

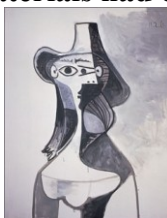
Week 8 CONSERVATION AND ANALYTICAL CHEMISTRY

1. What is the importance of analytical and conservation chemistry?
2. What makes them different from other branches of chemistry?
3. Do you know some of the methods that they use?

Task 1 READING¹

Read the short text below and search for expressions referring to methods used by analytical chemists.

The Influence that Synthetic Painting Materials had on the Technique of Pablo Picasso



Fourteen paintings by Pablo Picasso (1881-1973) were selected in order to carry out detailed examination analysis of the materials and documentation of the painting techniques used by the artist. Information was gathered from literature sources, curatorial files and conservation records as well as from the paintings themselves.

The examination procedure involved detailed surface examination, use of ultraviolet light, infrared photography, stereo microscopy and x-radiography. Samples were taken from each painting so that binding media, pigments and general structure could be identified. Cross-sections were made for viewing in visible and ultraviolet light. Pigments and extenders were identified by optical and electron microscopy, ultraviolet fluorescence staining tests, energy dispersive X-ray analysis and X-ray diffraction. Binding media have been characterized by Fourier transform infrared spectroscopy and pyrolysis - gas chromatography - mass spectrometry.

Some methods are summarized below. Complete the missing expressions. There is one expression that you will not need to use.

<i>canvas</i>	<i>aids</i>	<i>adhesive</i>	<i>reveal</i>	<i>varnishes</i>	<i>examination</i>	<i>evaluate</i>	<i>priming</i>
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Microscopic Analysis

The artifact is examined with a microscope to help (1)_____ its overall condition. This can give a preliminary assessment of damage and (2)_____ previous restoration efforts. A polarizing microscope can be used to analyze the type of pigments used.

Cross-sectional Analysis

A tiny sample of paint used by the artist is extracted from an already damaged area. Microscopic (3) _____ reveals the types of pigments used, the layering of the paint, and the style in which the artist builds up his colours.

Ultraviolet Radiation

Observation under ultraviolet light gives valuable information on the (4)_____ and glazes used and shows areas of previous restorations. Organic materials absorb ultraviolet radiation and then emit it at lower energy (in the visible region) a phenomenon known as fluorescence. If an artifact has been broken and then glued together using an (5)_____ followed by repainting, viewing under UV-light will make the break obvious due to the adhesive's fluorescence.

¹ Based on a lesson plan by D. Dlabolová

Infrared Spectroscopy

Infrared spectroscopy gives information about the types of pigments or dyes used. On subjecting a thin transparent film of a compound to infrared light, certain frequencies are absorbed. This (6) _____ in identifying its composition.

X-Radiography

This method possesses the ability to penetrate layers of paint and reveals information about the priming layer, the (7) _____, and any damage hidden under the paint. It is used to detect lead-based pigments in the paint. White lead was extensively used and often mixed with other pigments in old paintings.

Task 2 LISTENING 1: Conservation of a Renaissance work by Sebastiano Mainardi

(<https://www.youtube.com/watch?v=V--J37806dU>)

Answer the following questions:

1. Why was the painting X-rayed? _____
2. Why is the digital X-ray image manipulated? _____
3. Why is the painting photographed in several types of lighting? _____
4. Why do conservators use ultraviolet light? _____
5. Why was the painting re-painted in the 20th century? _____
6. Why are stereo microscopes used? _____
7. Why is Japanese tissue applied? _____
8. Why is a carefully designed mixture of solvents used? _____
9. Why are paper facings attached? _____

Task 3 GRAMMAR: Word formation revision

Sebastiano Mainardi altar piece was painted exactly 500 years ago. Although it survives more or less intact, its 1 _____ (**APPEAR**) has changed drastically since 1507, the year in which the artist signed and dated it.

Its fragile condition resulted in its 2 _____ (**REMOVE**) from public view in 1965.

The extent and 3 _____ (**COMPLEX**) of the conservation treatment it required meant that it would remain in 4 _____ (**STORE**) for more than forty years.

Before beginning any conservation treatment the conservator must 5 _____ (**THOROUGH**) examine and document the painting with many different photographic and scientific techniques.

The digital X-ray image can be 6 _____ (**MANIPULATION**) to bring out details such as the fabric patch found below the paint that covers a knot in the wood panel.

