



Analysis of the painting materials from the Dângău Mic wooden church, Cluj County



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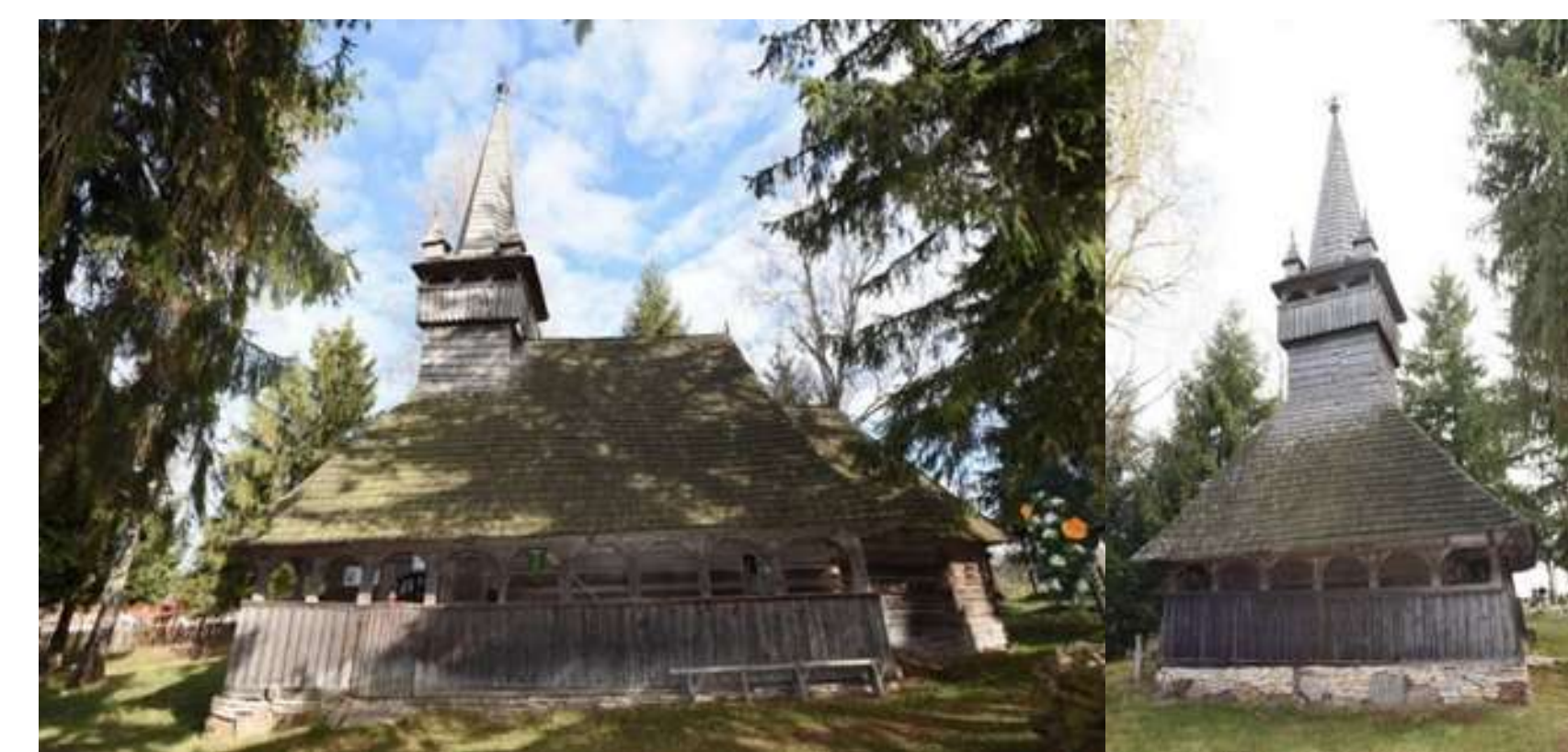
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Abstract. The wooden church from Dangaul Mic village was built in 1764 and still preserves the original painting from 1802. The architecture and beautiful interior frescoes make this Transylvanian church a part of the national heritage of Romania. To preserve the information regarding the current state of the church, facilitating future restoration efforts, a detailed investigation of the painting materials was carried out as well as imagistic documenting (visible, UV and IR spectrum). Analyses were performed by X-ray (XRF) spectroscopy and destructive and non-destructive Fourier transform infrared (FTIR) spectroscopy.

Introduction. The wooden church from Dângăul Mic village, Căpușul Mare commune, Cluj county, is dedicated to the "Descent of the Holy Spirit" and was built in the second half of the 18th century. The church was constructed traditionally from wood and placed on a stone foundation. The mural painting was made by the painters Dumitru Ispas from Gilău and Ștefan in 1802 at the expense of the village (as mentioned in the narthex inscription).

