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Perception and multimodal objectivation of an intervention in conservation-restauration

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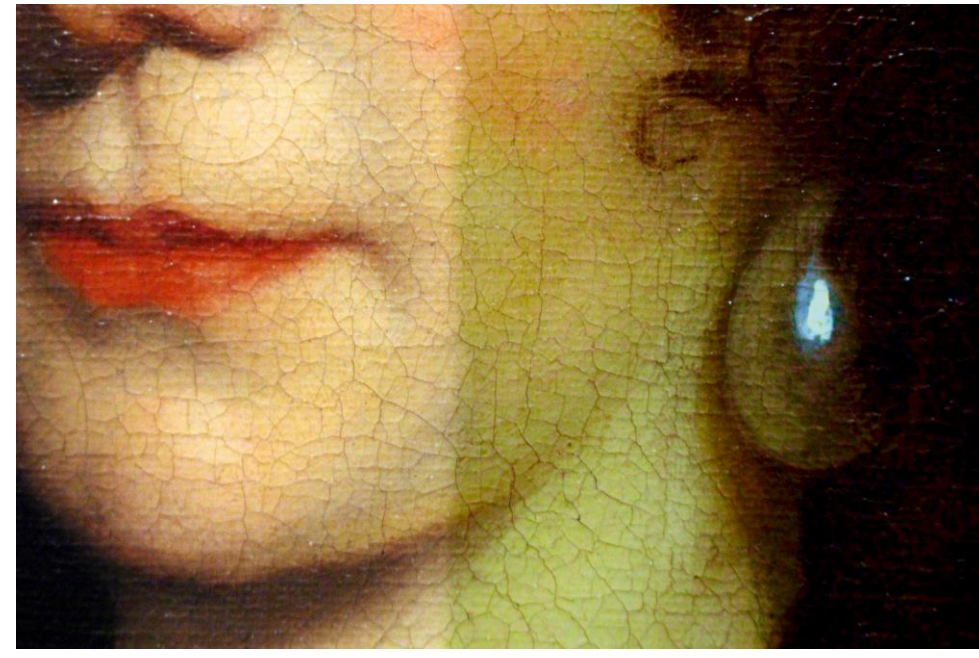
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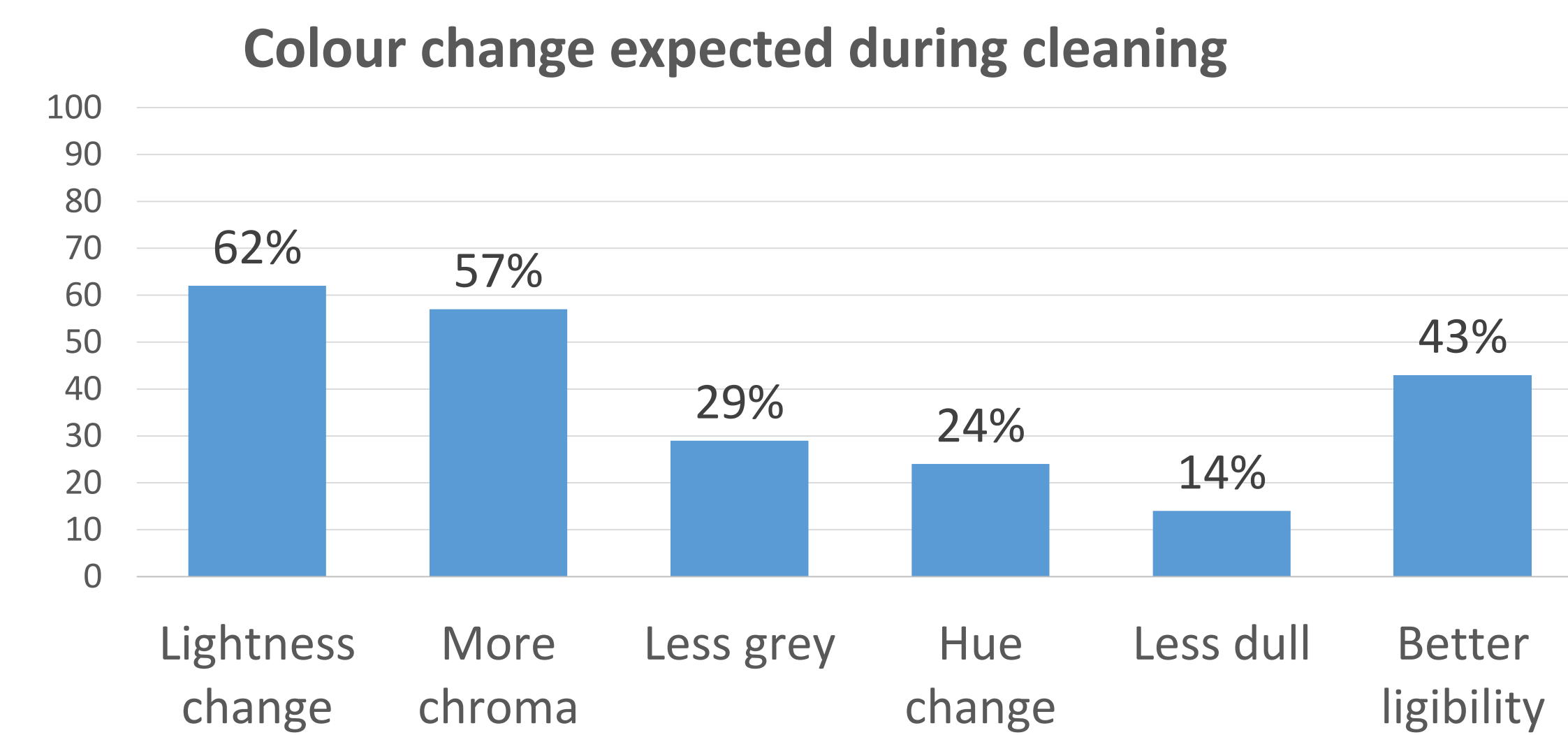
State of the art

