Akademia Sztuk Pięknych
im. Jana Matejki w Krakowie
1818

Report of physical-chemical research

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Measurements performed:

RTG fluorescence macro scanner (MAXRF): Dr. Maria Goryl

Data processing and interpretation – Dr. Maria Goryl

Object: Landscape

Summary of results:

Research done using the RTG fluorescence macro scanner shows the distribution of non-organic elements in the pigments and base of the object.

Map of lead distribution

Occurence of lead (Pb) in lighter parts of the object indicates the usage of lead white ($2\,PbCO_3 \cdot 3\,Pb(OH)_2$), which was used in the whitening of other pigments, for example the blue of parts of the sky. It was also added to white parts along with other whites, which can be seen on the distribution maps of barium and zinc.

Map of barium distribution

The map of barium distribution shows usage of barite white. Part of the barium signal matches the zinc signal, which may indicate the use of lithopone. Barite white was used in the white and grey clouds in the sky.

Map of zinc distribution

The map of zinc distribution shows use of zinc white and lithopone. The presence of zinc may indicate it was used as a whitening pigment or used in the underpainting / underlayer(?).

Map of iron distribution

The map of iron distribution indicates use of earthen pigments.

Map of cobalt and nickel distribution

Indicates use of cobalt white with added nickel, a pigment which occurred in other objects by Vincent van Gogh.

The map of cadmium distribution may indicate use of cadmium yellow, which he – according to sources – mixed with cobalt white.

The map of chrome distribution indicates use of chrome green or chrome yellow, which were also present and used in Van Gogh's color palette.

Map of calcium distribution

In the high resolution map of calcium distribution, the signature of the painter is visible, seen in black on the object. This may indicate use of bone black or plant-based black.

Measurements done with the RTG fluorescence macro scanner

Measurements of element composition performed with the RTG fluorescence macro scanner M6 JETSTREAM by the manufacturer Bruker,

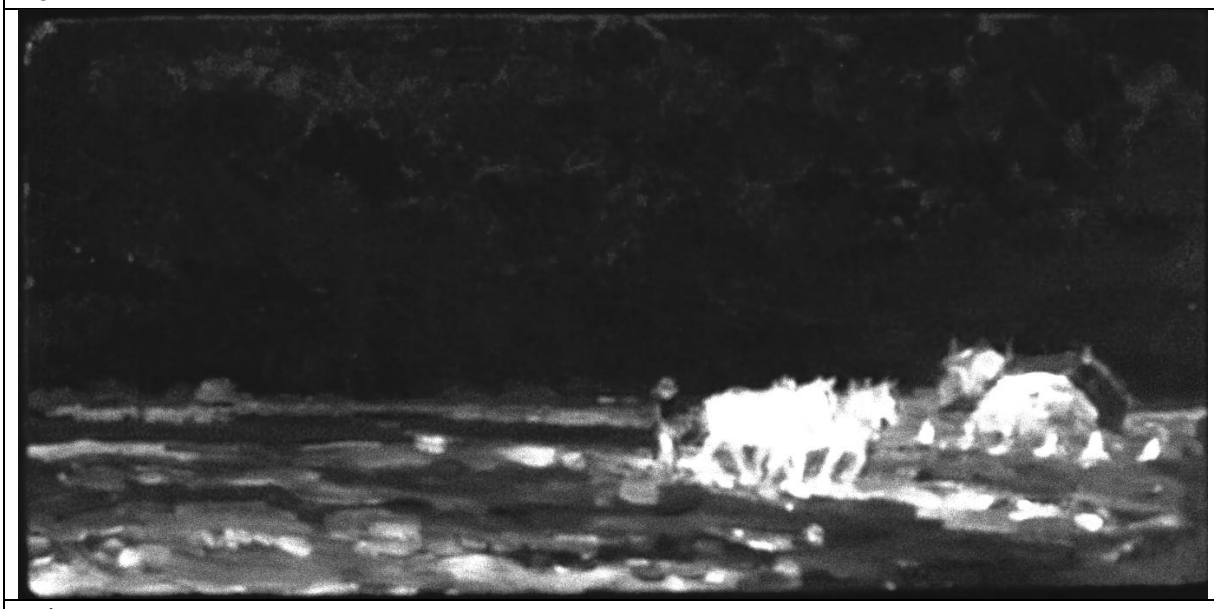
Measurement of the entire painting:

MaXRF measurement parameters: size of measuring spot 320 µm, distance between measuring points 180 µm, measurement time per point 50 ms. Below are distribution maps of elements.