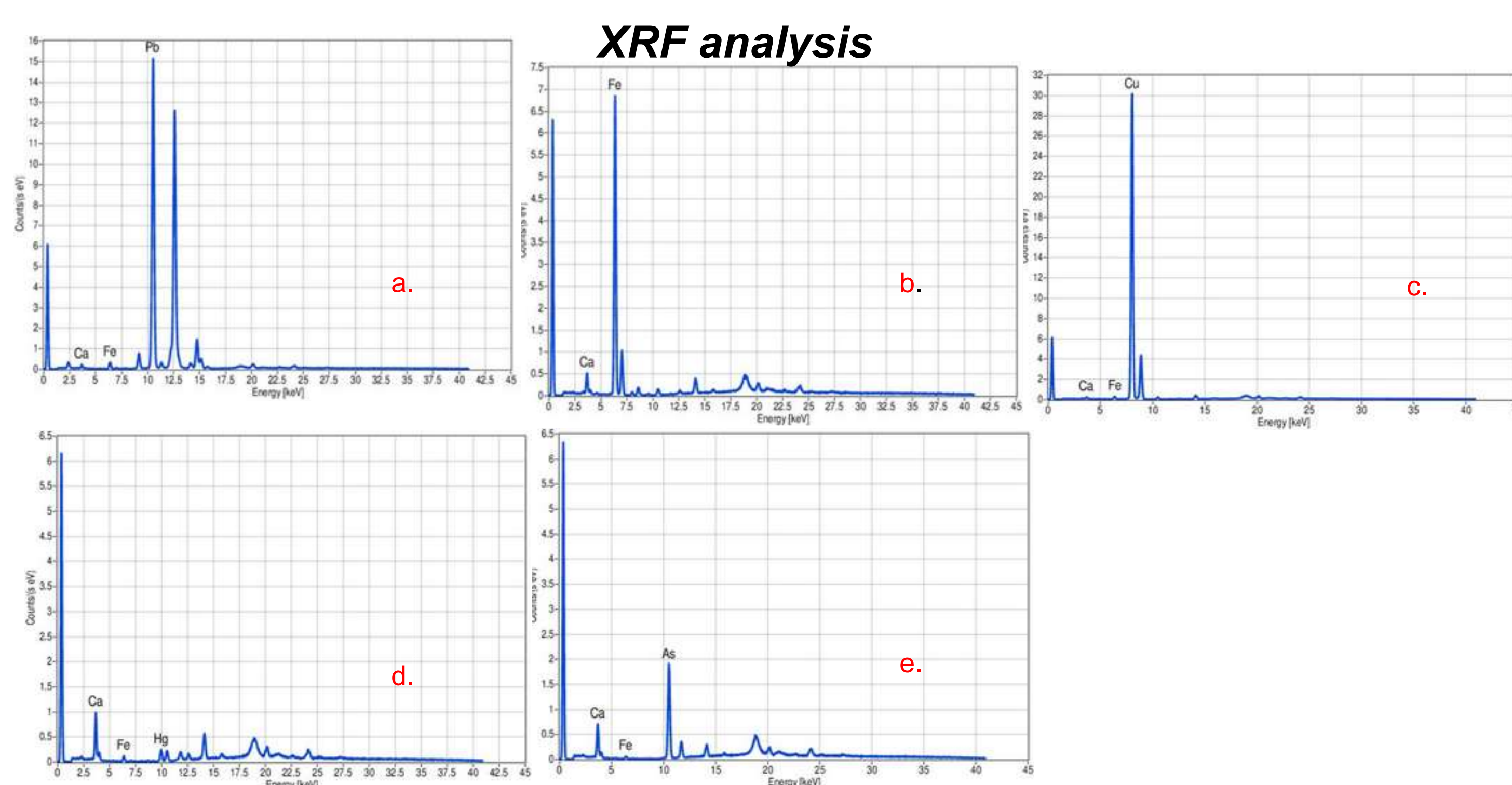
Experimental:

- nondestructiv analysis: X-ray fluorescence elemental analyses (XRF) and FTIR reflectance spectroscopy,
- destructive analysis: FTIR spectroscopy.



Dângău Mic wooden church, southern (left) and eastern (right) side view.

Results



XRF results for: a. light red clothing – red lead, b. dark red clothing – iron red, c. green clothing – malachite, d. carnation white – traces of cinnabar on calcium based ground, e. bishop aura - orpiment

Compared infrared, ultraviolet and visible spectrum imaging of the interior painting.



Disclosure: Ioan Bratu and Olivia-Florena Nemes are co-first authors.