Visual perception is an essential notion when it comes to the evaluation of the **conservation-restoration** process : the eye is the expert's tool of diagnostic and validation, as well as the observer's path to appreciate the work. Cleaning and varnish removal highly impact the appearance of paintings. Thus, efficacy and innocuity of cleaning are commonly evaluated by visual observations [1][2]. Several studies have already focussed on the evaluation of modifications occurring due to restoration, as the cognitive impact of a varnish removal [3]. Nevertheless, as far as we know, no studies have focussed on sensitive perception thresholds and have taken the restoration process into account. Thus, questions are raised about the relevance of an objective measurement in the evaluation process of paintings undergoing restoration.



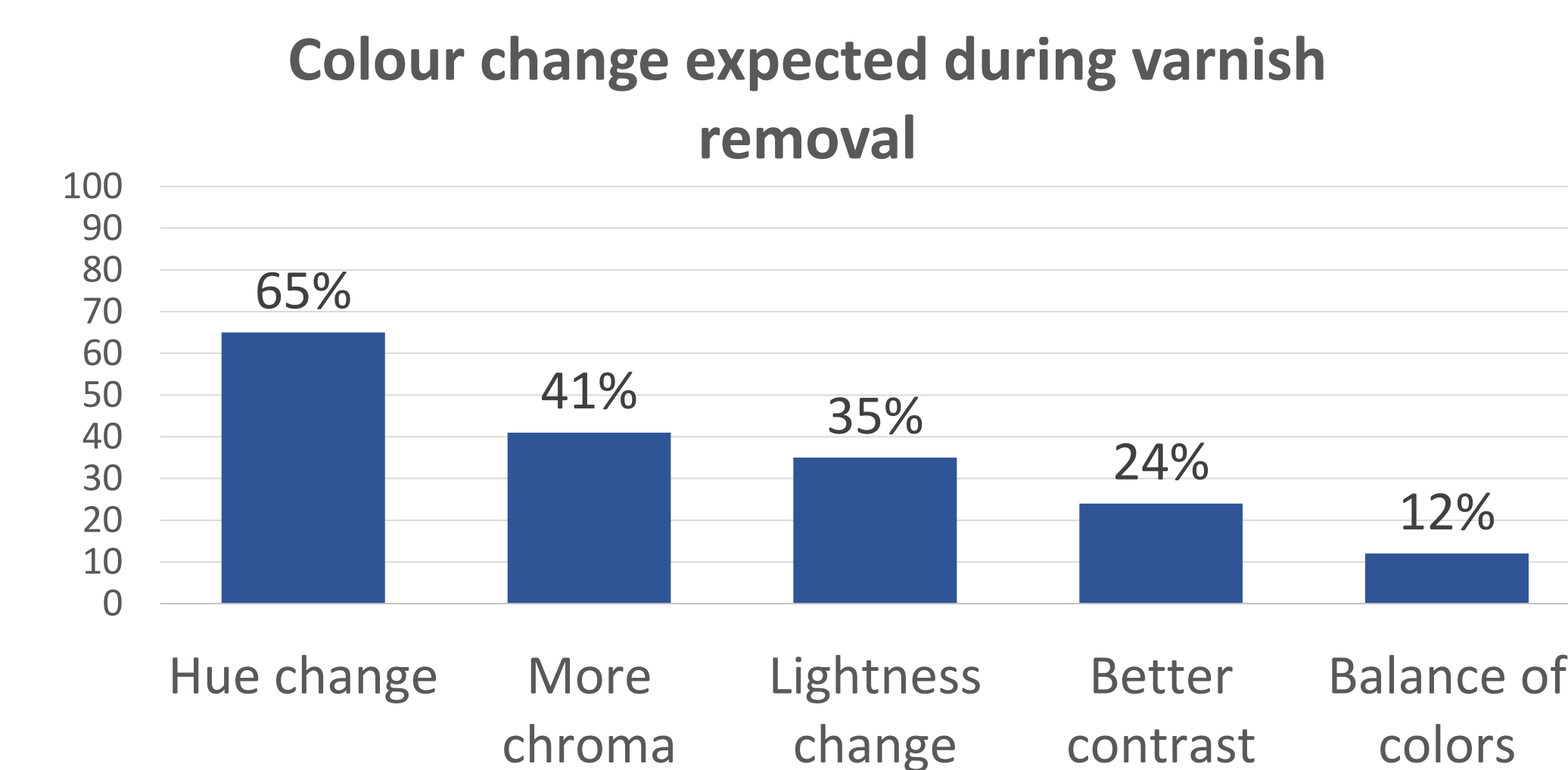
Prospect

In the questionnaire, questions are asked about colour and gloss changes occurring during cleaning and varnish removal. These answers give information about our further measurements.



- 62% of restorers mention a change in lightness : in general an increase but some of them mention a decrease of lightness for dark colours.
- 14% answered that colours are less dull, which also concern gloss.