Scanning area

Lead

Iron



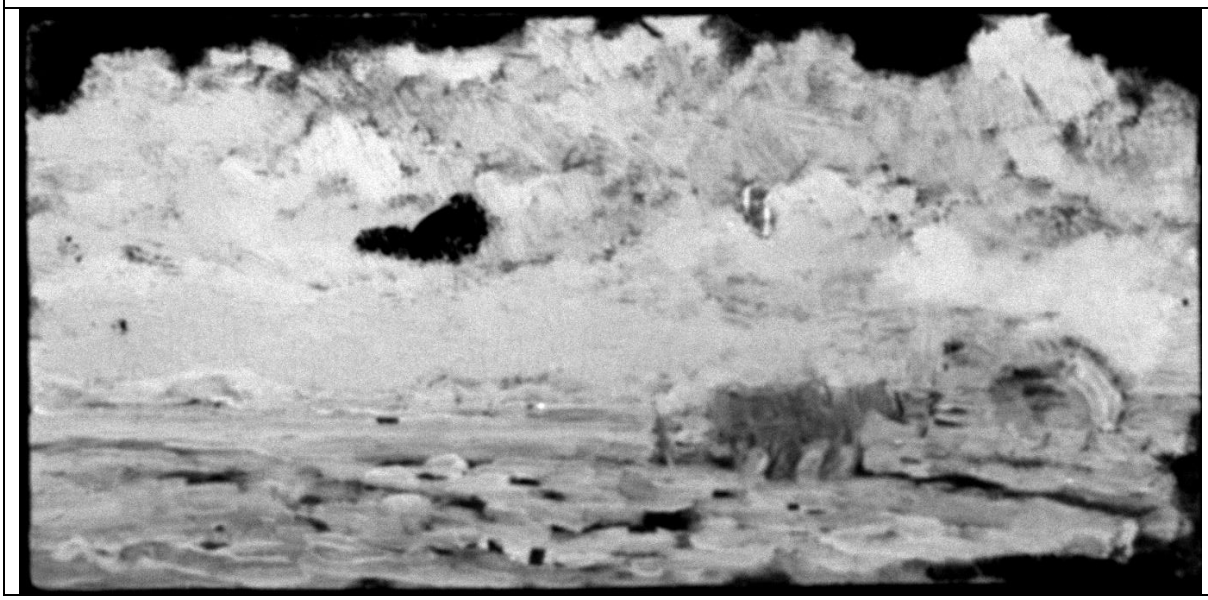
Calcium

Cobalt

Nickel

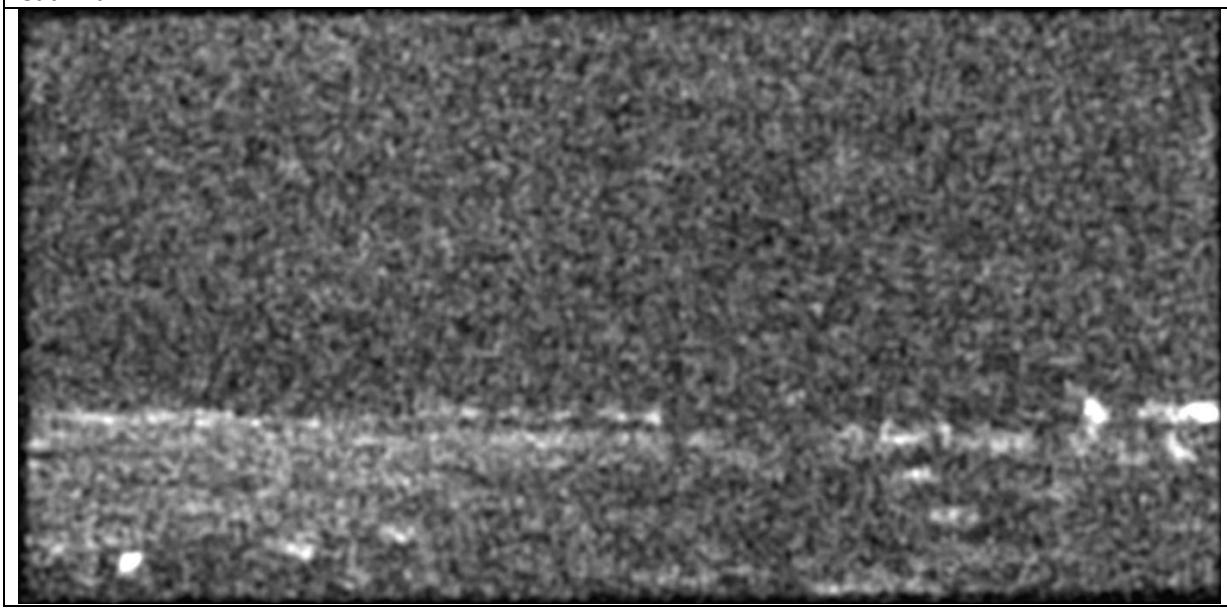
