

Conservation Science - Stopping the Rot and Picking Up The Pieces

Activity 3 - Beware of the Lights!

Target Audience and Age-Range

This activity is suitable for Family Audiences. It probably works best as a 'show and tell' activity. It uses concepts about the electromagnetic spectrum which are not formally taught until KS3 science in schools, so on that basis it may be judged suitable for audiences aged 11+

Duration

About 15 - 20 minutes

Background

Museum objects can be damaged by being kept in the wrong environment. Environmental damage can be caused by several factors including heat, humidity and light. This workshop introduces the idea of environmental damage to collections through looking at damage caused by light, and what can be done to control this.

Visible light is a small part of the spectrum of electromagnetic waves which go from very long wavelength radio waves to very short wavelength X-rays and gamma rays. Electromagnetic radiation travels in packets known as photons. Each photon carries a certain amount of energy with it, and the energy is inversely proportional to the wavelength of the radiation. So radio photons have very little energy, but X-rays are very energetic. In the visible part of the spectrum red light has the longest wavelength and so the energy. Blue light has a wavelength about half that of red light, and so each photon carries about twice as much energy. Ultraviolet light, invisible light of still shorter wavelength has even greater energy. When photons hit a surface some of them are absorbed and give up their energy. If the absorbed photons have enough energy they can break chemical bonds in the material that absorbs them, so causing damage. Photons of red light don't carry enough energy to harm most museum objects but blue and ultra violet photons are energetic enough to cause damage. This damage is often seen as pigments fading, but can also include weakening of fabrics. Most of the damage is caused by ultra violet light, which is strongly present both in sunlight and in many forms of artificial light. To preserve museum collections they must be protected from U-V light, but well enough lit for people to be able to see and enjoy them. This workshop is about U-V light and how we can control it in museums.

What You Need

- * Examples of light-damaged museum objects
- * Lamp with 'black light' bulb(see notes below) as U-V source
- * Schweppes' Indian Tonic Water (contains quinine, which fluoresces in U-V light)
- * Glass to contain tonic water
- * Samples of window glass, perspex, polycarbonate, polystyrene and U-V control window film.

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What You Do

After a suitable introduction, talking about light damage to objects, and possibly introducing the E-M spectrum with a demonstration of spectrum formation with a prism you demonstrate:

1. When U-V light is shone onto Tonic Water it lights up blue (fluoresces) - compare with a glass of water, which doesn't react. So Tonic Water is a U-V detector.
2. Place a sheet of glass over the top of the detector - it still shows fluorescence, so glass on its own won't protect against U-V
3. Repeat step 2 with other transparent materials, perspex, polycarbonate etc. Some of these (perspex) cut out U-V, others transmit it.
4. Show that glass with filter applied cuts out U-V.
5. (optional) drink tonic water!

NB To see fluorescence you need low light levels, a blackout or to put the experiments in a dark box.

Conclude by talking about the need for low light levels for sensitive collections, relevant to your museum (e.g. insects, watercolours, textiles etc.) and the need for having U-V control films applied to museum windows and to fluorescent light sources.

Health and Safety

No significant risks to public. Demonstrator should avoid prolonged, ie more than 30 mins at a time exposure to U-V source, if using a 'black light' bulb.

Sourcing Equipment

Black light bulbs are widely available from specialist lighting suppliers and places like party and joke shops - they are used in disco and party light effects. They are also available from electronics suppliers such as Maplin (www.maplin.co.uk) and Rapid Electronics (www.rapidelectronics.co.uk).

Transparent perspex can be had from sign makers, glass from glaziers and your conservation dept should be able to supply U-V control film.

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