- For gloss, half of them answered that it depends on the pictorial layer and its state of preservation.
- 33% are categorical and expect "more gloss".



- 65% of respondents talk about a change of hue, mostly due to "unyellowing" when they remove an oxidized varnish
- 35% of restorers mention a change in lightness : as cleaning, most of them expect an increase of lightness, but some specify that dark colours become darker

- For gloss, 64% of respondents expect less gloss but also 21% expect residual gloss.

The measurements of colour, gloss and surface state will allow us to confirm the assessment of respondents by quantifying these changes and to discriminate the end of cleaning and varnish removal.

Objective

The aim of this project is to link perceptive measurements from sensorial analysis and optical methods during a specific restoration intervention : **cleaning**.

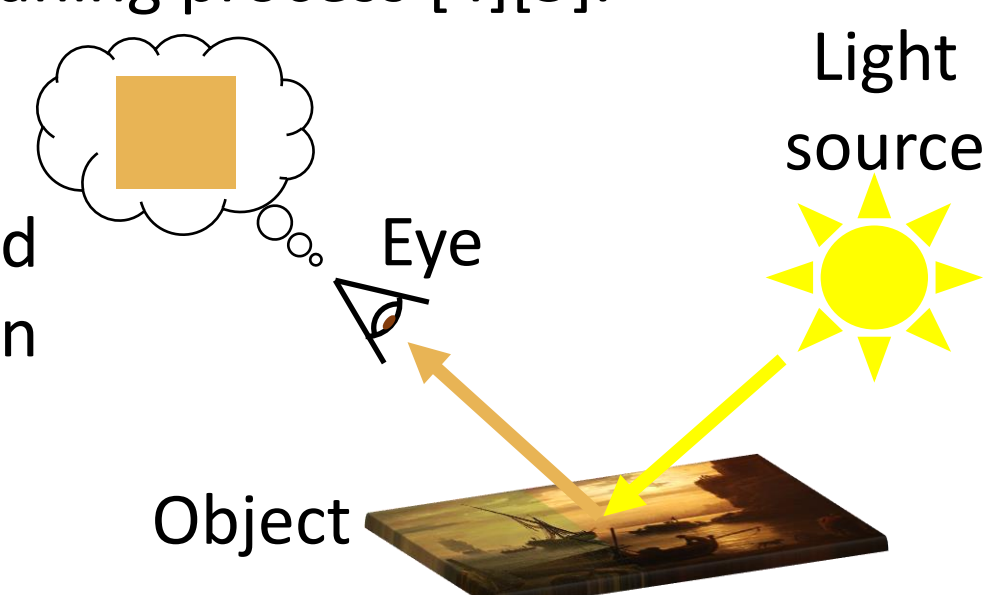
- Select relevant visual appearance attributes : colour and gloss
- Conduct perceptive experiments so as to identify thresholds in appearance modifications
- Select and conduct related optical measurements
- Correlate perceptual data to objective optical measurements
- Design an easy-to-use instrument for measuring colour and gloss without contact

