CONTEMPORARY ISSUES IN LIBRARY AND INFORMATION SCIENCE

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10. THE NEED PRESERVATION OF BOOKS IN LIBRARIES: THE ENVIRONMENT

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ABSTRACT

Books and other library materials should not be seen as physical items shelved on the stacks, they should be regarded more for the important information they contain, and how useful this information is for users seeking to satisfy their needs or passion for reading these materials. However, these materials should be regarded as objects governed by the same laws that affect all organic materials (Harvey, 1993). This probably justifies why some preservation administrators request that library science education should have a compulsory course about preservation to help all librarians understand the value of the items they deal with on a daily basis. Deterioration is a change of original state of any material by interaction between the object and the factors of destruction. The different types of deterioration are reflected in wear and tear, shrinkage, cracks, brittleness, distortion, bio infestation, discoloration, abrasion, hole, dust and dirt accumulation, etc. Deterioration as a loss of quality in any library material that decreases its ability to carry out its intended function. Generally, deterioration results from a number of variant factors classified into two main categories; inherent and external. Such categories include environmental, human, biological, chemical and natural. For purposes of this study, concern will be addressed to environmental and human factors only.

10.1 INTRODUCTION

Librarians increasingly have become aware of the importance of their collections, so they are now more conscious of the fragility of books when browsing through the stacks or examining them after circulation.

Whether talking about librarians, conservators, and preservation administrators, exploring the factors that result in deterioration of libraries' collections and developing the proper preservation methods or techniques to protect and secure these collections on the other hand is a major concern to all. Experts are concerned that temporary measures could indeed be used to prevent further deterioration of damaged books, but such solutions could not cope with millions of decaying and disfiguring items. There is a fundamentally different problem from the typical seventeenth or eighteenth century book dilemma. The danger now lies on the textbook itself and; therefore, the information it contains. Countless numbers of books are being destroyed, not by book burnings, but through the slow fires of deterioration (Baird & Schaffner, 1999),

Knowledge of the structure of library materials is essential for librarians who are concerned with preservation. Such knowledge equally assists librarians, preservation administrators and conservators to understand why some actions and activities are carried out to insure a long-term treatment of library materials. Most academic and research libraries have paper based reading collections in the form of books, periodicals, newspapers, charts, maps, manuscripts, archivals, etc. The materials used in manufacturing these collections- mainly acidic paper, cloth, leather, thread, ink and adhesives- are organic in nature and nutrition to some living organisms (Sahoo, 2001). This makes them subject to natural decay and deterioration; therefore, libraries' collections need protection from the different causes of deterioration to insure extending their life cycle and maintain them in a usable condition.

10.2 TEMPERATURE

Temperature is the outward manifestation of the amount of energy contained within an object. The tolerance of human beings for temperature variations is limited, and since libraries are for people, the ambient temperature has to be within the range that staff and patrons prefer. Modem technology has given us better control over the internal environment of a building; now we can monitor temperature so that it remains roughly constant regardless of the changes outdoors. We expect that buildings to be heated or cooled for our convenience, and this demand for changes in the temperature have affected

libraries where there are central heating or air conditioning systems.

Although the results may generally be pleasant and comfortable for staff and users, it is catastrophic for library collections. Explaining the scientific reason for this catastrophe, Feather (1996) said that the speed of chemical reactions increases with the rise in temperature, indeed the rate of increase in the deterioration of paper is even faster. Ogden (2007) added that heat accelerates deterioration; the rate of most chemical reactions, including deterioration, is approximately doubled with each increase in temperature of 10°C. In other words, at higher temperature, atoms and molecules move faster, because they are moving faster, chemical reactions occur more quickly (Alten, 2006). Thus, higher temperature increases the rate of decay, a chemical reaction. Temperature can damage some materials directly; according to Henderson (2007) high temperatures cause wax seals to soften or even encourage the combustion of cellulose nitrate film, whereas lower temperatures cause some organic materials, including plastics, to become brittle, making them prone to physical damage.

