

Environmental Monitoring

The Agents of Deterioration

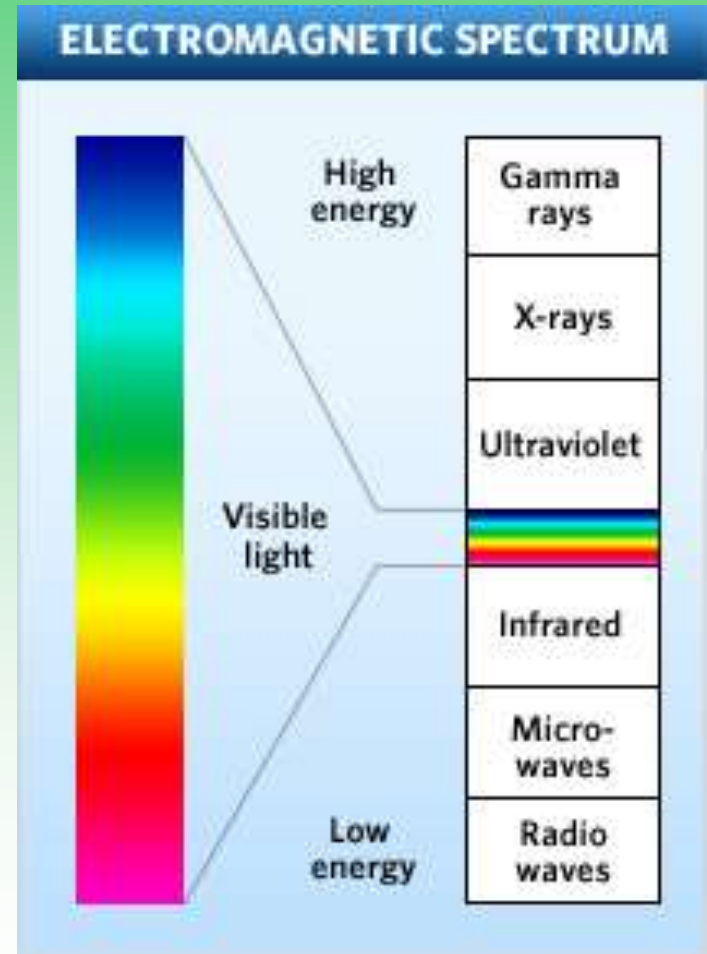
Conservation is the careful management of change

- Light (UV and visible light)
- Incorrect Temperature and Relative Humidity
- Biological Damage (pests, mould)
- Mechanical Damage (wear and tear, dropping an object)
- Chemical Damage (air pollutants, sweat)
- Disassociation (loss of information / provenance of an object)
- Loss (misplacement, theft)
- Catastrophe (flooding and fire)

How do light,
temperature and
humidity affect our
collection items?

Environmental Monitoring - Light

- Light is one of the most damaging causes of deterioration and causes permanent damage
- UV radiation is the most damaging and causes a photochemical change in the material
- The damage is cumulative



What damage can light do?

- Fading – textiles, watercolours, photographs, fur, feathers, wallpaper, drawings, documents, prints, leather
- Embrittlement of structure – paper, parchments, vellum, textiles
- Shrink / cracking – some varnishes/polishes, plastics, wood
- Colour change – yellowing in paper, textiles, wood, ivory/bone, coatings or repairs made with organic material
- Disintegration – textiles

Light
Damage



Light
Damage



Light

Appropriate Light Levels

50 Lux	water colours, pastels, leather, fur, feather, textiles, paper, lacquered furniture, paper, some plastics, ivory and bone
200-250 Lux	Oil paintings, painted wood and sculpture, coloured waxes, some plastics, chalk and charcoal
Light stable	metals, glass, ceramics, stone, most geological specimens

Light Monitoring

- Light is measured in Lux = one light unit (Lumen) per square meter
- UV is measured in microwatts per lumen = proportional measurement of the light falling on an object
- Measure with spot readings or cumulative readings
- Fabric fading strips or dosimeters

