

# Multi-modal non-destructive investigation of the wall paintings of the Magdalen Chapel of St. Emmeram, Regensburg. A methodology to address the material complexity of a palimpsest

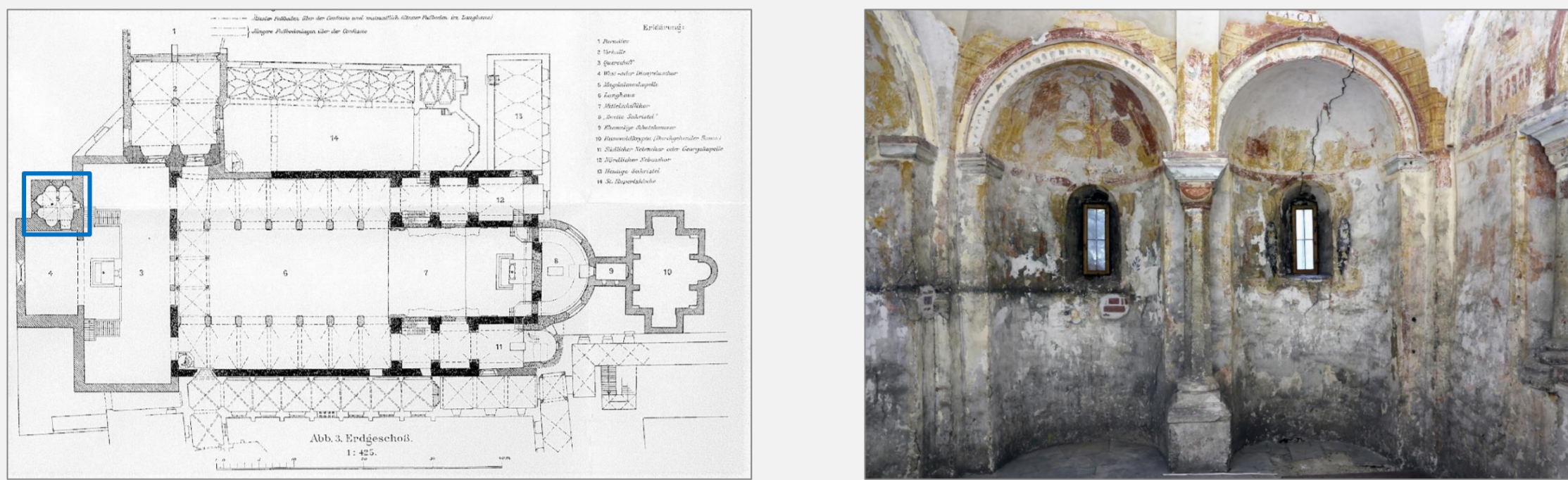
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The wall paintings of the Magdalen chapel in St.Emmeram, Regensburg, are being systematically investigated in the frame of three years interdisciplinary research project.

## The Magdalen Chapel

The Magdalen Chapel is a part of the monumental church of St. Emmeram in Regensburg (Germany), built in the 11<sup>th</sup> century. The Chapel was used for liturgical purposes until the monastery was dissolved in 1810. After that, it was used a storage room.



## The palimpsest of the wall paintings

The Magdalen Chapel shows a unique palimpsest made of overlapping and unrelated **wall paintings from four different painting phases simultaneously visible**, dated between the 12<sup>th</sup> and the 17<sup>th</sup> centuries. At some point, the walls were whitewashed and only partially uncovered in the 1980s. Nowadays, the chapel is closed to the public and the fragmentary status of the wall paintings hinders their readability posing queries about their conservation.

## The four different painting phases

<b>I Phase</b> mid-12 <sup>th</sup> century It depicts the life of holy penitents, among others Saint Mary of Egypt.	<b>II Phase</b> early-15 <sup>th</sup> century It shows the Man of Sorrows, Christ on the Mount of Olives.
<b>III Phase</b> end-15 <sup>th</sup> century It includes several standing saints.	<b>IV Phase</b> second half-17 <sup>th</sup> century It presents decorative painting with putti and fruit festoons.

**NEVER STUDIED BEFORE**

How are the four painting phases distributed ?

Which artistic materials were used in each phase ?

Are there conservation issues ?

### METHODOLOGY

**N. Thalguer** PhD project

Archival research | In situ mapping | Digital mapping (metigo MAP)

Reflected and photo-induced luminescence images (fokus GmbH Leipzig): VIS, UVL, UVR, UVIL, VIL, IRR, UVRFC, IRRFC

**insiTUMlab**: HSI (HySpex, NEO), MA-XRF (Elio, Bruker), Raman (i-Raman, BWTek), ER FT-IR (Alpha II, Bruker)

### PRELIMINARY RESULTS

**IV Phase**: Stitched image, ER FT-IR, Raman (785nm), Cu (Ka), Hg (Lg) maps. Possible stratigraphy: Malachite (Cu) Ph4, Carbon-based, Cinnabar (Hg) Ph3.

**III Phase**: Stitched image, ER FT-IR, HSI maps. Pigments: Calcite, Gypsum, Malachite, Azurite.

**II Phase**: Stitched image, Raman (785nm), MA-XRF, Pb (La), Fe (Kα) maps. Pigments: Calcite, Hematite, Cinnabar.

**I Phase**: Stitched image, MA-XRF. Pigment: Egyptian blue.

**HSI Data Processing**: Calibration with spectral reflectance standard (Spectralon ©), Geometric correction using calibrated reference image, Classification of pigments using the SAM-algorithm (Spectral Angle Mapping).

## The color palette



<b>I Phase</b> Lead white, Goethite, Massicot, Hematite, Cinnabar, Minium, Lapis lazuli, Egyptian blue	<b>II Phase</b> Lead white, Lead tin, Massicot, Hematite, Cinnabar, Minium
<b>III Phase</b> Lead white, Cinnabar, Azurite, Malachite	<b>IV Phase</b> Lead white, Goethite, Hematite, Carbon-based, Malachite

## Secondary products

**I Phase**: Laurionite, Pb(OH)Cl

**III Phase**: Libethenite, Cu<sub>2</sub>PO<sub>4</sub>OH

were identified as possible degradation products indicating conservation issues