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Examination of inscriptions on easel paintings with OCT

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FdOCT in Toruń – the properties

- Central wavelength: 845 nm $\Delta\lambda = 50$ nm
- Very low irradiation: 200 – 600 μ W
- Axial (in-depth) resolution 9 μ m
- Transversal resolution ~ 15 μ m
- Acquisition rate: 30 μ s/A-scan

0.1 s / 2D image (cross-section)
3 -10 s / 3D (volume data)

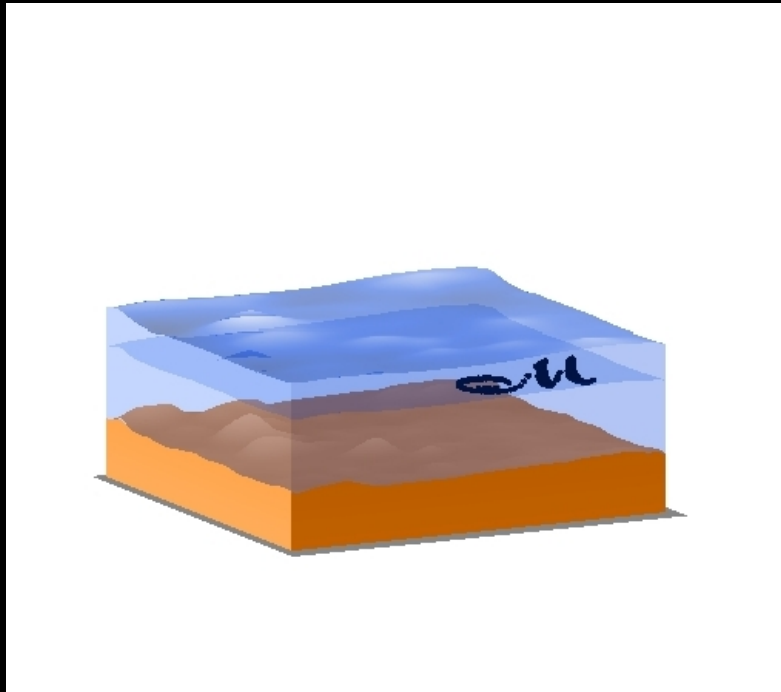


Specific application of OCT

- estimating the position of inscription in the sequence of varnish and glaze layers
- improving readability of convex and concave inscriptions hidden under a thick layer of varnish or even overpainting

by analysis of volume data consisting of parallel cross-sectional images recorded by **non-invasive** and **non-contact** OCT scanning

Region of inscription



Is the inscription
located directly
on the paint
layer?

Not necessarily...

