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Shedding “light” on a Picasso!

Multispectral imaging is a process of creating digital visual images of an object by using different, but well-defined wavelength regions of the E/M spectrum. The visualization of various layers of artworks created by students is attempted by using a simple, low-cost experimental set-up. The main advantage of this non-invasive technique is that it does not damage the artwork. At the same time the main advantage for students is that they realize the interaction of light with matter through an interdisciplinary and highly entertaining approach.

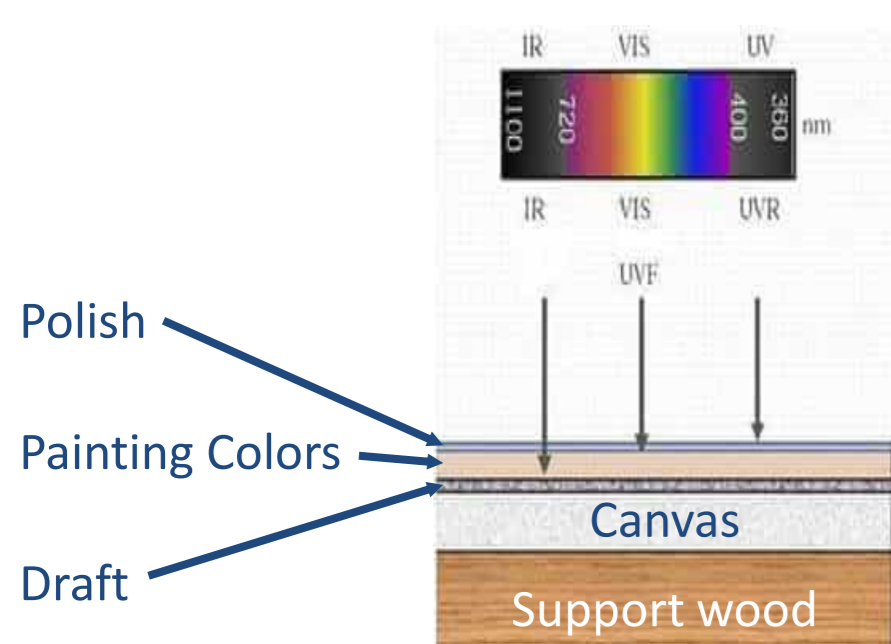


Pablo Picasso's Blue Room

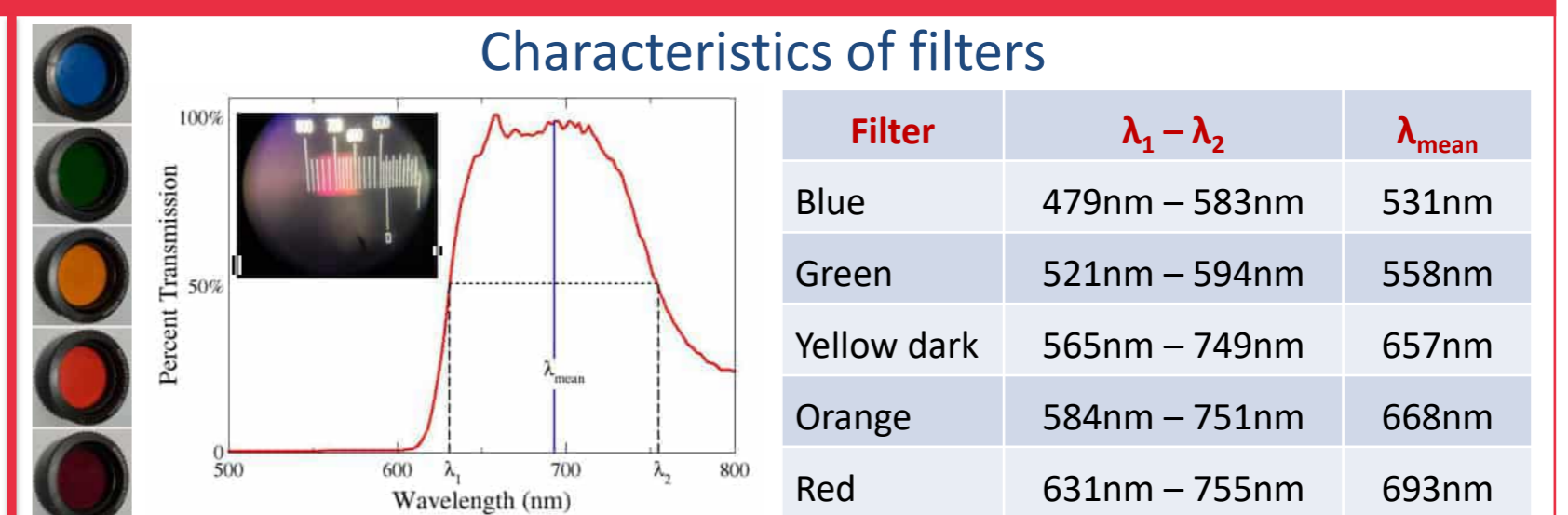
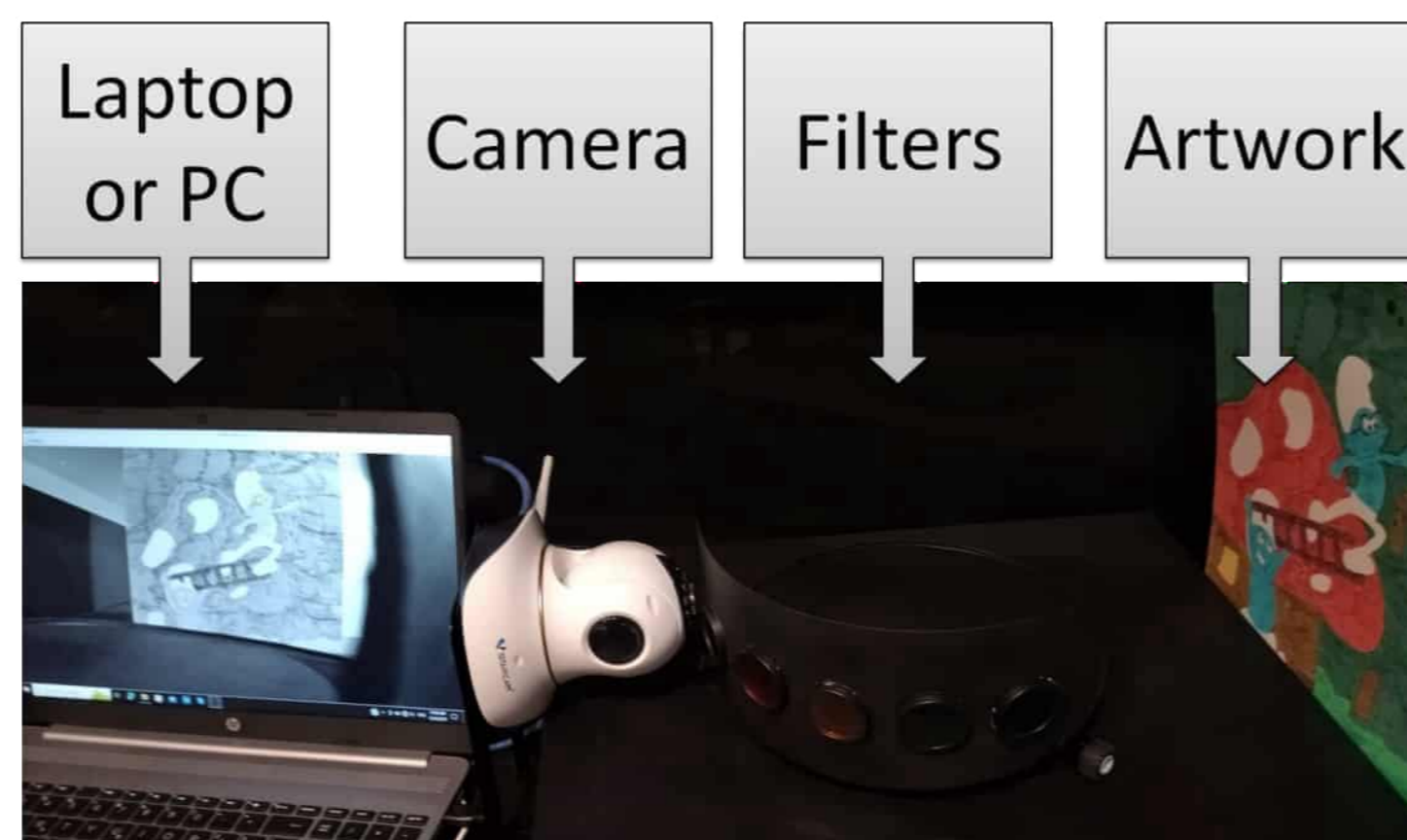
In 2014 scientists using infrared technology discovered the form of a man under the main drawing! The bearded man wears a bow tie and supports his head with his hand, while wearing three rings on his fingers.