Barium

Zinc

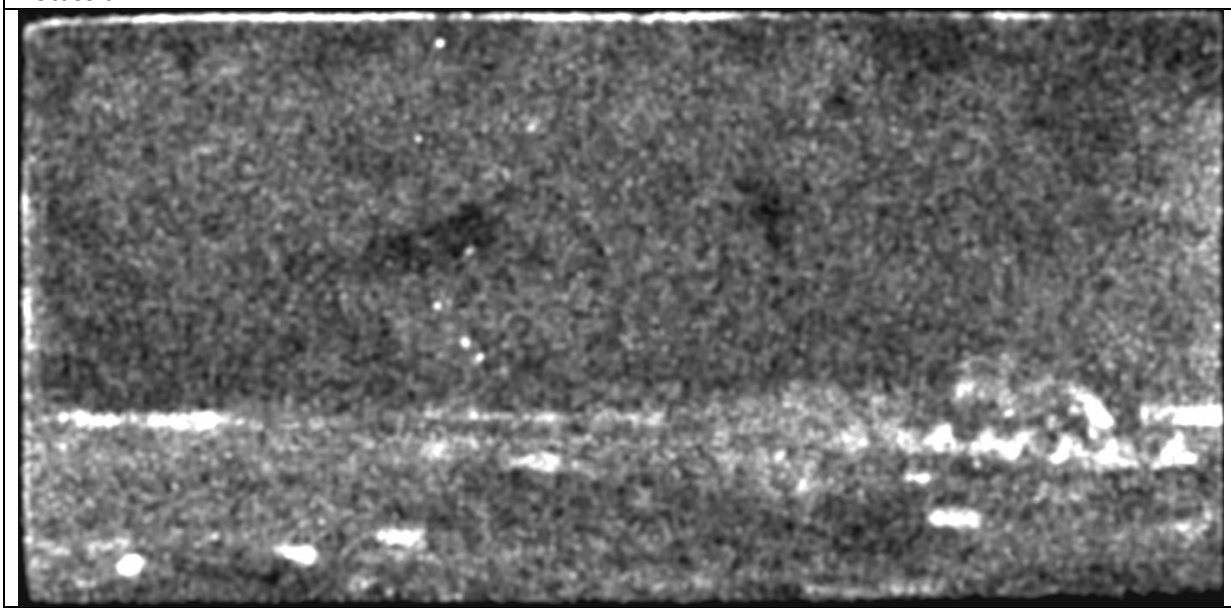


Chrome

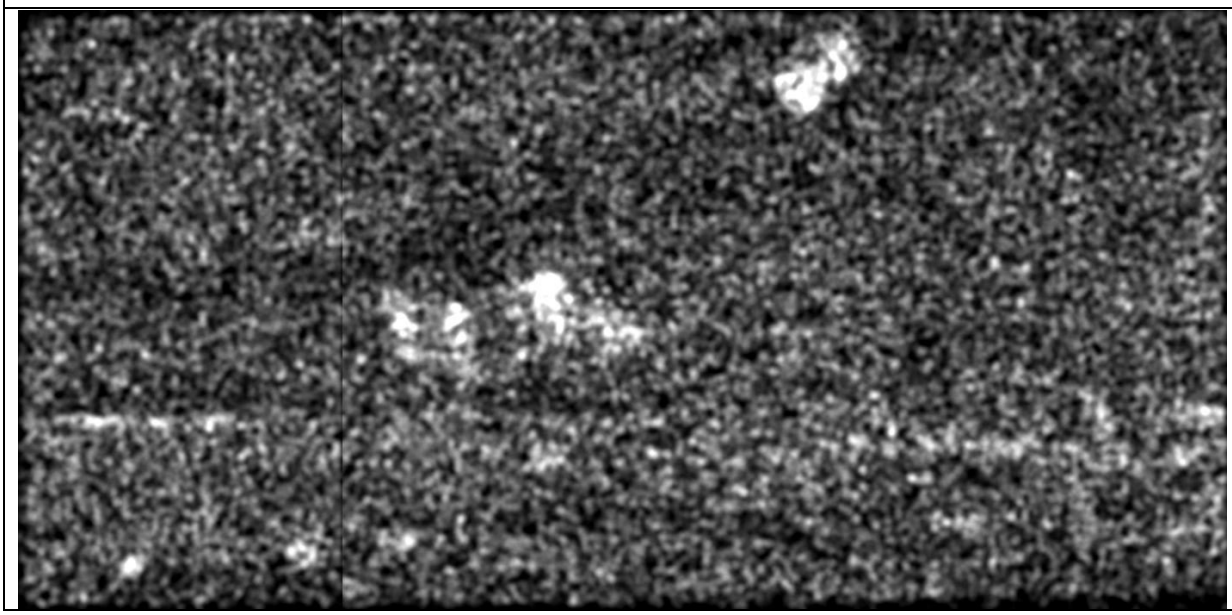