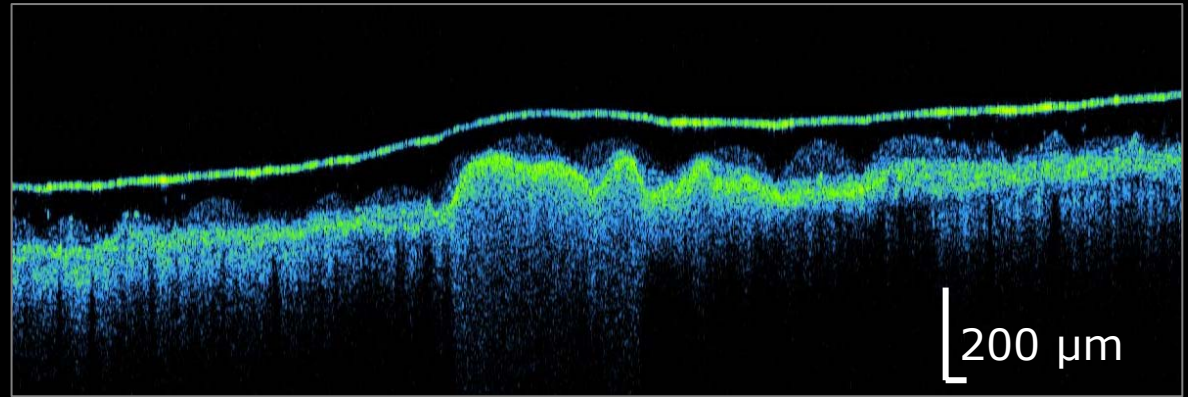
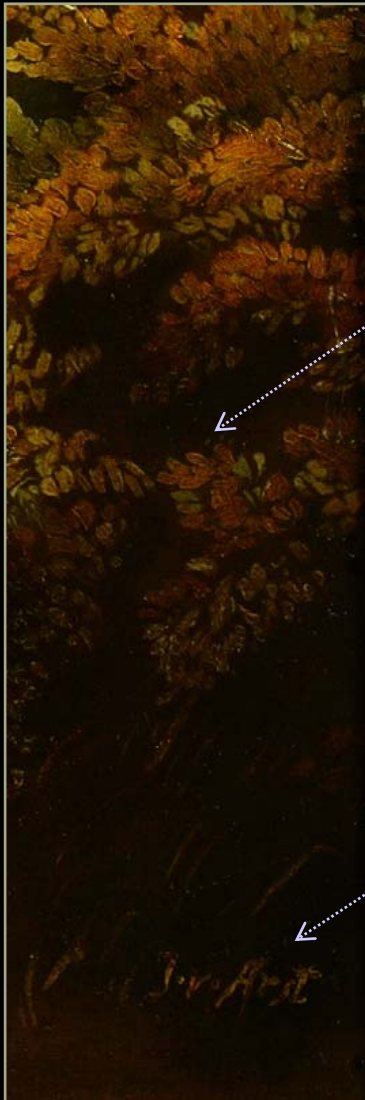
Original signature?