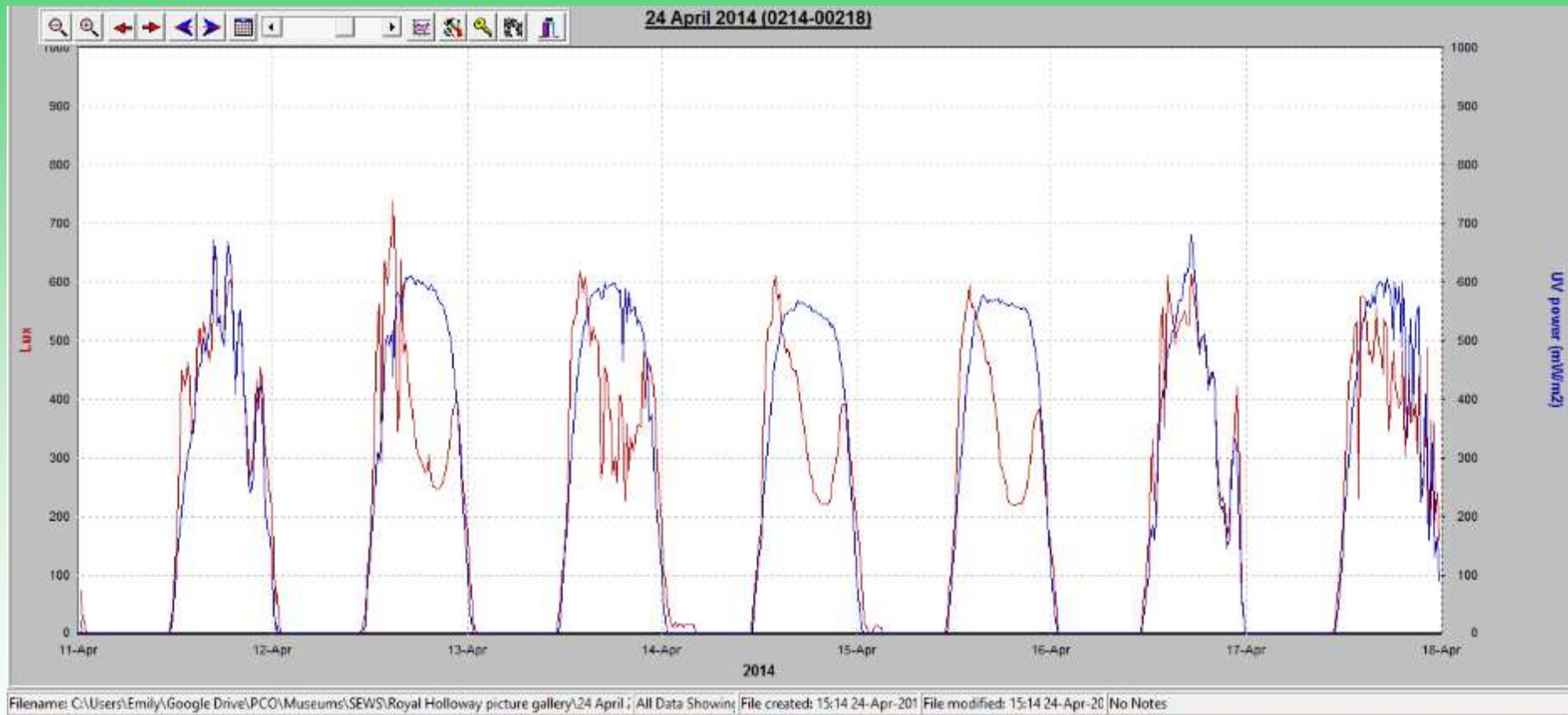


Preservation Equipment LTD



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Light Monitoring



Light Monitoring

Using a light meter

- Elsec light meters – also measure UV
- Place the monitor on / near the surface you want to measure
- Make sure you are out of the way of the light source
- Spot readings – take at same time of day; note weather conditions; note any changes in the room

Light plans

- Know what light comes into your museum
- Catering to the most light sensitive objects in a room
- Information built up over a period of time
- Change blinds to suit the conditions outside
- Change lighting in cases / museum space
- Share your plans with all staff and volunteers

Light Prevention

UV filters

- Cut out UV radiation from natural light
- Come clear or tinted
- Installed using water (for cleaning the windows and application)
- Removal is by physically pulling it off and scarping off residue
- Degrade over time from energy from UV and heat from the sun

Sun blinds and curtains / Black out blinds

- Heavy duty material – glazed cotton blinds
- Eliminate direct sunlight without eliminating light
- Use black or dark opaque material on windows
- Black out material on rods over cases or object