Cadmium



Potassium

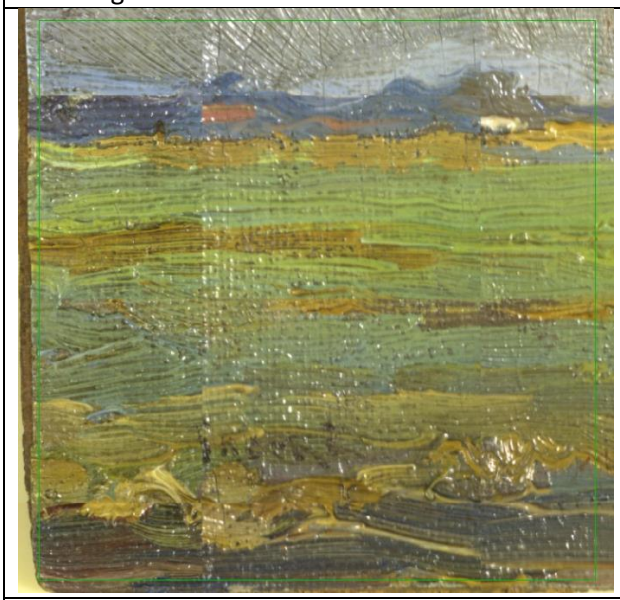
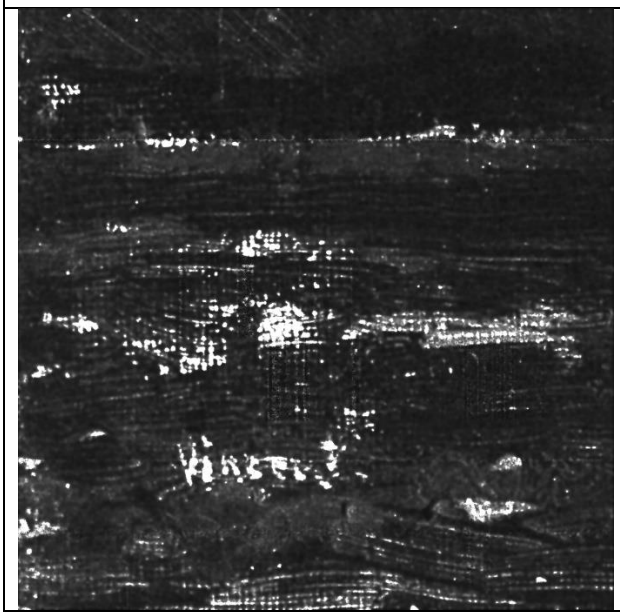