Theory

Different degree of penetrating radiation into the artwork depending on the wavelength



The Set-up



Source of UV radiation



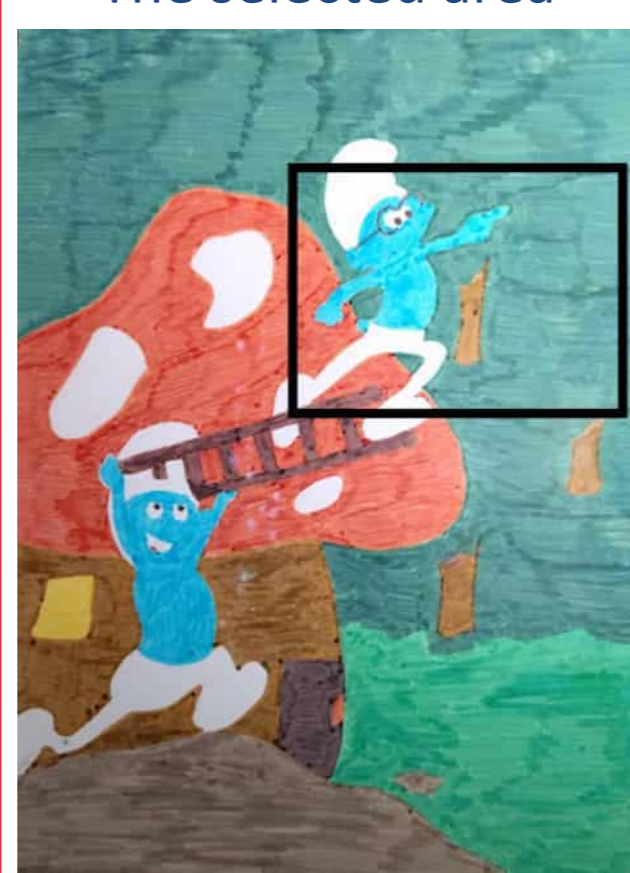
Ultraviolet Radiation

An artwork created with markers (left) and the same artwork when illuminated with UV light (right)