Appearance attributes

CIE define 5 visual appearance attributes : colour, gloss, translucency, texture and shape. This study will focus on colour and gloss which seem to be the most important parameters in the cleaning process [4][5].

Colour

Colour is a **physiological sensation** associated to the interaction between a light source, an object and the observer's eye.



Gloss

Gloss is a **visual sensation** related to the geometrical distribution of a luminous flux reflected by a surface, especially in the specular direction.



Questionnaire

A questionnaire about cleaning and (partial) varnish removal of paintings was sent to French restorers to learn more about their preferences and to implement a relevant experiment. 21 restorers answered. Questions were asked about the end of cleaning and varnish removal, change of colour and gloss, lighting, technique and materials of observation or methods of cleaning. All these information able us to develop an experiment to discriminate the end of cleaning and varnish removal.

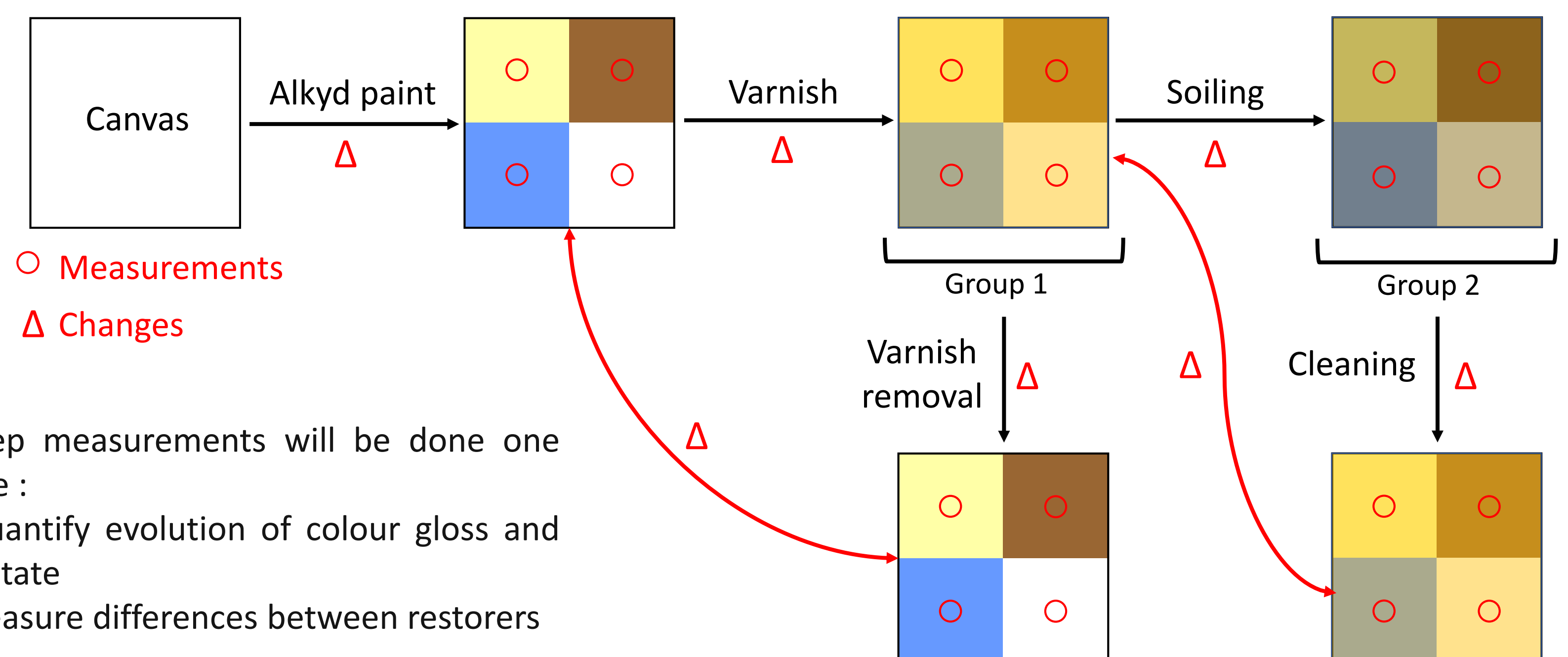
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Experiment