Priest (1987) further explained stating that deterioration is manifested in two ways: first, the acid of the paper reacts with such catalysts as atmospheric pollutants or the water content in the air, which breaks down the cellulose that bonds together the fibres in the paper; second, a process of oxidation can take place in certain circumstances specially with prolonged exposure to light, in which residual metals in the paper will degrade both the lignin and the cellulose weakening the chemical structure of the paper.

One crucial point is that fluctuations in temperature are more damaging than a consistently high temperature, especially when they occur over a short period of time (Swartzburg, 1995), thus to move a book from cooled air-conditioned store to a heated reading area can cause more damage than to overheat the storage area. Because temperature has a direct effect on RH, these two factors must be considered together, so raising the temperature will decrease the RH and vice versa, which will lead to fluctuating RH (Henderson, 2007). Low temperature does little damage to books, but a high temperature with

low relative humidity will dry out paper and other materials, and a high temperature with high relative humidity will encourage growth of mold and fungi. Research on materials supports the theory that hotter, moister

environments cause faster decay. Alten (2006) reinforced this assumption saying that although relative humidity levels contribute to chemical decay of materials, temperature is the more forceful factor. Cooler temperatures provide substantial increases in material life.

The temperature recommendations for areas used exclusively for storage are much lower than those for combination of user and storage areas. Cold storage with controlled humidity is sometimes advisable for remote storage or little-used materials. When materials are taken out of 'cold storage; however, the rapid temperature changes they experience may cause condensation on them (Ogden, 2007).

'Generally, paper would tolerate a temperature of about 20-22°C as long as the air is dry, ideally, the temperature should be lower in order to avoid the need for acclimatization when documents move from storage to reading room and back. According to the British Standards Institution Group (2000) the temperature should be at a fixed point between 16°C and 19°C with a tolerance of 1°C on either side, but ranging neither below the minimum nor above the maximum.

10.3 RELATIVE HUMIDITY

Relative humidity is the weight of the water vapour in a given volume of moist air expressed as a percentage of the weight that would be contained in a small volume of saturated air at the same dry bulb temperature (Swartzburg, 1995), thus an RH level of 100% represents complete saturation while 0% is complete dry (Feather, 1996), therefore, relative humidity has a more critical impact on the rate of deterioration (McCraith, 2002).

Deterioration will occur if the relative humidity is either too high or too low. High relative humidity (65% or greater) accelerates chemical reactions and when combined with high temperature and poor air circulation, mould and mildew growth will occur. Water-soluble inks and pigments can bleed or run in higher humidity, coated papers can stick together and photographic emulsions can soften and stick to materials in direct contact with them. Since most library collections are made of organic materials such as leather and paper that respond to RH much more directly, then as indicated by Henderson (2007), if RH is too high, too low or fluctuates widely, it will cause damages to these organic collections.

Wrong RH can lead to serious and unalterable damage to library materials; high relative humidity provides the moisture necessary to promote harmful chemical reactions in materials. Insect infestation is also encouraged since insects prefer a warm, humid environment (McCraith, 2002). However, according to Banks & Piletle (2000) it is not the humidity in the surrounding 'air that affects the chemical, mechanical and biological deterioration of materials, but the equilibrium moisture content (EMC) of the books themselves. The EMC is affected by several factors; degree of hygroscopicity of the material, temperature and the RH of the surrounding air.

Providing further details on the chemical, mechanical and biological deterioration, Alten (2006) explained that: (i) Chemical deterioration, takes place when a chemical reaction occurs, causing damage to an item. Chemical deterioration includes metal corrosion, increased fading and glass decomposition from high relative humidity levels, (ii) Mechanical deterioration is related to either the amount of water absorbed by organic materials, or thermal expansion in inorganic materials, especially metals. The changes in relative humidity levels lead to changes in item size and shape, resulting in cracking, splitting and warping, and (iii) Biological deterioration is damage caused by living organisms such as insects, bacteria and mold. Relative humidity levels determine whether these organisms flourish or exist at all.

