Agents of deterioration

Inherent and External

Lesson 2

Deterioration

- It is defined as the process by which information material loose their ability to fulfill the functions for which they were created.
- It may also be regarded as a decrease of quality of information material.

Agents of deterioration

- This refers to the factors which influence deterioration of information materials.
- They can be categorized into two;
  - Internal agents of deterioration
  - External agents of deterioration

Internal agents of deterioration

- These are agents of deterioration that emanate from materials themselves.
- They are injurious compounds found in ink and pigments and also those found in the paper and other records compounds.
- They occur as a result of the behavior of components within materials themselves.
- In other words, the causes reside in the natural properties of paper and the additives used in the paper manufacturing process.

They include;

i. **Natural properties of wood**

- Wood contains chemical substances which are acidic in nature. These substances cause deterioration of paper.
- The quality of any specific piece of paper depends greatly on the techniques used to make that particular paper product.
- When people first began to make paper, they used cotton, flax, straw or other plant fibres.
  - The primary ingredient in these fibres is cellulose, composed of hydrogen, carbon and oxygen, with small quantities of other plant constituents such as lignin, which may be considered an impurity in paper.

- Today, paper making is mechanised, and paper is often made from wood pulp.
- The fibres in wood pulp are by nature much shorter than those in cotton and are further broken down by the mechanical or chemical techniques used in paper production, resulting in fibres that do not hold together over great distances.
- This difference in fibre length is one of the reasons many modern papers are not as strong and long-lasting as older papers made from cotton.

- Many papers made from wood pulp also deteriorate faster because they contain considerably more lignin than those made from plant fibres.
- Modern papers may also contain dyes and sizing that can be acidic and contribute to the short life span of the paper.
- Papers made from wood pulp can be highly acidic.

ii. Lignin

- This is also an agent of deterioration.
- Lignin is an organic substance forming the essential part of the woody fibre that gives the plant its structural strength.
- It is a complex organic acid which impregnates cellulose fibers and they are soluble in water.
- If it is not chemically removed during processing, lignin will breakdown through oxidation to produce substantial quantities of harmful acidic products.

iii. Acidity in Sizes

- To strengthen paper and make it less absorbent, paper manufactures use a product called ‘size’.
- Initially this size was in the form of hot animal gelatin.
- Later however it was discovered that the surface could be further hardened, to improve its ability to accept writing and printing inks, by dipping the gelatin-sized sheets in a solution of alum(aluminium sulphate).

- It is this alum treatment that is one of the causes for the dark brown staining in paper.
- Primarily it is also alum-rosin sizing (introduced in 1830) that causes the greatest acid deterioration of paper

Others Sources of acidity (deterioration agents)

i. Inks fugitive pigments

- Inks cannot be separated from paper because they provide graphic components without which paper will have no documentary value.
- Inks can also contain high levels of acid.
  - Iron gall ink, popular in the seventeenth and eighteenth centuries, was highly acidic, burning through paper and fading over time.
  - Carbon inks are more stable;
  - Contemporary inks are often made from synthetic dyes.

- While they do not harm paper, they are not permanent and will fade over time, especially when exposed to light.

ii. Use of impure water

- Industrial manufacture of paper requires a lot of water.
- If the water used is impure, the dissolved water may lead to paper destruction.

iii. Metallic particles

- They are metallic irons that originate from grinding machines when logs of chips are being converted to pulp.

iv. Pins, Staples and Binding Fasteners

- These are elements such as pins that may be used to hold papers together.
- Apart from making holes on paper, they weaken the paper structure.
- In most cases they rust and produce stain.

v. Acidity in Adhesives

- The adhesives used on paper and on books can be highly acidic.
- Adhesives can consist of animal glues, vegetable pastes, waxes and resins, epoxys and tapes such as cellophane or masking tape. Many adhesives contain high levels of acid.
- While it is usually impossible to completely remove adhesives that were originally placed on archival materials, it is important not to mend records or archives with any adhesives except those considered archivally sound, such as wheat starch paste or methyl cellulose adhesive.
    - Such mending is best done with the assistance or training of a professional conservator.
- It is never appropriate to use adhesive tapes to repair materials.