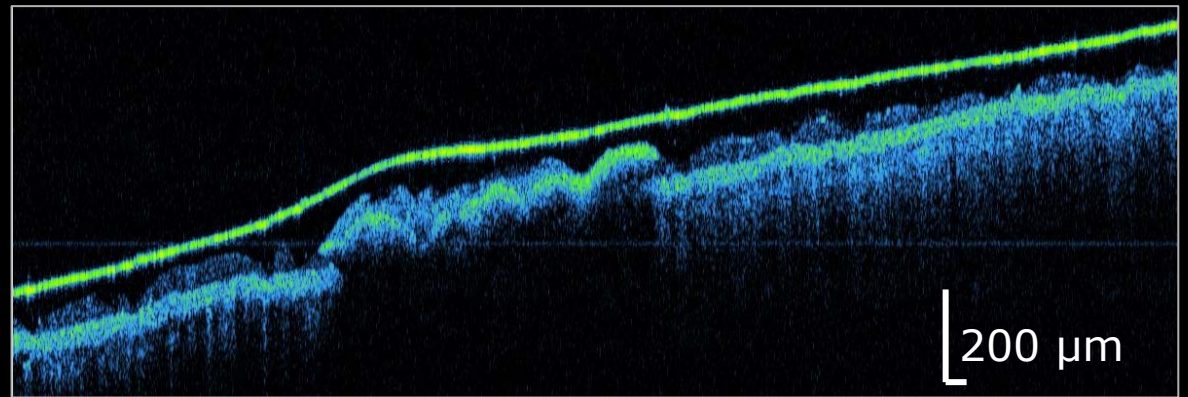
VIS

UV

Obrazowanie 3D – położenie sygnatury



leaves

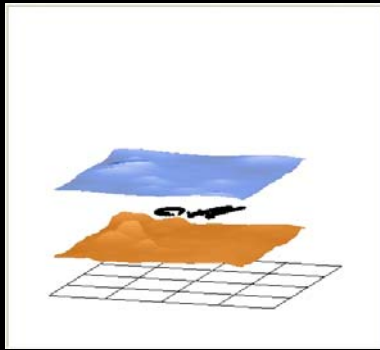


signature

Position of signature - alternative method

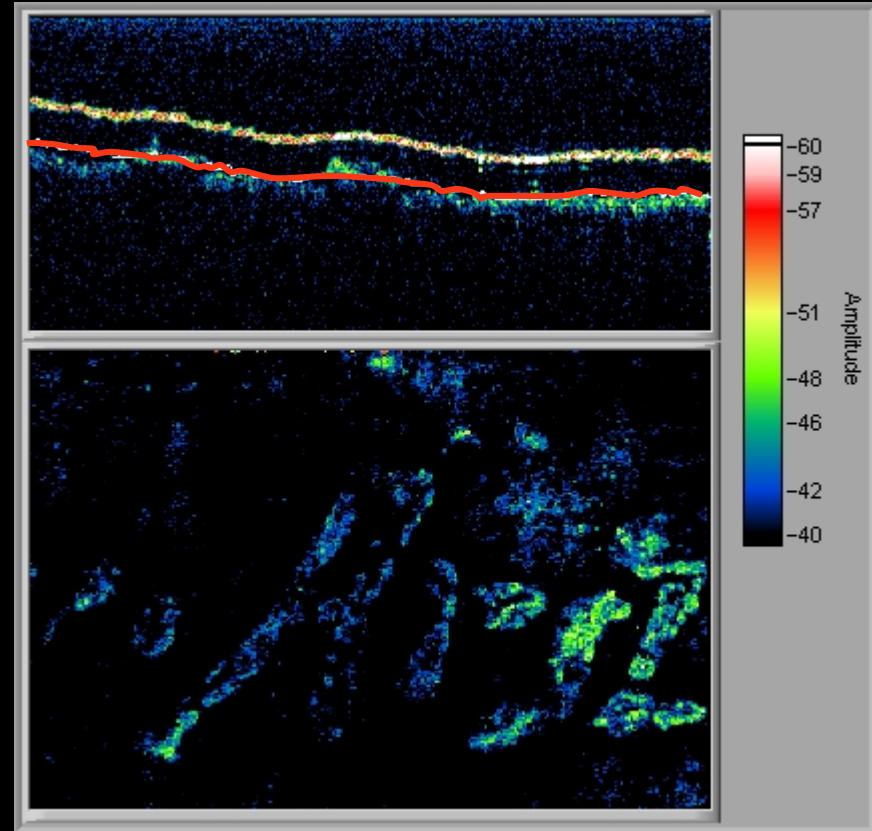
Skanning step: $4 \mu\text{m}$

Coherence gate position: ———
thickness (binned) $24 \mu\text{m}$

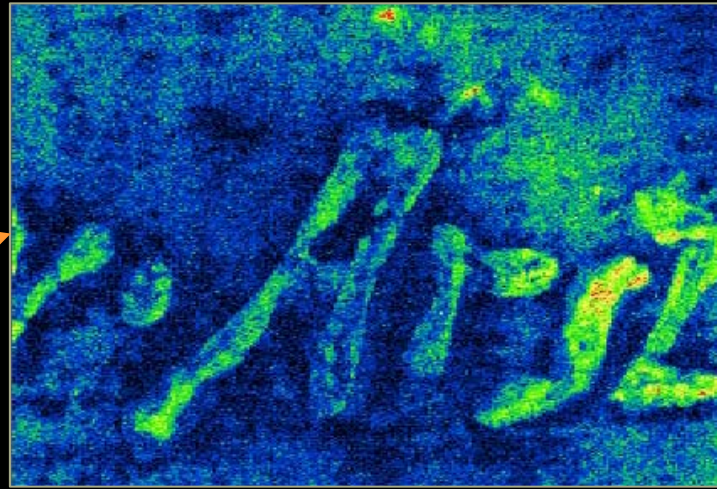
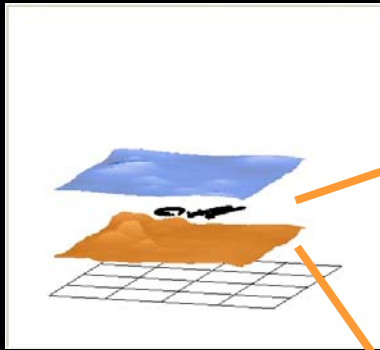