Extremely low relative humidity, which can occur in winter in centrally heated library buildings, may lead to desiccation and embrittlement of some materials (Ogden, 2007). If conditions are too dry then paper will become embrittled, whereas if they are too damp then fungal moulds will develop. In case the system is functioning properly, no serious problem of dryness inside the library building will arise (Feather, 1996). Nevertheless, excessive dampness is more common and more problematic to libraries and it is often found in older buildings, which many major libraries and repositories occupy. The moisture in the air will be partially transferred to all absorbent hygroscopic substances with which it is in contact. Since paper is hygroscopic, then excessive moist will, reverse the papermaking process by inserting back into the paper some of the water that has been originally extracted from it as the pulp was being dried. When paper becomes damp, it attracts the microbiological organisms manifested as mould, which can easily

develop in cold and damp conditions.

Once microbiological damage takes place, it can rarely be reversed and always have permanent impact. Mould growth takes place at any temperature in a range of 15-35 °C and at RH in a range of 45-60% causing significant deterioration of library materials (Banks & Pilette, 2000). There is a direct relationship between temperature change and moisture levels in hygroscopic materials, as warm air is cooled, it deposits some of its moisture, which is absorbed by hygroscopic materials, and therefore, cooling the air by 4 °C can raise the RH by 10% (Feather, 1996).

However, RH can be modified by mechanical devices; dehumidifiers remove excess moisture from air, while humidifiers increase the moisture level in very dry air, and that can be done at either a small or a large scale throughout the whole library building. In order to create a fully controlled environment, air-conditioning has to regulate both RH and temperature to predetermined levels. Maintaining an acceptable level of RH is of high importance to library materials where a full environmental control system is available. A frequent recommendation is a stable relative humidity between a minimum of 30% and a maximum of 50%. Research indicates that relative humidity at the lower end of this range are preferable since deterioration then progresses at a slower rate.

10.4 LIGHT

Light is categorized as ultraviolet radiation rang mg between 300-400 nanometers, visible radiation between 400-760 nanometers, and infrared radiation beyond 760 nanometers (Ritzenthaler, 1993). Library materials should be kept away from direct intense light as much as possible (Onwubiko, 2007) because an excessive level of light can cause damage to those materials. Light, natural and artificial, contributes to the breakdown of cellulose structures in the paper; moreover, it is a direct cause of the fading of pigments and inks. Direct sunlight raises the air temperature especially if it passes through glass, in addition all conventional artificial lighting systems radiate some heat from the light source (Feather, 1996).

Ogden (2007) stated that although all light wave lengths have harmful effects, ultraviolet (UV) is significantly damaging and destructive to library materials because of its high level of energy. Both sunlight and

fluorescent light have ultraviolet rays which could react with paper materials resulting often in yellowing the papers (Onwubiko, 2007). The sun and tungsten-halogen or quartz lamps, mercury or metal halide high intensity discharge lamps, and fluorescent lamps are some of the most damaging sources of light due to the high amounts of UV energy they emit.

On the other hand, according to Banks and Pilette (2000) infrared (IR) radiation has also damaging effects on library materials. The primary impact of IR is heating the item that absorbs it. IR is of concern in two aspects; solar heat gain and heating of items. Solar heat causes heating of library environment, whereas heating of items is caused by the IR emitted from either the sun or the installed lamps.

The ideal sunlight for the storage of library materials is total darkness, but this cannot be attained in all library stacks. The ultimate objective of preservation is to facilitate not to inhibit the use of materials. Stack lighting consisting of fluorescent tubes fitted with ultraviolet filters and diffusers presents no real preservation problem if used sensibly and economically. Reading areas on the other hand require appropriate levels of light for working. If there are windows in stacks or reading areas, it is essential that they be covered by ultraviolet filters like drapes, shades, blinds, or shutters that completely block the sun (Ogden, 2007).

Ideally, materials should be exposed to light only while in use. When not in use, they should be stored in a light-tight container or in a windowless room illuminated only when materials are being retrieved. Illumination should be by incandescent bulbs. When materials are being used, light should be from an incandescent source. It is important to note that incandescent bulbs generate heat and should be kept at a distance from materials. There are lighting systems for libraries that will turn off automatically when people leave the stacks area (Swartzburg, 1995).