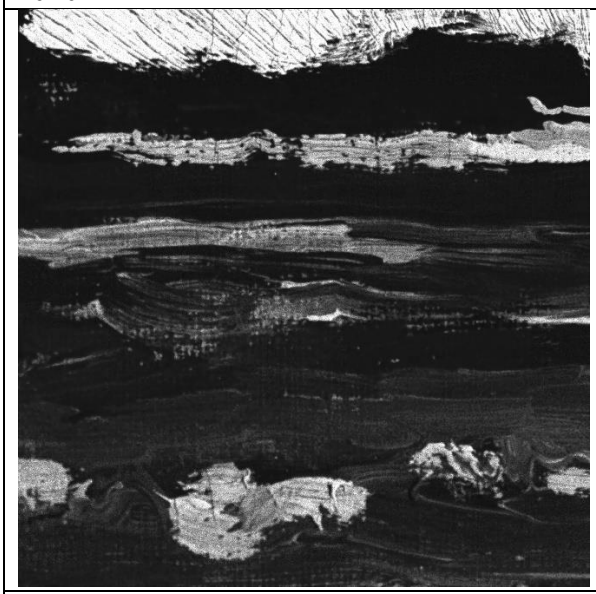
Tin

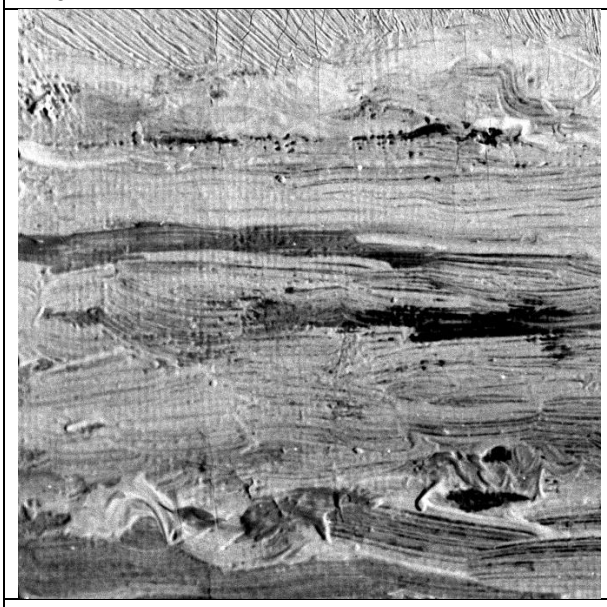


Measurement of the signature:

MaXRF measurement parameters: size of measuring spot 50 μm, distance between measuring points 30 μm, measurement time per point 50 ms. Below are distribution maps of elements.

Scanning area	Lead
	
Calcium	Iron
	

Barium	Cobalt
	
Nickel	Manganese
	

Zinc	Copper
	
Potassium	
	

Map of calcium distribution.