Framing Myths Explained

Enemies of Artwork

Framers are normally aware or have an idea of the enemies of artwork as they listed in books and documents that one may have at some time read; but are we aware of their significance and how detrimental they are to artwork. When I first started framing there was enough to remember and try to master other than worry or research the said enemies as there was no one reference to make this task reasonably simple. I hope this article will help as it is my intention to explain them as simple as possible.

Paper and fabrics are essentially organic in nature and will degrade over time that rate of degradation will depend on how we as framers deal with the enemies of artwork. The environmental factors will initiate the degradation mechanisms within cellulose materials which include; hydrolysis, oxidation and cross linking.

The Fine Art Trade Guild's(FATG) Normal Conditions are - out of direct sunlight, temperature range of 10C - 25C and Relative Humidity 40% - 60%.

Here is the LIST and we have all seen such lists - but what I have done is to put the enemies in the order in which I believe they affect artwork - and be under no doubt they certainly do!

Relative Humidity

Light

Heat

Acids and Alkalis

Biological Problems - Insects and Mould

Techniques and Materials Used in Framing

Relative Humidity:

In my view Relative Humidity(RH) in itself is the main problem and one that also contributes and influences many of the other enemies of artwork. RH is defined as the amount of moisture in the air compared to what the air can "hold" at that temperature - its value is expressed as a percentage. Paper is hygroscopic which means that it absorbs moisture and in comparison to cellulose materials air has a small capacity to hold water. Subsequently, if there is a change in RH, an exchange of moisture will occur between the air and paper until equilibrium is achieved; this exchange will result in dimensional change of paper i.e as RH increases paper expands and vice versa.

If paper expands or contracts differentially relative to a particular area then stresses may occur where the two areas meet thereby causing either cockling or buckling i.e loss of flatness and/or the flaking of pigments. The former is particularly noticeable when an water-colour artist has not stretched the paper before painting (buckling) Cockling and buckling can also occur if artwork is incorrectly hinged.

A sufficiently high RH of greater than 70% will encourage the growth of mould especially in still air conditions. In addition, such conditions may trigger foxing which is considered to be either fungal growth which generally grows in acidic paper or when metallic impurities in the paper react with moisture in the atmosphere. See under Biological Problems.

Light:

One normally associates light damage to artwork with UV radiation but in fact that is only part of the problem and as such when lists are compiled it is more accurate to consider LIGHT as a whole.

Light damage is most pervasive and difficult to avoid; the degree of damage depends upon the intensity of the light source and the duration of exposure. Damage is manifest in a number of ways; it can cause cellulose materials to bleach, darken and yellow; it can also weaken and embrittle cellulose fibres causing pigments and dyes used in artwork, photographs and fabrics to fade and/or change colour. One should remember that light damage is cumulative and irreversible.

The sun's energy includes three distinct spectrums, defined according to their wavelengths which are typically measured in nanometers (nm).

- Ultraviolet (UV) light, which represents only about 3% of the solar spectrum, includes wavelengths from 280 to 380 nanometers.

- The visible portion of the spectrum includes wavelengths greater than 380 nanometers to about 780 nanometers and is typified in terms of colour by that of a rainbow.

- The Infrared (IR) portion of the spectrum encompasses wavelengths greater than 780 nm and up to approximately 4000 nm. The IR portion of the spectrum is typically associated with heat. While IR does not contribute directly to fading, the heat caused by the absorption of IR radiation can influence the fading process.

It is known that the shorter wavelengths (such as UV) cause more fading damage than the longer wavelengths (such as visible). Consequently, as far as fading is concerned research has determined that 40% is caused by UV radiation and 25% by visible light. The rest is caused by: 25% heat, 10% combination of artificial lighting, humidity and poor anchorage of dyes and pigments.

UV radiation is of high energy, high frequency and short wavelength 4 - 400 nanometres(nm); however, that portion of UV between approx 4 and 300 nm is absorbed by the ozone layer. For an explanation of the damage caused the remainder can be split between 300-340nm and 340 - 380nm.

In the range 300 - 340nm UV radiation causes lignin to breakdown and deteriorate resulting in an increase in the acidity of papers which, over time, will eventually lead to a breakdown in the cellulose structure of the board resulting in embrittlement and yellowing. This is particularly noticeable in mountboard by the discolouration of the bevel.

In the range 340 - 380nm UV radiation cause the fading of both dyes and pigments in fabrics and artwork on paper.

UV radiation represents 5% of the visible light spectrum but causes 90% of damage to artwork. Specialist glass that includes a UV filter helps to protect artwork but one should be aware that only glass with a UV protection factor of greater than 97% is considered as protective; further, one should be aware that UV filters do not stop fading; however, they do help to reduce it.