Moderate and acceptable levels of light will ensure protecting materials and at the same time provide users with the appropriate environment to use the library materials. Light levels should be as low as possible, and exposure should be for the shortest time that is feasible.

10.5 POLLUTION

The most serious danger, which aggravates all the rest, is pollution.

Atmospheric pollution has been a consequence of industrialization, and it is unavoidable in modem world, in spite of all the procedures governments are taking to alleviate it. The problem of pollution of the environment has become a major concern influencing both life and property. To books; it is a major enemy causing deterioration and damage to paper and other materials such as leather, which are particularly vulnerable to damage caused by acid.

EPA (2009) identifies air pollutant as a substance in the air that can cause harm to humans and environment; they can be in the form of solid particles, liquid droplets, or gases. In addition, they may be natural or man-made. Atmospheric pollutants are classified into primary and secondary; the primary are emitted directly from a process and they include volcanic ashes, carbon monoxide gas, sulfur dioxide, radioactive pollutants and toxic metals to name a few, whereas secondary pollutants form in the air when primary one interact and they include ground level zone and peroxyacetyl nitrate (EPA, 2009). Other sources of pollution, which librarians are ignore of, include electrostatic photocopier machines and air filter systems.

The primary damage caused by particulate pollutants is surface abrasion. McCraith (2002), indicates that with time these particles become imbedded in paper fibers and photographic emulsions, causing more extensive deterioration. Among the effects of dust particles combined with moisture from the air, are staining or mould growth. Dirt also helps deposit acidic gases from the air onto materials, contributing to further chemical deterioration. The effects of various pollutants on library materials can be very severe, they can cause dust, soiling and irreversible molecular damage to materials (New World Encyclopedia, 2009). Ogden (2007) stated that pollutants contribute seriously to the deterioration of library materials causing paper to become discoloured and brittle, and leather to become weak and powdery. Not to mention that certain particulates like soot can roughen, dirt, and disfigure materials. Particulates are exceedingly small and not easily detectable and virtually irremovable. At the simplest level, as indicated by Feather (1996), dirt is not only unsightly, but damaging as well because it consists of particles, which cause physical damage to paper. If the RH is high, the dust may become more hygroscopic than the paper itself and consequently accelerate the degradation and defragmentation of the cellulose structure. It should be understood that these particles are chemicals, which

may contain fragments of acid. Each particular kind of dust may set up its own chemical reaction but they are all equally harmful. Some synthetic polymers used in adhesives and paper may contain tiny quantities of chemical impurities, which with oxidation can internally break down the cellulose and magnify the deterioration of paper.

According to Swartzburg (1995), in industrialized climate, tons of pollutants such as sulfur dioxide, raw gasoline and nitrous oxide are released in the air, the chemical compounds in polluted air can multiple the damage impose upon library materials caused by the fluctuations in temperature and relative humidity. Agreeing with Swartzburg, Banks & Pilette (2000) said that these pollutants may actually cause serious damage to library materials breaking down the molecules from which paper, fabrics and leather derive their mechanical strength, thus the materials become vulnerable and embrittled.

Hence, the control of air quality in libraries is important for materials; therefore, a fully functional air-conditioned system will filter and purify the air inside the library building
protecting its materials. A special filtration system known by the HV AC system (heating, ventilating, and air conditioning) is thought to be an effective and saving solution providing full control against damage caused by temperature, relative humidity and air pollutants.

10.6 CONCLUSION

Although it is the information itself we usually want to preserve, the medium in which we store it is critical, because it determines the ability to retrieve the content. Preservation begins with considering the way we treat information media, how they are stored and used, and more.

Prominently considering the environment in which they have to exist. It has been taken for granted that all preservation media are impermanent, so far some are more liable to decay than others are. Moreover, we should understand many of the chemical and physical causes of that impermanence (Havermann, 1995) in spite of the researches carried out continually to reach everlasting solutions for deterioration of collections.

