



## Agents of Deterioration of Organic Museum Objects and Their Management: A Review

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**ABSTRACT:** Museums stored a number of objects which shows our cultural and natural heritage. These heritage materials are rich source of educative materials and are organic in nature. After a passage of time these collection become deteriorate due to some agencies.

Organic objects are of immense importance, that's why their protection and preservation are very necessary. In this article the author summarizes different agencies of deterioration and their preventive conservation treatment.

**KEYWORDS:** Deterioration, Management, Museum Objects, Organic, Preventive Conservation

### 1. INTRODUCTION

The history of museum is as old as our civilization. Different specialized museums stored organic objects of their own importance. These collections are showing a depict of our cultural and natural heritage of our country. Heritage may be defined as the collection stored for a long period of time have some cultural and natural importance. Museum stored two different types of collection like organic and inorganic. These organic collection are very susceptible to deteriorate. Showing their immense importance, It is very important to conserve it. Here the author discussed different agents which deterioration of the organic materials like paper, parchment, manuscripts, herbarium, textiles and natural history specimens etc. These collections are rich source of information for present and future generation. After a long period of time the museum collection shows some problems in the form of deterioration, these problems are caused by external agencies. To control these problems different preventive conservation methods were applied. Due to its immense importance the primary goal of the conservator is to safeguarding of the aesthetic, historical, structural and material integrity of the object. (E.C.C.O. 2002 [1]).

### 2. AGENTS OF DETERIORATION OF ORGANIC MATERIALS

There are many causes of deterioration of organic collection in museums which are as follows:

#### 2.1 Environmental Factor

#### 2.2 Biological Factor

#### 2.3 Physical Factor

#### 2.4 Chemical Factor

#### 2.5 Disasters

#### 2.1 Enviromental Factor

Deterioration is caused in organic materials by Temperature, Humidity, Light, Atmospheric pollution

##### 2.1.1 Temperature

Temperature is one of the main cause of deterioration of organic objects in museums. High temperature makes the objects to disfigure and increase the speed of chemical reaction and low temperature accelerates the biological growth of museum object. The ideal temperature for museum objects will be 20 to 22°C. It is very important that the museum staff should know how to manage the temperature inside.

##### 2.1.2 Humidity

Humidity is defined as the water vapour present in the volume of air. This is measured in terms of relative humidity (RH), and is denoted in %. The high relative humidity makes the object swells there by encouraging biological activity. When the relative humidity is low, organic object loses its water and get shrunk. Certain amount of humidity is necessary for the flexibility of paper, but in prolonged high humid condition, paper becomes soggy and the moisture weakens the fibres of paper. For organic materials water is the root cause of deterioration. It weakens the adhesives of paper and book binding, also weakens the sizing element of



paper results in spreading of ink. Moisture sometimes accelerate the chemical deterioration of paper which becomes yellowish and stained with spots. For any type of museum object the relative humidity should be in between 45% to 60%.

### 2.1.3 Light

The museum organic materials get deteriorated when it is exposed to light whether it is natural and artificial light. Light is very important as it is enhance the beauty of objects. It is in the form of energy which can change colour and led to deterioration on the surface of delicate objects such as paper, painting, textile and other organic objects. For the photochemical degradation of paper the ultraviolet radiation of light are responsible which make it deteriorate. The paper becomes weak and brittle when some portion of cellulose is oxidized to oxycellulose, the long cellulose chains are broken. Due to the formation of oxycellulose, paper caused some problems like yellowing of white paper and fading of ink and dye of coloured paper. Artificial light like fluorescent tube light also radiates a high percentage of ultraviolet rays causes deterioration of organic materials. Deterioration of organic materials by light is mainly depends upon the following factor, which are as follows:

**2.1.4.a Intensity of light-** The rate of deterioration of organic materials are increased when the intensity of light increases.

**2.1.4.b Duration of exposure-** the duration of exposure of paper to light is directly proportional to its deterioration. Distance from the source of light more the distance and causes less the damage.

### 2.1.5 Atmospheric Pollution

Atmospheric pollution plays a vital role in destruction and deterioration of organic objects. Mainly the dust particles and gases comes from outside through the ventilation system or by visitors are major source of this pollution.