Conclusion: The church painting was executed using a small number of pigments : iron red, red lead, white lead, malachite, orpiment and very small traces of cinnabar. The pigments were mixed with linseed oil and egg yolk using the tempera grassa technique. Gypsum was used as ground and applied over the wooden beams and cloth. The hemp and cotton cloth was used to cover the spaces between the wooden beams. The narthex door wood species was identified as fir wood.

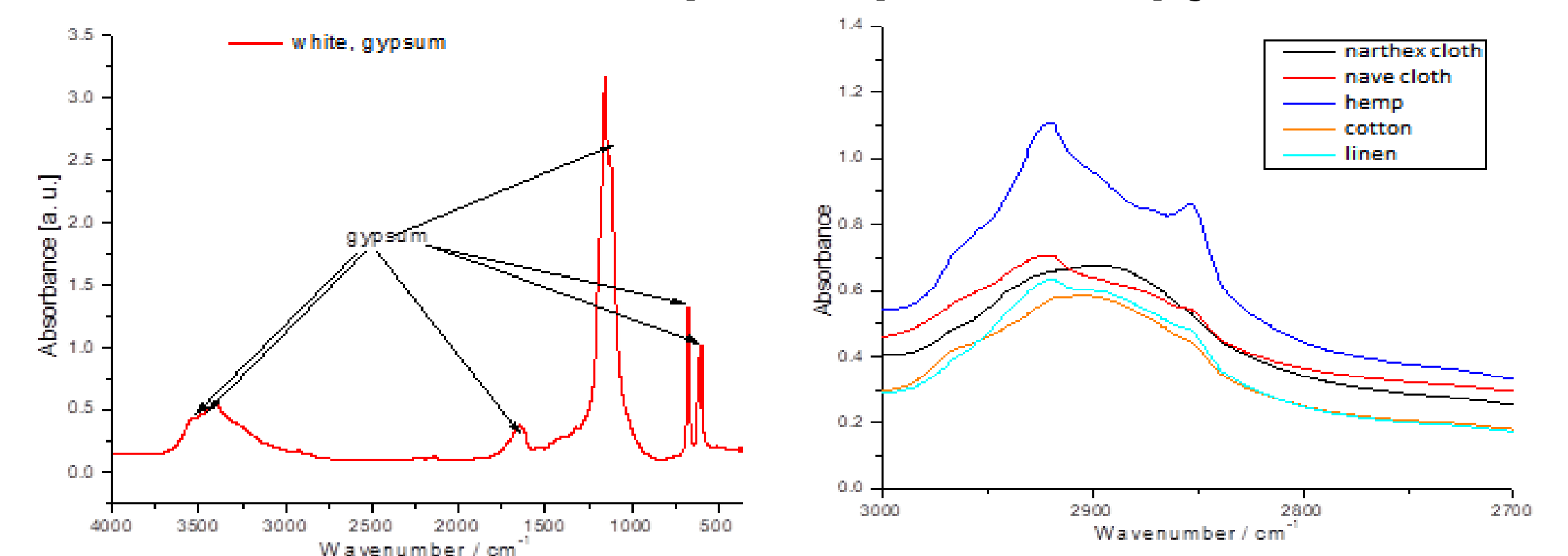
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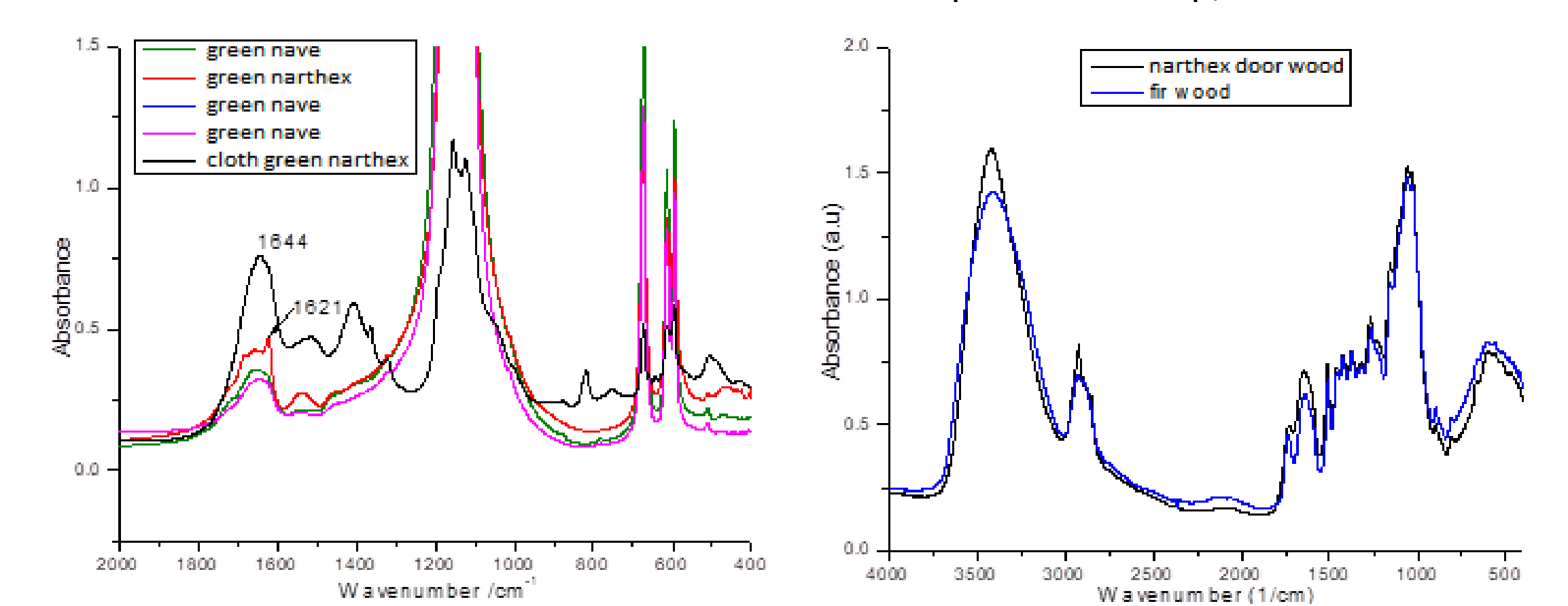
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FTIR absorption spectroscopy