It is necessary to consider the ideal conditions under which library

materials ought to be kept so that we can assess what is available or attainable. Preservation is a means to ensure that information is available; therefore, the ideal environments have to be reconciled with the conditions in which both librarians and users can work with books for the purpose for which they were intended. The environmental enemies of books are conventionally classified under four headings: temperature, relative humidity, light, and pollution.

REFERENCES

Alten, H. (2006). Collections Creator, How Temperature and Relative Humidity Affect Collection Deterioration Rates. Retrieved on August 27, 2009 from http://www.collectioncare.org/pubs/v2n2pl.html

Aziagba, P. (1991). Deterioration of Library and Archival Materials in the Delta Region of Nigeria. International Library Review, 23. 73-81

Baird, B.J. and Schaffner, B.L. (1999). Extinguishing Slow Fires: cooperative Preservation Efforts. ACRL Ninth National Conference.

Baird, B.J., Krentz, J. and Schaffner, B. (1997). Findings from the Condition Surveys Conducted by the University of Kansas Libraries. College and Research Libraries, 58(2), 115-126.

Banks, P. and Pilette, R. (2000). Preservation: Issues and Planning. Chicago: American Library Association.

Battin, P. (1985). Preservation at the Colombia University Libraries. In Feather (Ed.) Preservation and the Management of Library Collections, 2nd ed. London: Library Association Publishing.

Byrnes, M (1992). Preservation and Collection Management: Some Common Concerns. In Sellen and Curley (Ed.) The Collection Building Reader. New York: Neal-Schuman Publishers.

Conway, P. (1994). Digitizing Preservation. Library journal, 19(2),42-45.

Croft, J.A. (2003). The Preservation Evolution: A Review of Preservation Literature, 1999-2001. Library Resources and Technical Services, 47(2),59-70.

Dale, R.L. (2004). Consortial Actions and Collaborative Achievements: RLG's Preservation Program. Advances in Librarianship, 27, 1-11.

Davenport, N. (2004). Library of Congress Heritage Copy Preservation.

Library Collections, Acquisitions, and Technical Services, 28(1),58-65. Retrieved on August 31, 2009 from http://www.sciencedirect.com/science? ob=ArticleURL& udi=B6VSH-4BDJTS 1- 4& user=565570& rdoc=l& fint=& orig=search& sort=d& docanchor=&view=c& s earchStrId=995012082& rerunOrigin=google& acct=C000028758& version=l& uriVe rsion=O& userid=565570&md5=4320e8e05bf580e888b024 7 a662d 165c

Feather, J. (1996). Preservation and the Management of Library Collections, 2nd ed. London: Library Association Publishing.

Febvre, L. and Martin, H.J. (1976). The Coming of the Book. London: NLB.

Gorman, M. (2000). Our Enduring Values: Librarianship in the Twenty First Century. Chicago: American Library Associatiort

Grove, L. (1964). Paper Deterioration: An Old Story. College and Research Libraries, 26, 365-374.

Harvey, R. (1993). Preservation in Libraries: Principles, Strategies and practices for Librarians. London: Bowker-Saur Publishing.

Havermann, J. (1995). Environmental influences on the deterioration of paper. Rotterdam: Meeuws and Co.

Henderson, J. (2007). Managing the Library and Archives Environment. Retrieved on January 28,2010

Irvine, R. and Woodhead, G.S. (1894). On the Presence in Paper of Residual Chemicals Used in its Preparation. In Feather (ed.) Preservation and the Management of Library Collections, 2nd ed. London: Library Association Publishing.

Johnson, P. (2004). Fundamentals of Collection Development and Management. Chicago: American Library Association.

Jones, T. (2001). An Introduction to Digital Projects for Libraries, Museums and Archives. Retrieved on September 14, 2009 from http://images.library.uiuc.edu/resources/introduction.htm

Jordan, S.K. (2000). A Review of Preservation Literature, 1993-1998: The Coming of Age. Library Resources and Technical Services, 44(1), 4-21.

Kiernan, K. (1995). Material Concerning the Electronic Bewulf on the British Library Web server. In Feather (Ed.) Preservation and the

Management of Library Collections, 2nd ed. London: Library Association Publishing.

