MARS BARS TO MANET

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ART AND SCIENCE

ART
Complex combination of traditional and new materials

SCIENCE
Find out what materials the ART is made from

Helps curators interpret the ART

Find out how the materials behave

Most of the materials degrade- the ART will need to be conserved whether they it is 500 years old or 5 years old.
The Structure of a Painting on Canvas

Simplified multilayer structure

Each layer is made from different polymers

Cellulose in linen canvas
Panel Painting Construction

Oak or poplar boards joined together

Gesso applied as ground layer ready for paint layers

Construction of Rubens’s Landscape by Moonlight
Imaging

• Digital Photography
• Optical Microscopy
• Scanning Electron Microscopy (SEM)-
• A beam of electrons hit the surface of a material. Scattered electrons are imaged.
Multilayer Structures

Most layers in a work of art are not transparent to visible light.

Need to use other parts of the electromagnetic spectrum.
**X Rays**

- The X-rays are too small to be scattered by most paint pigments.
- Pigments such as lead white and dense objects such as wood and tacks, strongly absorb X-rays.
- The image observed on an X-ray are the areas of absorption.
Infra-Red

- Infra red light is not scattered or absorbed by most paint, therefore it penetrates to the underpainting.

- If the underpainting has been made in an IR absorbing material (e.g. charcoal) then none of this light will be reflected back and it will appear dark.

- The "image" shown by an IR reflectogram.
Infra-red Image of a Courtauld Gallery panel painting

Figures in lower paint layers
Infra Red Reflectography

Chris Ofili  
*No Woman No Cry*  
1998

“RIP Stephen Lawrence”
Artists Interviews

Sometimes we can ask the artist what materials he used and how he made the painting.

In this case, Chris Ofili designed and painted a stage backcloth for the Royal Opera House.
Cross Sections
Paint Cross Sections

- Take a tiny piece of paint from a damaged area
- Slicing through it to make a cross section
- See the layer structure by looking at it with a microscope.

David Hockney A Bigger Splash 1967
Artists’ Materials and Techniques

David Hockney A *Bigger Splash* (1967)
Cross section from ?

- Final paint Layers
- White Lead Ground
- Green of Landscape
- Gesso Ground
Mechanics

Different solid materials have different mechanical properties.

**Tensile strength** - *how strong they are when pulled*

**Stiffness** – *how much they extend when they are pulled*

**Hardness** – *how much they indent when touched*

*We need to know these properties to understand how works of art will respond in different situations.*
Canvas – Woven Fabric Support

warp

weft
Geometry of canvas

Natural Materials: cotton / linen / silk

Synthetic Materials: Carbon fibre / polyester / acrylic

Microscope Images at 5X Magnification

warp

weft
Panel Shape and Moisture

Hydroscopic-response from outside inwards
Wood swells differently in different directions.

Panel painting-paint film acts as a moisture barrier.
Moisture can leave more easily from the back → back contracts more than the front → painting will warp into a convex shape paint layer will crack → characteristic pattern along the grain

50%RH

Paint

Wood

30%RH
Cranach - Adam and Eve

http://www.getty.edu/museum/conservation/cranach_comparison/
Viscoelastic

Many material found in ART are VISCOELASTIC

Their response to an applied force depends on the temperature, moisture content and the speed of that force.
Temperature

At cold temperatures materials become brittle.

Most art we want to keep around room temperature.

Mark Quinn Blood Head
National Portrait Gallery

Environmentally Controlled Truck
Pulling materials fast makes them brittle.

Conservators handle art gently.
Thank You

http://www.courtauld.ac.uk/vr_tour/new/index.shtml?pano=room_02-1.xml
http://www.guardian.co.uk/books/audioslideshow/2009/feb/22/art-philippullman
http://www.getty.edu/conservation/
https://twitter.com/royaloperahouse/status/312157362918129664/
http://www.nationaltheatre.org.uk/discover-more/digital-classroom
http://www.physics.org
http://www.rhul.ac.uk/science/sciencefestival/home.aspx Saturday 1st March Free at Royal Holloway College, Egham