The volunteers for experiment will be separated in 2 groups and will be asked to restore a sample :

- Group 1 : "A museum asks you to restore a painting. You only have to remove the varnish (it is already cleaned). It will be varnished when it gets back to the museum."
- Group 2 : "A museum asks you to restore a painting. The curator wants to keep the varnish so you only have to clean it."



- At each step measurements will be done one each sample :
- To quantify evolution of colour gloss and surface state
 - To measure differences between restorers

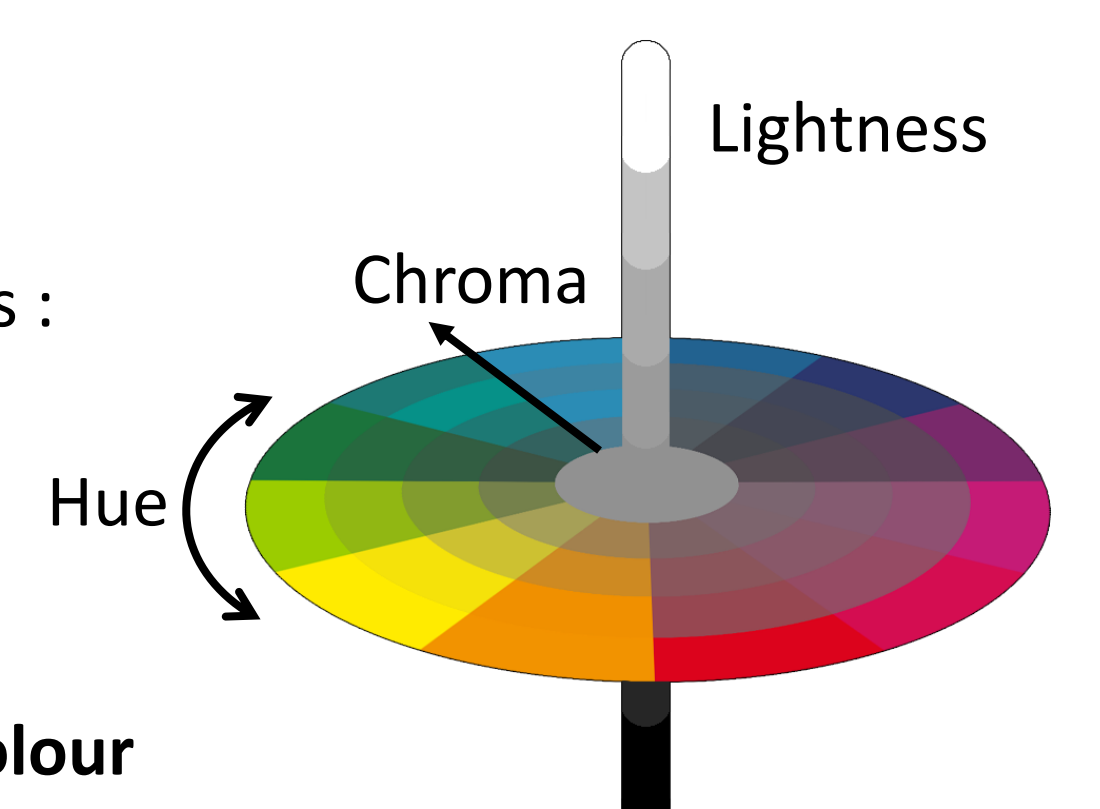
Methods

Colour

Colour will be measured with different instruments in order to compare accuracies :

- Spectrophotometer
- Spectrocolorimeter
- Multispectral imaging (9 channels)
- Photography (3 channels : RGB)

Finally, colorimetry will be used to describe and visualise colours. The **Munsell colour space** describes colours in term of hue, chroma and lightness. This terms are commonly used by restorers to characterize colours.



Gloss

Gloss will be measured with a glossmeter.

Also the gloss of an object is highly depending on its surface roughness. In order to complete our measurements of gloss, surface roughness will be measured with a 3D microscope.