One might assume that if the destructive elements of UV light are eliminated then visible light is of little concern - this is not the case. Visible light has two sources; natural and artificial. Daylight tends to be brighter and more intense than artificial light and therefore tends to cause more damage.

The effect of artificial light is less acute, although fluorescent tubes do emit substantial amounts of UV and can be considered as hazardous lighting conditions. Incandescent light sources are the least harmful, but the heat they generate can still, like sunlight, damage artwork.

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Heat/Temperature

Heat/high temperature can be particularly damaging in that it results in chemical reactions occurring faster thereby accelerating deterioration; further, large fluctuations in temperature may result in dimensional change leading to visual damage such as the cockling of artwork, flaking/cracking of pigments and/or mediums due to the differential expansion/contraction and damage to photographic emulsions.
In dry conditions, paper becomes brittle and friable and the coloured areas as well as the inks become scaly conversely in damp conditions the growth of mould and insect infestation is encouraged.

Acids and Alkalis

Air pollutants can be particularly harmful and damaging to artwork either in the form of gaseous contaminants or particulates. Sulpher and nitrogen oxides, peroxide and ozone when combined with moisture cause a chemical reaction - acid-catalyzed hydrolysis - resulting in the formation of acids and eventual damage to cellulose materials.
Particulates such as dust etc can abrade, soil and disfigure whilst insect debris can cause acidic damage and encourage the growth of mould.

Offgassing refers to the emission of harmful gasses from materials within the framing package and is normally associated with the use of poor quality materials. As cellulose materials age their composition can and does change thereby producing different substances, including various acids, which may increase the deterioration of artwork. Examples of which include; wood moulding/slips whereby lignin has broken down causing discolouration or ‘woodburn‘ where the grain of backing materials has been replicated upon adjacent papers. The use of old artwork or previously contaminated materials which may have a residual degree of acidification will increase the rate of degradation of any cellulose materials.

Considerable efforts are made to avoid an adverse reaction between acids and alkalis in the framing package. The buffering and provision of an alkaline reserve within mountboard ensures an alkaline environment whereby the calcium carbonate(CACO3) attacks free acids within the board's pulp thereby ensuring the boards longevity. Free acids are those acids present below a ph value of 7 and hence the term 'Acid Free.'

An alkaline reserve is created by adding extra CACO3 (2%-5% dependent upon manufacturer) and remains within the board thereby creating an alkaline environment enabling the board to react against airborne acids and prevent the formation of additional acids such as sulpher and nitrogen.

The advantages of buffering are not always beneficial especially for photographic images as the alkaline environment created by the addition of CACO3 can interact with the emulsions used in the photographic processes thereby causing visible damage. Unbuffered boards and those that have passed the PAT are available for use with photographs.

Biological Problems - Insects and Mould:

The combination of increases in heat/temperature and RH can encourage the growth of mould, especially with values of RH greater than 70%, and increase insect activity; infestation by one usually leads to infestation by the other. Any insect attack may go un-noticed until considerable damage has been done.

Silverfish will feed on starch, cellulose, animal sizing and bleached wood pulp paper, and, if allowed too, they will completely destroy and devour the art. Book lice live in damp areas and feed on mold, starch, organic glues, cloth, silk and leather. Beetles/woodworm type insects destroy frames and stretchers; whilst, flyspots/thunderflies can be commonly seen on the surface of artwork and if not removed will permanently damage artwork.

Foxing: The term 'foxing' describes disfiguring small yellow brown spots or blotches on paper. Two main causes are mould and iron contaminants in the paper. Moulds generally grows on acidic paper in conditions of high humidity greater than 70%, they feed on the paper itself, as well as any dirt or organic material. Metal particles and impurities embedded in the cellulose fibres during the original manufacturing process are also a cause of foxing. Damp conditions encourage mould growth, and will cause iron contaminants to oxidise. In some cases a conservator may be able to reduce the effect of foxing, but requires a complete understanding of the papers, inks/medium used in order to neutralise the artwork.

Techniques and Materials used in Framing

Paper and generally fabrics are organic by nature and as such will degrade over time, that rate of degradation can be lessened by the use of correct framing techniques and the use of conservation materials. The converse is true and more importantly, the incorrect or poor use of the above can increase the rate of degradation. It is relatively simple and reasonably inexpensive for a framer to up their game thereby improving the longevity and the quality of the product provided.

Conclusions:

When heat/temperature and humidity are combined any damage to artwork is accelerated. High fluctuations in either is a major contributory factor.

The supply of oxygen initiates destructive mechanisms and if removed then damage is significantly arrested - hence the research into ANOXIC methods of framing/storage.

Other damaging factors not considered in this article include incorrect handling and inappropriate storage of artwork.