Signature between
two varnish layers

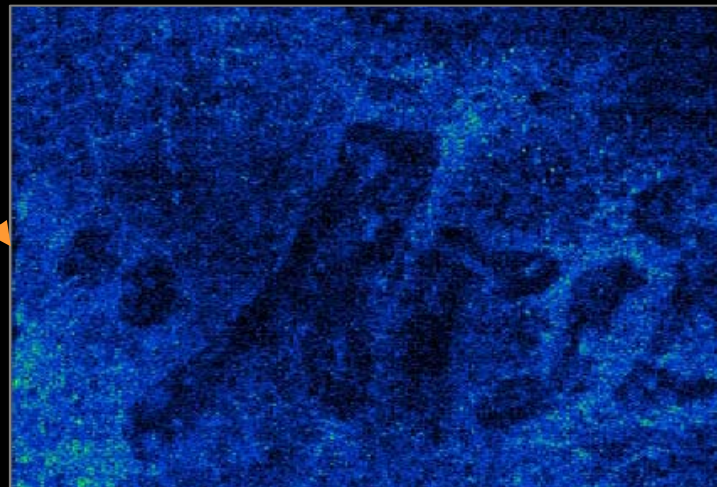
mm
0
0.2 ↓



Position of signature - alternative method



50÷90 μm



90÷160 μm

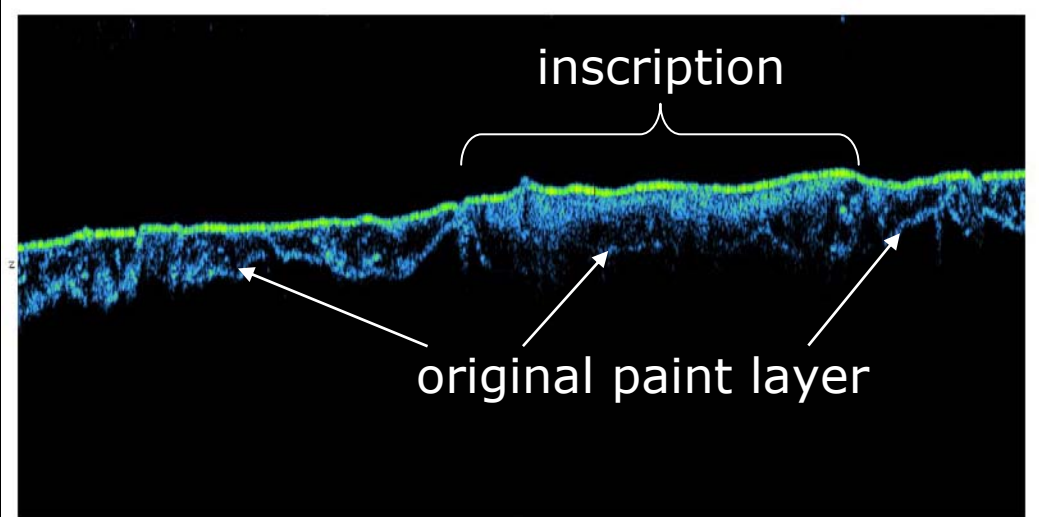
Now – the real subject



Painted in 1797

Declared to be Saint in 1867

The position of inscription „St. Leonard”



