

(0.00088 inch) thickness and tissue paper in either a steam-heated flat-bed hydraulic press or an electrically heated roller press. A sand-witch or envelope is prepared by assembling the materials in the following order.



The deacidified documents of the volume are placed in such a way that there is a gap of 5mm in between the sheet 1 and 8, 2 and 7, 3 and 6, 4 and 5 respectively of a section. The arrangement of the sheets is in step formation in the manner shown in the following figure

After lamination, this gap portion (laminated tissue) becomes strong enough to serve the purpose of ‘guard’ for stitching the documents into file covers for the purpose of binding into a volume; the laminated guard can be strengthened by putting in a slip of either bond paper or muslin cloth. During the preparation of a sand-witch or envelope of paired documents as described above all loose fragments and the edges of the documents should be carefully fastened to the acetate film in their proper places with a cotton swab or an artist’s brush dipped in acetone. Each sand-witch or envelope is then placed between two sheets of ‘Taffon’ (tetrafluorethylene), synthetic resin-coated glass fabric) before feeding it into the press. In the case of hydraulic (flat-bed) lamination, the sand-witch is covered with stainless-steel plates and a double thickness of blotters before being placed on the platen. This is to absorb any inequalities, which may exist on the surface of the platen or in the sand-witch, and to ensure uniform pressure on the material to be laminate, regardless of any differences in thickness at the edges of the document. One or more sand-witches may be placed on one platen. In the latter case, the order of the various materials on each platen is as follows.



For satisfactory and uniform lamination, no more than two sand-witches or envelopes should be placed on each platen. On the basis of research

carried out in 1954-57, the United States National Bureau of standards has in fact recommended that two sand-witches or envelopes be placed on one platen.

The temperature required for laminating paper documents varies from 140-150°C and the pressure from 22-36 kg/cm² depending on the condition and type of paper. Between two and-a-half and three minutes are mostly required for lamination, and the entire process, i.e. of heating and cooling, takes from seven to ten minutes. The cellulose acetate, because of the high pressure, penetrates the pores of the document paper as well as the tissue paper.

Steam at a pressure of 5.5 kg/cm² is passed into the platens. As a result, the temperature rises to the required 150°C within two minutes. Simultaneously, pressure is applied to the platens. After three minutes, the escape valve is opened and passing water through them cools the platens. The required pressure is maintained throughout this operation. When the platens have cooled, the pressure is released and the laminated documents are removed. Yash Pal Kathapalia (Kathapalia, 1973) mentions certain precautions which are necessary when repairing documents by this process. Care should be taken to ensure that,

- a) there is no smoking in the room and that no naked flame whatever is allowed; and
- b) there is proper air circulation and that acetate fumes are removed by means of exhaust fans.

During the last twenty-five years, significant advances have been made in the field of restoration several conclusions have clearly emerged.

- a) film of polyvinyl chloride should not be used for the lamination of valuable documents.
- b) lamination with cellulose acetate film is a safe method of restoring documents.
- c) Polyethylene film used for lamination purposes can be delaminated, and is better for lamination purposes than cellulose acetate films.

3.4 BINDING AS A PRESERVATION MEASURE

Binding has been the major traditional preservation activity in libraries. The specific function of bindings is to protect the book while in use or while it is being stored. In many libraries binding is the only method used to preserve library material. Libraries bind materials for several reasons, which are described by Ross (Harvey, 1993), which are as follows –

- a) to strengthen items which are manufactured in unsuitable format for the rough and tumble library use. e.g. paperback editions.
- b) Need to rebind items whose bindings have become too worn to offer protection to the text of the book.
- c) To put together in a more conveniently shelved unit items which were issued serially, or which were issued separately e.g. pamphlets.
- d) Security is another reason to bind issues, as it is considered more difficult to steal a large bound volume than a small-unbound item.
- e) Binding is used a preservation tool for fragile items, which extends their life as useful items in library collection.

It is important to note the different reasons for binding volumes in libraries and the consequent requirements for bindings of various kinds. In public libraries, binding is used to achieve the maximum number of issues in a circulating collection before a volume is discarded; whereas binding a volume in a research library is to achieve the maximum life possible for that item. Another reason is that it is cheaper to rebind a volume than to purchase a new one.

Several different kinds of bindings in common use, these are as – recasing, sewing through the fold, Double-fan adhesive binding, oversewing etc. Commercial binders carry out most binding work in today's libraries. Commercial library binderies have received adverse criticism in preservation circles because they have been perceived to apply unthinkingly one style of binding to all material, regardless of how appropriate the binding might be.

3.5 PHOTOCOPYING

Photocopying is best used to copy smaller items. It is an especially suitable format for heavily used items, where microfilm is difficult to use and user resistance. Photocopying is not appropriate for works with colored or high quality black-and-white illustrations.

Photocopying has some advantages over other formats. It can, if required, produce a copy, which is in the same or very similar format as the original. The result is relatively permanent if appropriate alkaline paper is used.