External agents of deterioration

1. Physical agents
2. Chemical agents
3. Biological agents

1. Physical agents

Physical agents are related to climate and more precisely macro-climate under which the documents are kept.

There are three basic physical factors;

- Humidity
- Temperature
- Light

i. Humidity

- This is the amount of moisture in a given volume of air at a given temperature. It may also mean the amount of vapour contained in the atmosphere.
- Inadequate moisture or excessively dry environment makes documents fragile.
- Inadequate moisture causes information materials to crack.
- High humidity leads to decomposition of paper through a process of hydrolysis.

ii. Temperature

- Temperature is the measure of hotness and coldness of a place or thing.
- Temperature and humidity are inversely proportional. A rise in one leads to decrease in the other and vice versa.
- High temperatures increase the rate of chemical reactions such as ageing.

- High temperatures will also increase stress/strain of information materials.
- High temperatures lead to dryness and cracking of adhesives and other molecule structures.
- High temperature causes change of color to the information material from white to brown or colorless.

iii. Light

- Excessive exposure to direct sunlight can cause deterioration of documents.
- When light falls on objects, the objects absorbs source of the light while the rest is reflected.
- This light causes a chemical reaction called hydrolysis which changes the molecular structure of paper.
- Light contributes to discoloration of inks leading to fading in documents.

- Light has bleaching effects on paper and turns yellowish and darkish.
- Light also causes the paper to become brittle in process of oxidation.
- Light causes paper to disintegrate.

2. Chemical agents

- The causes are mostly found in the atmosphere in form of gases and impurities particularly motor vehicle and industrial plant fumes and dust.
- The atmosphere in industrialized zones contains a series of impurities in form of chemical pollutants and other contaminants which cause great harm to documents.
- These chemical pollutants when exposed to the document leads to formation of acid and trigger destructive reactions resulting to a compound that exhibit itself as spots or stains on the document.

3. Biological agents

- They include different categories of living things which causes deterioration.
- They prefer dusty, inadequately ventilated area, unconducive relative humidity, low temperatures levels and dark light conditions.
- They include rodents, insect and micro-organisms and activities of man.

i. Rodents

- These include such living organisms like rats and mice that eats archival material and use paper to build nests.
- They also chew wires and cause short circuit and fires.
- They are attracted to warm, dark environments and can gain access to information centers if there are cracks and holes on the walls.
- It is important to examine and explore the building and minimize all entry points by having wire mesh in windows and doors and any penetrating holes.

ii. Insects

- They feed on cellulose, paste, gelatine , leather and other organic materials.
- They thrive in warm, dark, dirty and poor ventilated areas.
- Insects are attracted to nutrients found in paper such as starches, adhesives.
- They are attracted to damp and dirty location.
- Insects include; cockroaches, book lice, termites, book worms and beetles.

iii. Micro-organisms

- They are omnipresent living organisms.
- There are two types of micro-organism that infest documents and books. They include fungi and unicellular bacteria.
- They cause;
  - Fragility and decomposition.
  - Disintegration of molecular structures
  - Staining and spotting of information materials.
  - Acceleration of natural ageing.

iv. Man

- Man is arguably a major factor in the deterioration process of information materials.
- Deterioration through man can occur either *directly* or *indirectly*.

- Indirect deterioration can be due to unintentional damage through ;
  - Poor retrieval and filing practices.
  - Carrying files wrongly.
  - Frequent use, no matter how careful, can itself lead to or accelerate damage and deterioration.
  - Photocopying without due care.
  - Careless handling during retrieval.

- Direct deterioration can be through
  - Vandalism- Comes in times of war and riots.
  - Theft- Deliberate removal of documents
  - Mishandling- Irresponsible handling of information materials.
  - Mutilation- Direct plucking, tearing apart of the document.

Other causes of deterioration

- Natural disaster
- Fire e.t.c


THE END