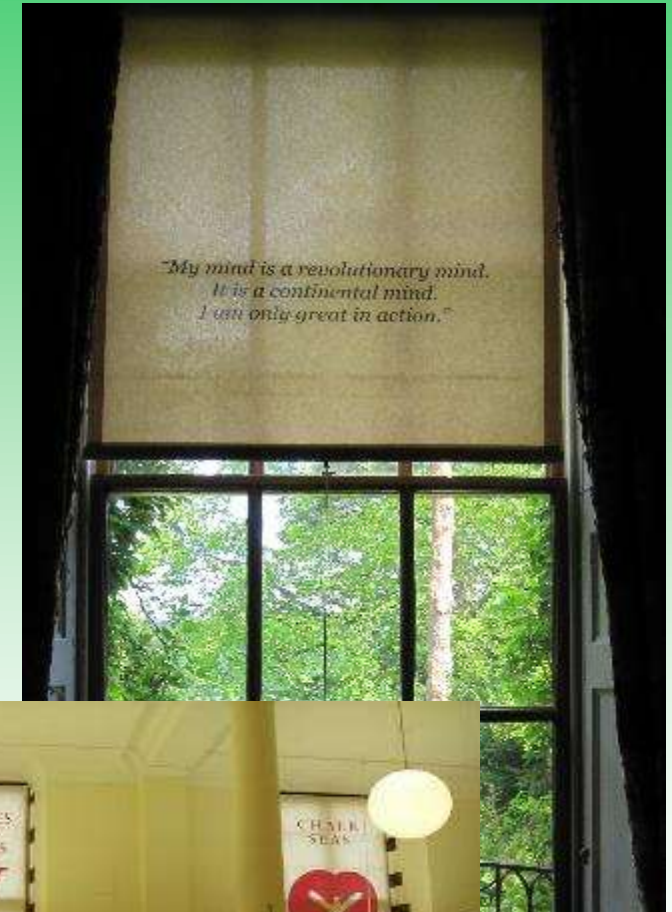
Sun-x



Light Prevention

Display

- Repositioning spot lights off cases or object
- Covering items exposed to light when the museum is closed
- Case covers printed with interpretation
- Moving items that are in direct sunlight
- Reduction in the duration of light exposure
 - rotating items on display
- Redisplaying in a different “setting” i.e. night time setting
- Facsimiles



Light Prevention

Artificial light

- 50 lux objects – artificial light is more appropriate than daylight

Tungsten incandescent lamps

- good colour, low UV emission, UV filter not necessary, can get hot

Fluorescent lamps

- good colour properties, efficient lamp, unacceptable UV emission – requires UV filtration, can get hot

Tungsten halogen lamps

- the bluer the light the higher the UV out put, need UV filtration , can get hot

Metal halide lamps

- can be inappropriate colour for exhibitions being a cooler light, high UV out put and need filtration

LEDs (Light Emitting Diodes)

- increasing used inside cases, low heat and UV emission, good light colour, can affect some forms of paint

Energy consumption

Temperature & Relative Humidity

What is relative humidity?

- Relative humidity is the amount of water that the air can hold at any one time, measured as %
- Warmer air has the capacity to hold more moisture, so as the air warms, the % of moisture in the air decreases
- As the air cools, the % of moisture increases
- Organic items take in and expel moisture to keep in equilibrium with the atmosphere around them
- In this country, generally the atmosphere is drier in winter months than in summer months
- Temperature can be used to control RH

Temperature & Relative Humidity

- Aim to keep the temperature between 15-20C (above 5C in the winter) and RH 45-65 %
- High RH can cause swelling in organic materials
- Low RH can cause cracking in organic materials
- Fluctuating RH is the most destructive
- High RH and dust together can cause mould growth and corrosion on the surface of objects
- Objects need time to acclimatise to new environmental conditions