This process has some disadvantages – One is the harshness of the process, which may cause damage to fragile items. Photocopying machines themselves are another cause of damage. Damage results from excessive light, including ultraviolet light, excessive heat, and from inappropriate design, which forces materials into stressful positions. Paul Banks comments that

'photocopying is a prime example of the two-edged sword.' The ease of preserving intellectual content of library materials, but at the same time imposing considerable stress on the material. Bindings suffer most of the damage caused by photocopying. Spine damage results from pushing down on the binding to force the pages flat so that text near the inner margin can be reproduced. Flipping the book over the machine for copying sequential pages can cause damage. Sometimes paper is being bent or folded in-advertently, or deliberately for that matter. Large bound volumes are particularly at risk, and indeed many libraries do not allow them to be photocopied.

The British Library has been active in recent years in developing and making available new photocopiers and new methods of copying. Three of these have been developed

– the overhead copier, the image digitizer, and electro luminescent copying. The cost of these photocopiers are high; in 1985 the overhead photocopier was £ 6900 and the image digitizer £ 20,000 or more. Equipment needed for the electro luminescent copying process cost about £ 200. Recently released photocopiers have taken note of preservation needs for example, the Xerox 5042, has a platen the end of which is angled at 35 degrees to allow better copying of inner margins without requiring force on the spine and has an optional foot-switch which allows both hands free for more careful handling of the materials.

3.6 MICROFILMING

There is no doubt that microfilming is currently the most widely used format for preservation copying. Major libraries throughout the world are strongly committed to microfilming. Microfilming has a long history of use in libraries and considerable amount is known about it, including its longevity if stored under appropriate conditions. Microforms are produced in several formats, of these microform and microfiche are the most likely to be encountered in libraries, although other formats, like aperture cards. Libraries have traditionally produced or purchased 35 mm microfilm this size is best for the archival purposes and it allows larger size images with higher quality. Three types of microfilms are available; silver-gelatin, diazo, vesicular. Only silver-gelatin film which has been carefully processed to the appropriate standards should be used for archival master negatives which will be retained for long periods of time. However, it is important, that it should be carefully stored and handled, as it is susceptible to damage from fungi, water and mechanical abrasion. Working copies can be silver-gelatin, but diazo and vesicular have advantages where durability in day-to-day use is more important than archival life. Both diazo and vesicular film is less expensive and more scratch resistant than silver-gelatin. It is fair to say that

microfilming has cost advantages over other reformatting processes in current use and over restoration treatments, especially for items with many pages. Another major advantage observed by Alan Calmes (Calmes, 1986) is the long-term stability of microforms. If they are created using appropriate processing standards, storage conditions and handling procedures are observed, lifetime of more than 1000 years have been expressed in the literature. The space-saving factor, especially for serials is also significant. Microforms are able to be cheaply and easily copied once a master has been produced. Paper copies of part or all of them can be readily produced if microfilm or microfiche reader-printer are provided. The equipment needed to access microforms is a simple optical device. It is not 'high-tech' with a high probability of becoming obsolescent in a short time, as is the case of CD-ROMs and magnetic tapes

There are some limitations to microfilm and its usage. The equipment is not user-friendly and many readers have complained about headache, backache and neck-ache. The most often cited argument against microfilming is that they are difficult to use. A. J. Anderson (Anderson, 1988) has mentioned the reaction of one reader about the use of microfilm.

"But these dreadful microfilm readers! I had expected to enjoy a pleasant day with the fragile crackle of old newspapers in my hands. Instead I had the devil of a time pressing buttons, twinkling knobs, and peering into an obscurely lit screen. What a disappointment it was! And what a crashing ache in the temples and the back of the neck I developed before the whole unnatural experience was over."

The production, storage and handling of microforms require strict adherence to standards, which can sometimes be expensive and difficult to maintain. Careless handling and storage can easily damage them. But as compare to other preservation methods, microfilming has been proved as a best alternative to preserve library material for generations. Many microfilming projects have proved that microfilm can be used for hundred years without any damage if handled properly and stored in appropriate climate.

3.7 PRESERVATION PHOTOGRAPHY

Preservation photography is one of the preservation methods which is normally applied only to original black-and-white photographic prints. According to Ross (Harvey, 1993) the aim is to produce a master negative plus another negative (the interim master negative) from which prints can be taken as required. The master negative should be stored in the best possible condition for example in low temperature storage with the appropriate relative

humidity, light and other levels, and should only need to be accessed on the rare occasions when the interim master is worn out and another interim master is required. Prints can be taken from the interim master negatives whenever required, for example to make a reference copy, or for exhibition purposes. High quality equipment and materials should be used and the services of professional photographers should ideally be contracted.