The materials which were made up of organic origin such as leather, parchment and artifacts are susceptible to deterioration by atmospheric pollution. The sulfurous and sulfuric acid are the worse contaminants resulting from the combustion of fuels and from other industrial processes. The effects were very serious on cellulose materials such as paper and leather. This shows the close connection between the loss of strength of paper and its acidity resulting from sulphuric acid contamination. Dust and dirt particles in the air not only absorbed the pollutants but also show an abrasive action on books and paper.

## 2.2 Biological Factors

Where there is excess amount of moisture is present, there is always the presence of biological growth such as molds, insects, fungi and rodents plays an important role in infestation. Biological agents attack paper and other organic materials where both temperature and humidity are uncontrolled. Mold spores are present in the air until they find suitable condition for the growth. The mold will digest the organic material on which it has begun to grow. This results in the staining and deterioration of materials, shows rapid loss of strength of organic material. When there is white patches on book cover and document it means growth of fungi. It is very common on organic materials that are tightly packed.

Presence of high temperature, humidity and man's negligence also favours the growth and proliferation of insects. In museum objects insect growth were found where there is accumulation of dirt and dust, foodstuffs were present, entry of insect infested items, poor ventilation etc. Rodents also plays a very important role in the deterioration of organic materials which are cellulosic in nature. The materials contain carbohydrates and protein in the form of sizing, paste, starch and other organic substances attractive to insects. The nature and extent of the damage depend not only on the insect and damage but how promptly the infestation is discovered and controlled.

### 2.2.1 Deterioration Caused by Insects

The most common type of insect which deteriorate the organic material are as follows:

#### 2.2.1.a Termites

Termites are small, yellowish or whitish, it is considered social insects that live in wood, cellulosic materials and under the ground. They live under conditions in which humidity within the colony is maintained. In books they made deep holes or deep irregularly shaped erosion. Sometimes termites shows total destruction of the volume and brings about great loss or damage of the cultural property.

#### 2.2.1.b Silverfishes

These are wingless insects with long antennae and a tail like appendages. It is silverygrey in colour. These are mostly found in moist locations that is under stones and board, cracks and crevices or in dark places where humidity is greater than 55%. Silverfish causes superficial damage of organic objects.



## 2.2.1.c Cockroaches

These are nocturnal in nature belongs to the phylum Arthropoda. It is reddish brown in colour and fetid odor. It is found in dark, damp places like in bathroom, floors of kitchen, sink, near waterpipes and cabinets and cupboards. Cockroaches causes superficial erosion of irregular outline, a blakish “comma” shape marked on paper is an indication of the presence of cockroach.

## 2.2.1.d Booklice

Booklice are small soft-bodied insects that are relatively large head, fairly long antennae and strong toothed mandibles. It causes superficial irregular to paper, leather, gelatin, water colours, parchment glue and gums of bookbinding.

## 2.2.1.e Powder post beetles

Powder post beetles have front wings forming a sheath for the underwings. They are 2 to 5 mm long and dark red to black in colour. They bores holes into books and other organic materials and makes it deteriorate.

## 2.2.1.f Carpet beetles

Carpet beetles causes deterioration by making irregular perforations and sometimes surface tunnels containing powdery excrement and cast-off larval skins on books and other paper of organic materials.

## 2.3 Physical Factor

Physical factor are one of the most common factor responsible for the damage of organic materials. It is caused by wearing, tearing mishandling of the objects. Sometimes the Administrative faults are also responsible for the damage and deterioration of objects. Sometime the curator are not aware how to handle, store and use of the collection. Carefully attended the collection minimizes the risk of damage of the collection.

## 2.4 Chemical Factor

During the manufacturing process of paper, sometimes the industries used paper with low cellulose contents and some chemical compounds like alum, rosin etc which causes acidic effects and facilitate chemical deterioration of the paper with the passage of time. The unwanted chemicals were present in the atmosphere like oxides of carbon, sulphur, nitrogen, and hydrogensulphide. Because of the absorption of the chemicals by the moisture absorbed by the paper, the organic materials in the museums get affected. The most deteriorating substances for the organic materials are sulphur dioxides, oxides of nitrogen and ozone. Sulphur dioxide is a hazard to cellulosic materials like paper and cloths. Most of the nitrogen dioxide comes from automobile exhausts & when it combines with oxygen and water turns into nitric acid. This nitric acid shows strong acidic effects and effect the dyes in ink, cloth, paper and leather. Ozone acts as a powerful destroyer of organic materials. It makes the colours of fabric book covers fade and the book binding materials such as leather, gelatin, glue and paste are also susceptible to deterioration by ozone in humid atmosphere.