Spectrum of Ground – gypsum

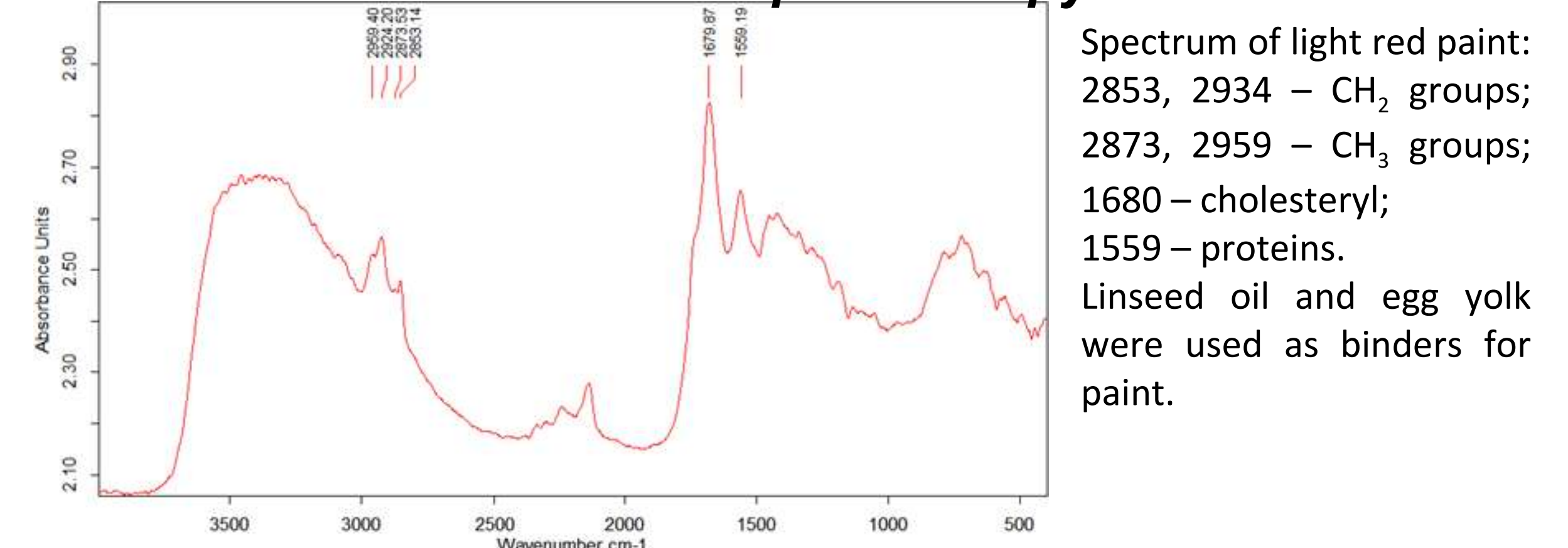
Spectra of narthex and nave cloth compared to hemp, cotton and linen.



Spectra of green pigment from narthex and nave: 1644 cm⁻¹ -proteins; 1621 cm⁻¹ -gypsum

Spectra of Narthex door wood compared to fir wood standard

FTIR reflection spectroscopy



Spectrum of light red paint: 2853, 2934 – CH₂ groups; 2873, 2959 – CH₃ groups; 1680 – cholesteryl; 1559 – proteins. Linseed oil and egg yolk were used as binders for paint.