Incorrect Relative Humidity



Temperature & Relative Humidity Monitoring

- Relative Humidity to be kept 45-65 %
- Temperature to be kept 15-22C

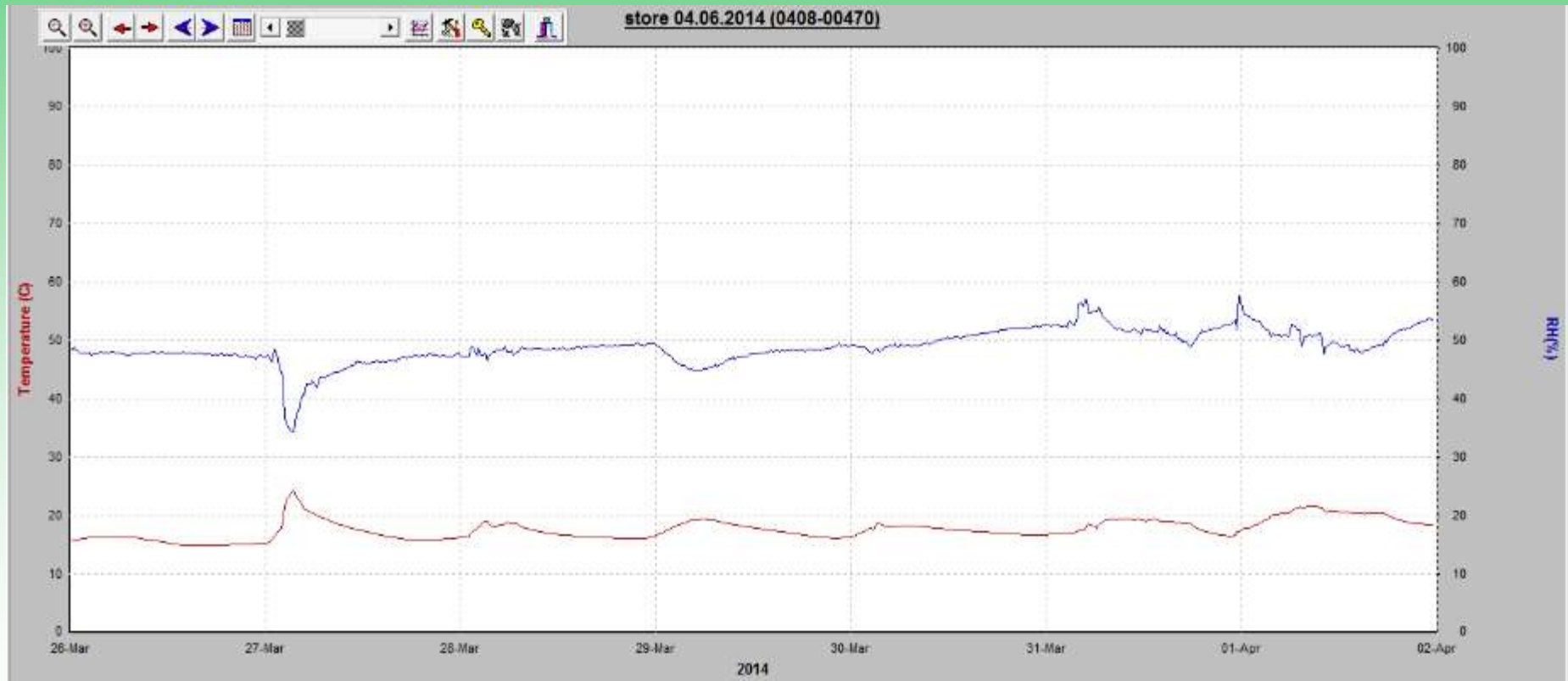


Spot checking



Electronic monitoring

Temperature & Relative Humidity Monitoring



Temperature and Relative Humidity Stabilisation

- Do nothing!
- Controlling the amount of moisture that come in with visitors
- Oil filled radiators to regulate the temperature and humidity
- Humidifier / dehumidifier to regulate the humidity
- Fans to encourage air movement
- Use of sun blinds to reduce solar gain
- Air conditioning
- Microclimates
- Packing material
- Move vulnerable items

Mould

- Mould/Mildew is a fungus – often white or coloured fluffy or filamentous growth
- Foxing on paper can also be caused by fungal growth
- Spores (1 micrometre in diameter) are constantly in the air – settle on surfaces in still air
- Can stay dormant until the conditions are right for them to germinate:
 - Optimum of 20C
 - RH greater than 65%
 - Suitable food



Mould Damage

- Will eat whatever organic mater it lands on
- Causes structural issues, staining and can change the pH of the surface which can affect dyes / chemical stability
- Can stay in the structure of the object and re-occur
- Acidic conditions will encourage growth
- Affects to human health



Controlling Mould

- Monitor by visual inspection – racking light / UV light can help with detection
- Keeping RH below 65% is the principle method of control
- Good ventilation, damp proof and well maintained buildings, remove excess water (i.e. condensation), introduce fans, keep material off the floor and away from outside wall, keep clean, regular inspections
- Light discourages growth

Dealing with Mould

- Isolate material in a clear polythene sealed bag
- Discard packing material
- If damp/wet use cold air fans to dry
- Use appropriate PPE to remove mould
- In some cases alcohol can be used to reduce the likelihood of mould returning but not suitable for most historic objects

Exercise

- Temperature and RH readings – analyse an example of readings to determine what is happening to the environment and what action can be taken to stabilise the environment
- Spot monitoring – practice with the environmental monitors taking readings within a museum space