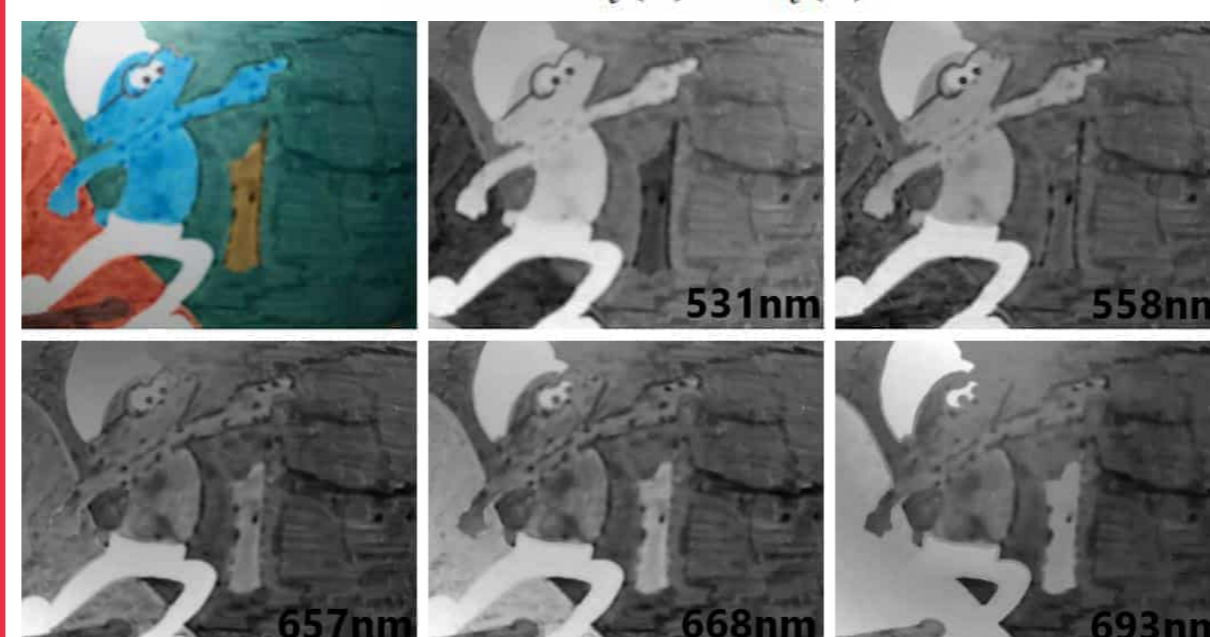
Visible Radiation

The selected area

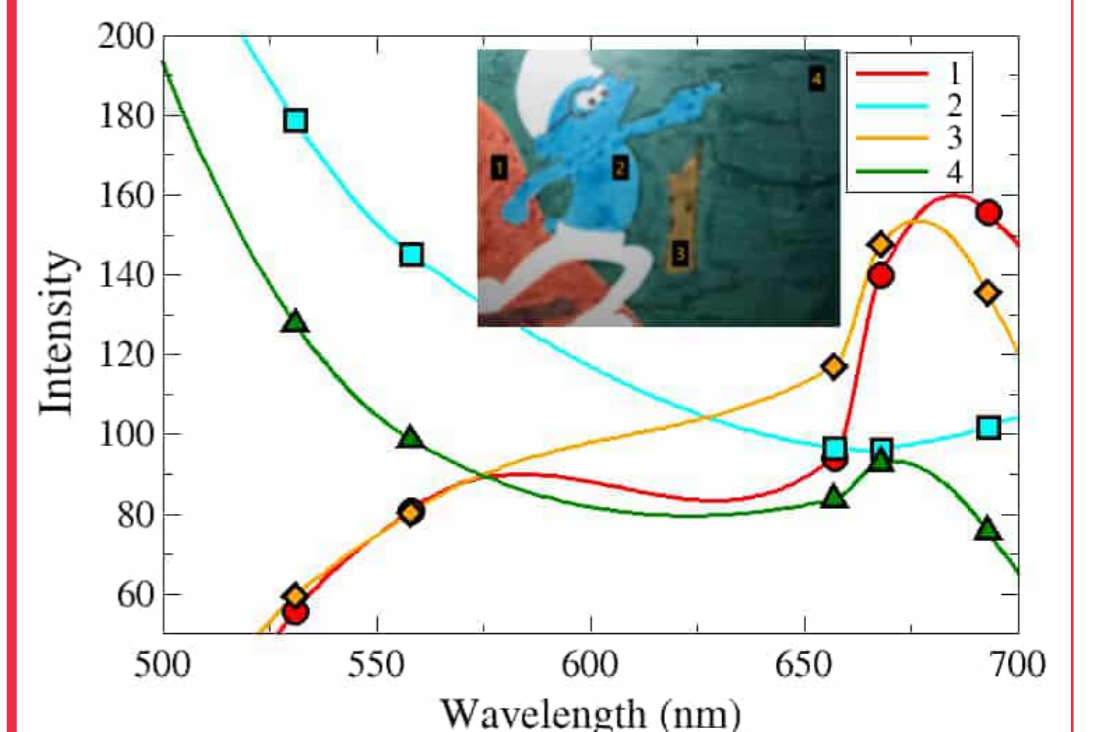


The selected area (top left) and the "normalized" images for the various filters

$$I_i(x) = \frac{Q_i(x) - B_i(x)}{W_i(x) - B_i(x)}$$

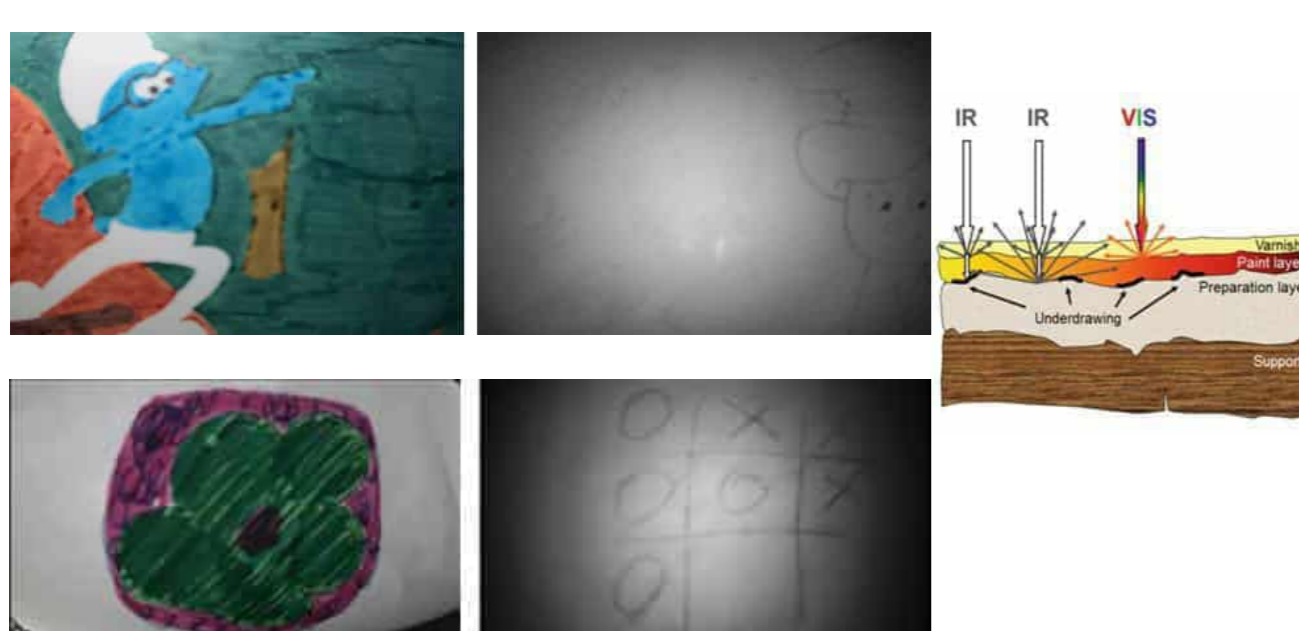


The average value of the pixel intensity of each region for different filters (the four regions are shown in the inset)



Infrared Radiation

Two examples of artworks in the visible spectrum (left) and the same areas with infrared radiation (right)



Conclusions

Students:

- cultivation of STE(A)M skills
- combination of theoretical concepts and laws with practical applications through the observation of phenomena, which exceed the limitations of human senses

Teachers:

- alternative proposal for teaching the E/M spectrum
- interdisciplinary approach to knowledge
- every-day materials, low-cost set-up, free software

From Teachers For Teachers

A constantly enriched digital repository has been created that offers **set-up instructions**, **theoretical background** of the phenomena, **photos**, **videos** and **educational worksheets**.



https://bit.ly/picasso_2024