3.8 DIGITIZATION

Libraries link the past and the future, and preservation has always been a key function. Libraries ensure that any type of information is preserved and made available for later use. Despite its very short history, digitization has an unbelievable bad record when it comes to preservation. Witten and Brainbridge (Witten & Brainbridge, 2003) mentioned that

- Enormous amount of digital information are already lost forever.
- Information technologies become obsolete very quickly.
- Document and media formats continue to proliferate.
- Technology standards will not solve fundamental issues in the preservation of digital information.

This paints a gloomy picture of digitization as a preservation tool. In 1996, the US Commission on Preservation and Access issued the final report of a Task Force on the Archiving of Digital Information. An impressive group of 21 experts had spent a year in studying the problem. The conclusion was alarming that there is; at present no way to guarantee the preservation of digital information. It is noteworthy to mention the efforts of Yale and Cornell University. Project Open Book of Yale University (Conway, 1996) was a multifaceted, multiphase research and development project. Its purpose was to explore the feasibility of large-scale conversion of preservation microfilm to digital imagery by modeling the process in an in-house laboratory. The project unfolded in a sequence of phases designed in part to allow the project to evolve as the digital imaging marketplace changed. Yale converted 2000 volumes from

References: -

- American Council of Learned Societies (ACLS) (1975). Newsletter vol. 26, 1-8.
- Anderson, A. J. (1988) We hate microfilm *Library Journal*, 50-52.
- Browning, E. W. (1950). More training needed in book binding and conservation, *Library Journal*, 75, 190-191
- Calmes, Alan. (1986). New Confidence in Microfilm. *Library Journal*, 38-42.
- Chapman, Stephen. (2003). Digital Imaging and Preservation Microfilm: The Future of the

microfilm (representing 440 000 images) indexed the volumes, stored the results and tested a prototype web accessed tool developed by Xerox Corporation.

Cornell University's (Kenney, 2003) project (Digital to Microfilm Conversion) was the feasibility of adopting digital technology for preservation purposes. The two-and-a-half year demonstration project tested and evaluated the use of high resolution bitonal imaging to produce computer output microfilm (COM) that could meet national preservation standards for quality and permanence. In the course of the project, 1,270 volumes and accompanying targets (representing 450,000 images) were scanned and recorded onto 177 reels of film. The project led to an assessment of quality, process and cost and to the development of recommendations for the creation and inspection of preservation quality microfilm produced from digital imagery.

Research Libraries Group (RLG) (Chapman, 2003) initiated a cooperative microfilming project funded by NEH (National Endowment for Humanities) in 1986. These initiatives promoted wide acceptance of a definition of preservation as prolonging the life of information in documents, rather than the documents themselves when the documents could not be preserved in their original forms. NEH has considered microfilm the preferred preservation choice for embrittled published materials and an accepted access option. A number of earlier projects supported by Commission on Preservation and Access focused on digitization for preservation as well as access.

4. Conclusion:-

Preservation of library material is most serious problem in today's librarianship. Libraries are more concentrating on dissemination of information than the preservation of library materials. Techniques for organizing and disseminating information are developing fast, but conservation field is still neglected. If due attention is not given for the conservation of library material, then there is every possibility that our cultural heritage and "nation's collective" memory may disappear. The cultural heritage of the nation in the form of old books and manuscripts the knowledge contained in it may be permanently lost if it is not properly preserved for future generation.

- Hybrid Approach for the Preservation of Brittle Books July 23, 2003 from <http://www.clir.org/pubs/archives/hybridintro.html#full>
- Clarkson, Christopher. (1987). Conservation priorities: A library conservator's view, In *Conservation of library and Archives materials and the graphic arts*. London: Butterworth
- Conway, Paul. (1996.) Yale University Library's Project Open Book: Preliminary Research Findings, *D-Lib Magazine* Retrieved July 23, 2003, from <http://www.dlib.org/magazine.html>
- Grimwood-Jones, Diana (1988). 'Preservation' In *British Librarianship and information work 1981-85 Vol.2* Special libraries, material and process edited by David W. Broomley and Angela M. Allott London: Library Association
- Harrod, Leonard Montague. (1977). *The Librarians' glossary*. London : clarion Books
- Harvey, Ross. (1993). *Preservation in libraries : Principles, strategies, and practices for librarians*. London: Bowker
- Kathapalia, Yash Pal. (1973). *Conservation and restoration of archive materials*. Paris: UNESCO
- Kenney, Anne R. (2003). *The Cornell Digital to Microfilm Conversion Project: Final Report to NEH, RLG DigiNews* Retrieved July 23, 2003 from <http://www.rlg.org/preserv/diginews/diginews2.html>
- Mukhopadhyay, Kalyan Kumar and Guha, Partha Subir. (1990). *Library Conservation_ Calcutta: Information Research Academy*
- Wit; J. R. (1959). conservation In *The world book encyclopaedia* vol.3 Illinois : field enterprise educational corporation
- Witten, Ian and Brainbridge, David. (2003). *How to build a digital library*_New York: Morgan Kaufmann