LISWiki (2008). Deacidification. Retrieved on September 13, 2009 from http://liswiki .org/wiki/Deacidification

McCraith, I. (2002). Preventive Conservation: Environmental Factors and Deterioration. Off The Record, 19(3), 1-2.

Nakata, M. et al. (2008). Indigenous Digital Collections: an Early Look at the Organization and Culture Interface. Australian Academic and Research Libraries, 39(4), 223-236.

New World Encyclopedia (2009). Preservation (Library and Archival Science). Retrieved on August 31, 2009, from http://www.newworldencyclopedia.org/entry/Preservation (library and archival science

Nordin, N. M. (2008). Glorious Legacy of Malay Manuscripts: Digitization of the National Treasures. Voice of Academia, p.I-14.

Ogden, S. (1979). The impact of the Florence Flood on Library Conservation in the United States of America: a Study of the Literature Published 1856-1976. Restaurator, 3(1/2), 1-36.

Ogden, S. (2007). Temperature, Relative Humidity, Light, and Air Quality: Basic Guidelines for Preservation. Retrieved on August 26, 2009 from http://www.nedcc.org/resources/leaflets/2The Environment/01BasicGuidelines.php

Oldham, MJ. and Schrock, N.C. (2000). The Conservation of General Collections. In Banks and Pilette (Ed.) Preservation: Issues and Planning. Chicago: American Library Association.

Onwubiko, M.C. (2007). Deterioration of Library Materials: What options for Nigeria?

Library Review, 40(6), 13-21. Retrieved on August 31, 2009 from http://www.emeraldinsight.com/Insight/ViewContentServlet?content Type=Article&Filen ame=/published/emeraldfulltextarticle/pdf/0350400602.pdf

Priest, D.J. (1987). Paper and Its Probfems. Library Review, 36, 164-173.

Ramaiah, L.S. and Sujatha, G. (2008). Preservation of Library, Archival and Digital Documents: Problems and Perspectives. New Delhi: Ess Ess Publications.

Ritzenthaler, M.L. (1993). Preserving Archives and Manuscripts. Chicago: the Society of American Archivists.

Sahoo, J. (2001). Preservation of Library Materials: Some Preventive Measures. OHRJ, 47(1).

Sparks, P.G. (1990). Technical Considerations in Choosing Mass Deacidification Processes. In the Council on Library and Information Resources Report. Retrieved on September 13,2009 from http://www.clir.org/pubs/reports/sparks/sparks.html#consider

Starmer, M.E. and Rice, D.M. (2004). Surveying the Stacks: Collecting Data and Analyzing Results. Library Resources and Technical Services, 48(4),263-272.

Stefano, P. (2000). Digitization for Preservation and Access. In Banks & Pilette (Ed.) Preservation: Issues and Planning. Chicago: American Library Association.

Swartzburg, S.G. (1995). Preserving Library Materials, a Manual, 2nd ed. Maryland: Scarecrow Press.

UNESCO. (2004). Development of Information Literacy through School Libraries in South-East Asian Countries. Retrieved April 12/, 2008 from the World Wide Web: http://www2.unescobkk.orglelib/publications/06INF/information.pdf

Usovicz, E.F and Lilley, B. (2000). Preservation Microfilming and Photocopying. In Banks and Pilette (Ed.) Preservation: Issues and Planning. Chicago: American Library Association.

Wessel, C.l. (1972). Deterioration of Library Materials, Encyclopedia of Library and Information Science, 7. p. 69-120.

Yee, M. M. (2005) FRBRization: a Method for Turning Online Public Finding Lists into Online Public Catalogues. Information Technology and Libraries, 24 (3), 77-95. Retrieved on February", 2010 from http://repositories.cdlib.org/postprints/715/

Zachary, S. (2002). Mass Deacidification in 2002 and the University of Michigan Experience. ARL 224, p. 6-9. Retrieved on September 13, 2009 from http://old.arl.org/newsltr/224/massdeacid.html