200 um

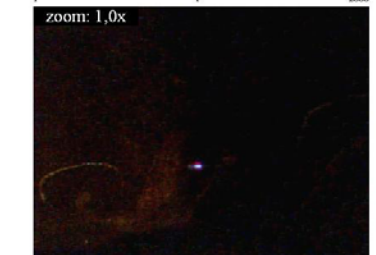
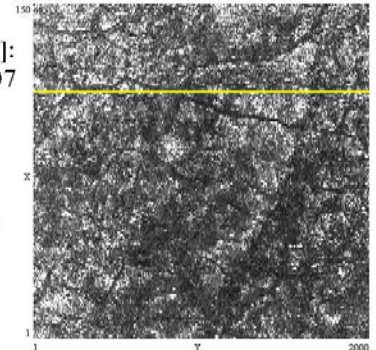
Wymiar (X|Y|Z) [mm]:
7,0 | 7,1 | 1,07

Obiekt:
Sw Leonard 09.04.2008
(X: 0,0 cm / Y: 0,0 cm)
T: 24,4 deg C / RH: 36,2 %

Pomiar:
09-04-2008 (12:50:22)
Pojedynczy pomiar

Tomogram:
111/150

Opis:
inskrpcja "St Leonard" (S)



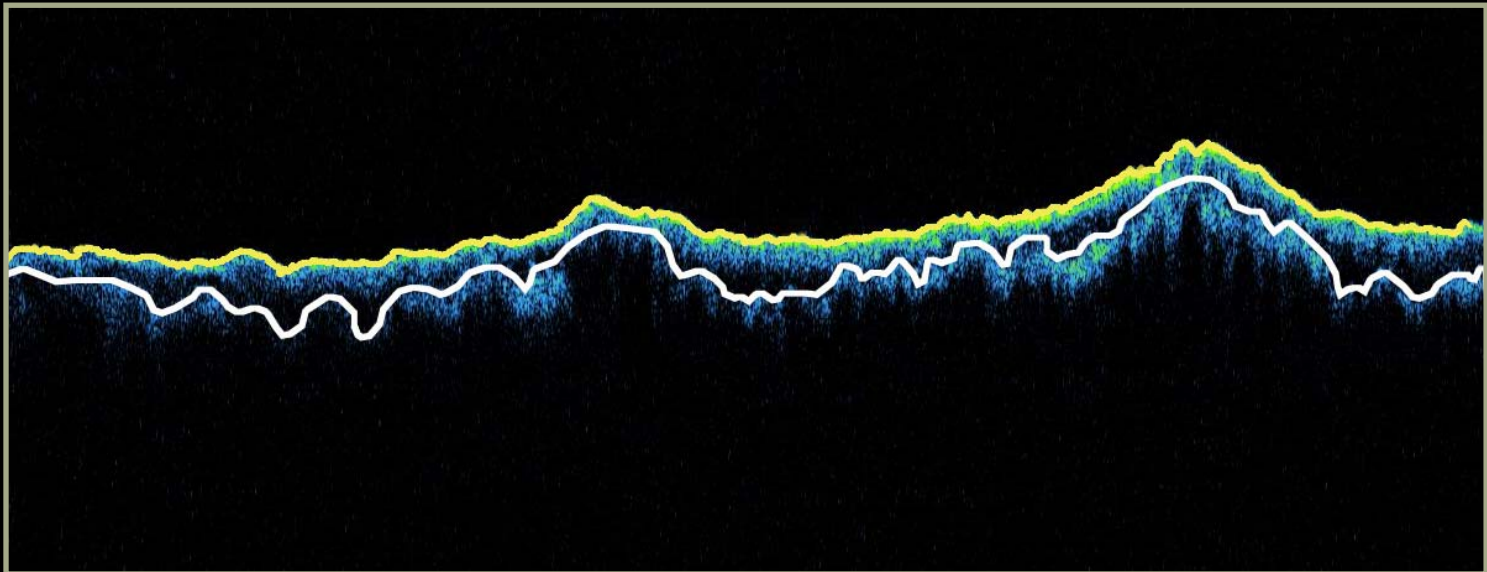
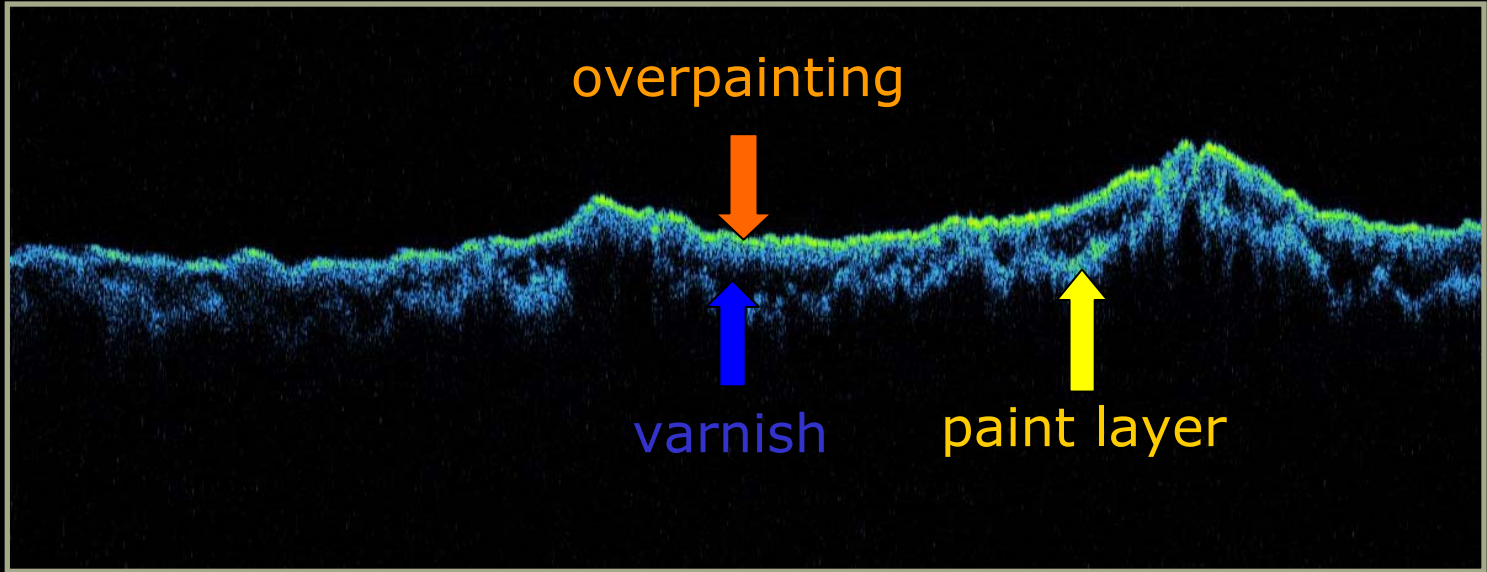
Second inscription in the background



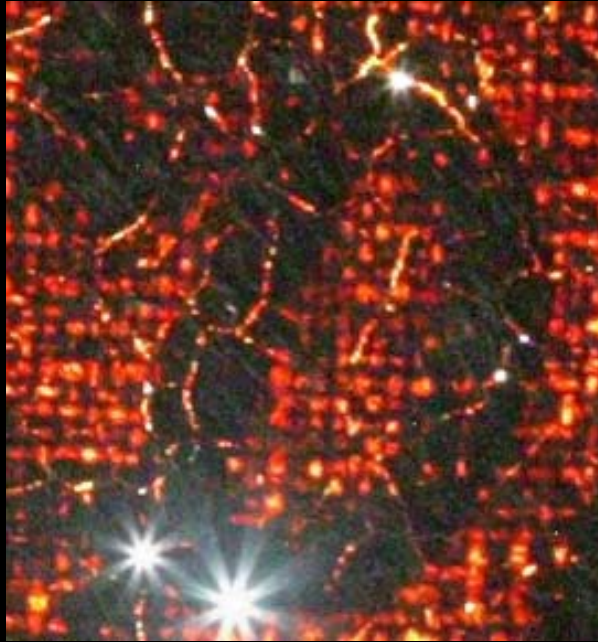
Convex inscription covered
with overpainting