Infrared reflectography, using a special video camera that records infrared radiation invisible to the human eye, allows the conservator to see through the paint and make 7 _____ (**VISION**) Mainardi's drawing that has not been seen in 500 years.

Stereo microscopes are used to greatly magnify the surface of the painting allowing the conservator to closely examine the artist's materials and painting technique as well as to identify areas of damage.

Heat and mild pressure from a miniature tacking wire reattaches and **8** _____
(STABLE) the now flexible paint layers.

After lengthy planning and testing the conservator uses a carefully designed **9** _____
(MIX) of solvents to safely remove the old varnish without any harm to the original paint.

The picture has been **10** _____ **(PAINT)** by restorers many times over the centuries to cover up damages and losses.

11 _____ **(REMOVE)** of these repaints with a variety of solvents has revealed the beauty of Mainardi's surviving original paint.

Over the coming months, conservators will apply clear varnishes and fill and carefully in-paint the damaged and missing original colours with stable and safely **12** _____
(REVERSE) materials returning the painting to a visual state that will permit it to go back on display in the permanent galleries.

Task 4 LISTENING 2: How to use a Spectronic-20 spectrophotometer²

(<http://employees.oneonta.edu/viningwj/videos/Spec20.wmv>)

Vocabulary (explain to one another):

proper (adj)	transmittance(n)	knob(n)	adjust (v)
insert (v)	align (v)		

Listen to instructions in the video and complete the following sentences:

1. After turning on the instrument, proper _____ should be chosen.
2. The power switch zero knob should be used to _____.
3. The cuvette should be inserted _____ into the sample chamber.
4. The mark on the tube should be _____ with the mark on the sample chamber.
5. After closing the sample chamber cover, adjust the light control knob to _____.
6. Finally, the blank solution should be _____.

Can you explain in your own words how the spectrophotometer is used?

² Based on a lesson plan by A. Rozkošná.

Task 5 Read the paragraph and summarise the main points.

To improve the visual aesthetic effects restorers sometimes used materials without experimentally testing them, causing further *deterioration* of the artefact in the long run. Such was the case in the previous restoration of the Sistine Chapel. *Seeping* water and humidity caused the pigments of the fresco paint to flake. Animal glue was used by restorers to fix the pigments and to replenish some luster that had been lost due to the salt deposits (efflorescence) on the surface of Michelangelo's frescoes. In addition to hundreds of years of *soot* and grime, the glue had darkened and yellowed. Moreover, the glue lost its elasticity with time; it hardened and cracked causing the pigments to *flake*. All of this conspired to show Michelangelo as an expert in painting the human figure, but a dull colourist. Furthermore, he was accused of not being trained in the school tradition of fresco painting. The restoration, undertaken by the Vatican Museums (1980–1994) *vindicated* him and portrayed him as both a master of colours and of pure orthodox methods. The defence of Michelangelo's reputation is better understood by explaining the chemical composition of fresco painting. The pigment is mixed with water and applied on fresh lime (calcium hydroxide) mixed with sand. The lime reacts with the carbon dioxide in the air and forms calcium carbonate (marble). The shiny surface is formed on drying, and *seals* the pigment in the plaster. The painter has to be efficient and quick, for this method allows no transgressions or second thoughts. Only rarely was it found that Michelangelo repainted a-secco (dry plaster) to add minor *retouching*.

Can you explain the meaning of the words in italics?

Formulate questions about the underlined parts of sentences below.

Seeping water and humidity caused the pigments of the fresco paint to flake.

Michelangelo was accused of not being trained in the school tradition of fresco painting.

The lime reacts with the carbon dioxide.

The painter has to be efficient and quick, for this method allows no transgressions or second thoughts.

Task 6 Inversion

Study the example from the text above:

Only rarely was it found that Michelangelo repainted a-secco (dry plaster) to add minor retouching.

Negative adverbs

In formal styles, when we use an adverb with negative meaning (e.g. *never, seldom, rarely, scarcely, hardly*) in front position for emphasis, we invert the subject (s) and auxiliary (aux)/modal verb:

Never [AUX]have [S]we witnessed such cruel behaviour by one child to another. (or We have never witnessed ...)

Seldom does one hear a politician say 'sorry'. (or One seldom hears ...)

Expressions beginning with *not*

We also invert the subject and verb after *not* + a prepositional phrase or a clause in initial position:

Not for a moment did I think I would be offered the job, so I was amazed when I got it.

Not till I got home did I realise my wallet was missing.

(<http://dictionary.cambridge.org/grammar/british-grammar/inversion>)