## 2.5 Disasters

Disaster is one of the main cause of deterioration of organic materials which include fire, water, floods high winds cyclones, earthquakes etc. Effects of disasters on organic materials are too obvious to comprehend.

## 3. PREVENTIVE CONSERVATION

### 3.1 Preventive conservation of Environmental factor

Environmental Factor is one of the leading factor which deteriorate the organic materials in museums. Control of environmental factor partially begins from the selection of site, it is very important to select best design for museum building having cross ventilation facilities for free air circulation. There should be a number of electric fans and few exhaust fans will be facilitate air circulation inside the museum building. Sunlight is the greater source of ultraviolet radiation, that's why the rays should be prevented from falling directly on organic object. For the prevention of organic materials coloured curtains should be used it is very effective in blocking ultraviolet rays. Acrylic plastic sheets were used in the planes of windows. Humidity and Temperature are more hazardous for organic materials so it is advisable to maintain ideal room temperature and humidity for the preservation of organic documents. For the storage and maintenance of organic materials it is advisable to maintain ideal temperature 20 to 25°C and relative humidity 45 to 55%. Use of humidifier and dehumidifier is very important in the context of humidity. High humidity could also be minimized by the use of dehydrating agents like silica gel. To clean dust and dirt the best way is to use a vacuum cleaner it sucks the dust and cannot resettle on the surface.



### 3.2 Preventive conservation for biological factor

Stagnant air, dampness, dark and dusky places in a museum facilitate the growth of biological pests, to control these pest good housekeeping and maintenance of optimum storage condition is necessary. Presence of edibles inside the museums should not be allowed. Periodic use of insecticidal powder of solution like lindane at the dark corner walls, beneath the racks and almirahs is a good precautionary measure to prevent insects. It is safe to use paradichloro-benzene as it acts both as an insect repellent and insecticide.

### 3.3 Preventive conservation for Physical Factor

There are some precautionary measures which were adopted by the museum staff to increase the longevity of organic materials. Important books and manuscripts should kept in specially prepared containers, trolleys should be used to carry large no of organic objects.

Care should be taken for photography. Books should not be shelved too tightly or too loosely. Use bookends to support books when shelves are not full. It must be always ensured while opening the books, pages are not torn or covers are not damaged. To turn a page lift the top corner and lightly slip the finger tips down the fore-edge supporting the page. Pages should never be folded otherwise wrinkled will be formed and they may be torn at the folds. Corner of pages should not be folded to mark pages. Avoid licking of fingers as an aid to turn pages. Underlining must be avoided, Never use metal clips or pins to hold book pages. Books should not be left open on the reading table.

### 3.4 Preventive conservation for disasters

For the protection of museum collection it is very important to take every precautionary measure for disaster. A disaster planning is an essential element of preventive conservation. It is also necessary to identify any external and internal threats that might cause problems for the collection and measures to meet those threats. Without an existing disaster preparedness plan or crisis management plan, the Museum staff will be unable to act quickly against disaster. It should be mandatory for every museums to have a written disaster preparedness and response plan containing description of emergency procedures, emergency supplies list, disaster response outline, conservation experts, list of staff volunteers, list of external contacts and names, addresses, home and work telephone numbers of personnel with emergency responsibilities. The museums should be provided with fire and smoke detection system and automatic fire extinguishing system. Use of match stick or open flame and smoking should strictly prohibited inside the museums. Inflammable materials and chemicals should not be stored inside the stacks. The telephone number of the fire office should be visibly and clearly exhibited. Location of emergency gate must be clearly indicated. The electrical defects and faults should be set right in time.

## 4. CONCLUSION

Museums stored a number of collection have immense importance of cultural heritage and natural heritage. These collections are composed of organic and inorganic importance. But after the passage of time museum collections become deteriorate by some unwanted agencies. Taking precautionary measure is the best way to protect organic materials. In this article the author describes different agents of deterioration of organic materials and their preventive conservation treatment.

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