Region of convex inscription

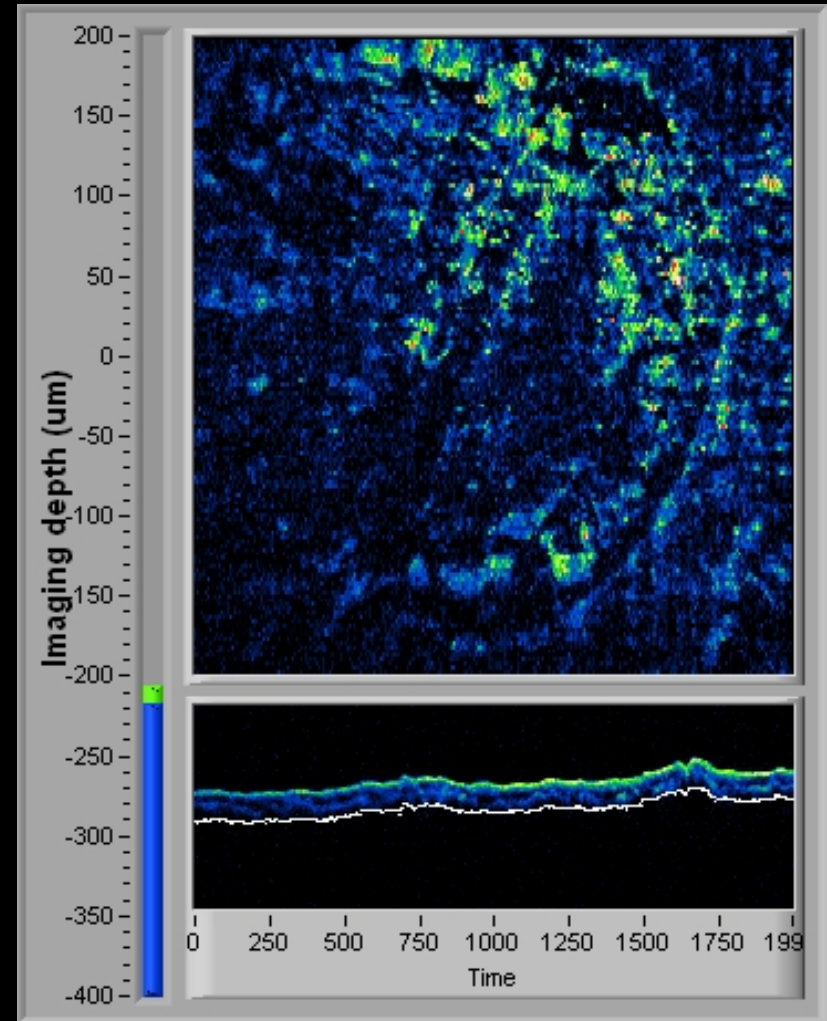


Convex letter under overpainting



Photograph in strong trespassing light

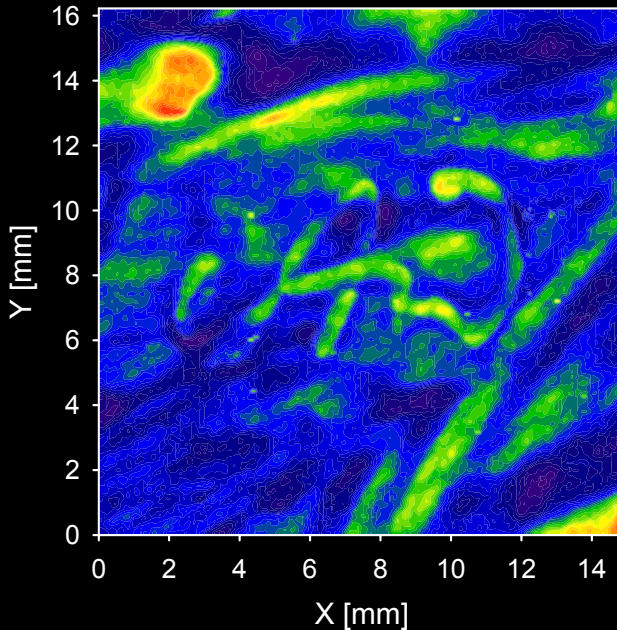
Gated OCT image



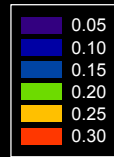
Concave inscription – improving readability

Oct4art Toruń, 2008

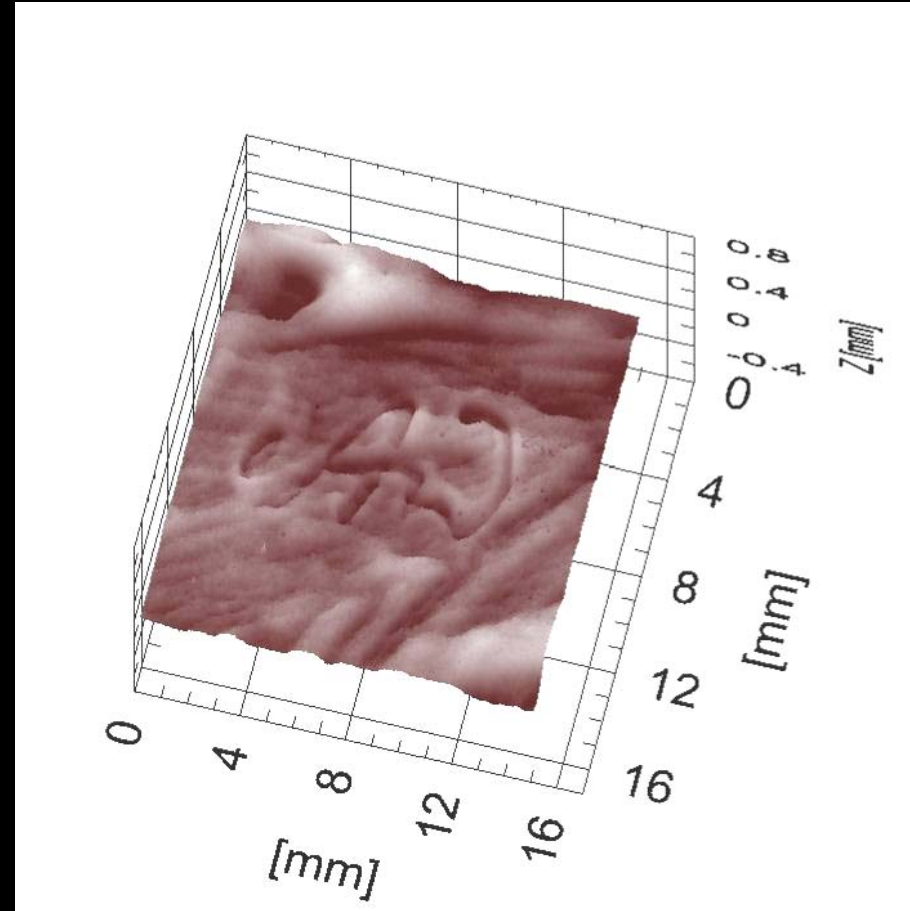
Surface before varnishing



Map of varnish thickness



Surface of paint layer recovered virtually





Conclusions

The OCT examination can be applied with success for:

- determining position of inscription in the sequence of varnish and glazes layers
- reconstructing concave and convex details of painting's surface by virtual removal of varnish



Acknowledgements

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