Using high-res 3D:

Digital Restoration

MARCO CALLIERI

DME WORKSHOP

BRUSSELS – 12/3/15

[digital] Anastylosis / Restoration

When working on digital 3D mdoels, there is often confusion between the two…

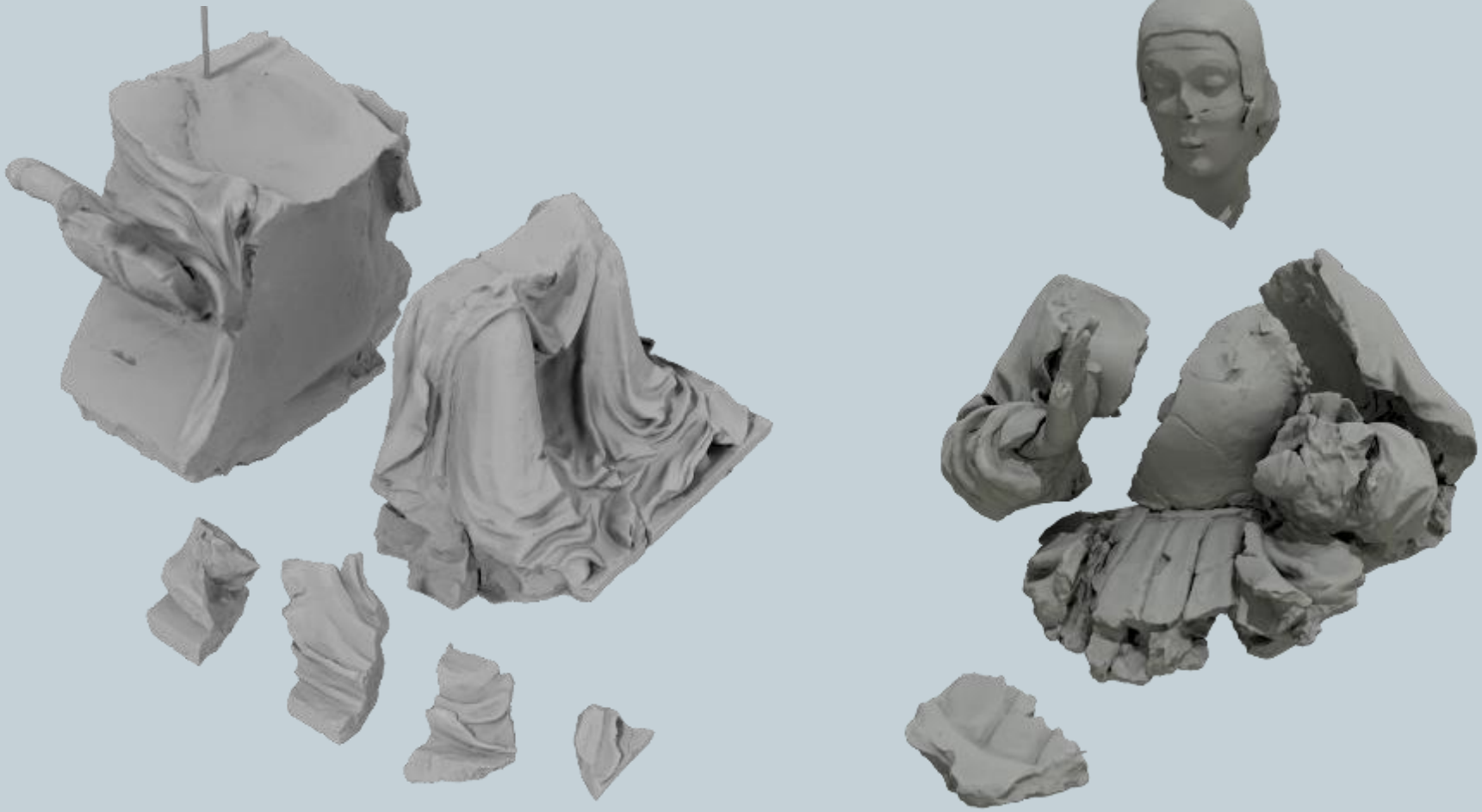
Digital anastylosis:

- *Placement* of digital models of fragments in the correct position in space, to obtaint he original shape of an artefact

Digital restoration:

- Actual *modification* of sampled 3D data to recreate the original appearance/structure/functionality of an artefact

Pietranico's Madonna



Pietranico's Madonna

Problems / drawbacks

3D measured data is a SCIENTIFIC data, modify it has to be done in a SCIENTIFIC, ARTISTIC and HISTORICAL correct way

- Keep close to original data
- Keep an expert at an arm's length

But, remember that what happens in the digital world, remains in the digital world…

An Helm in a Tomb

DIGITIZE

SCULPT

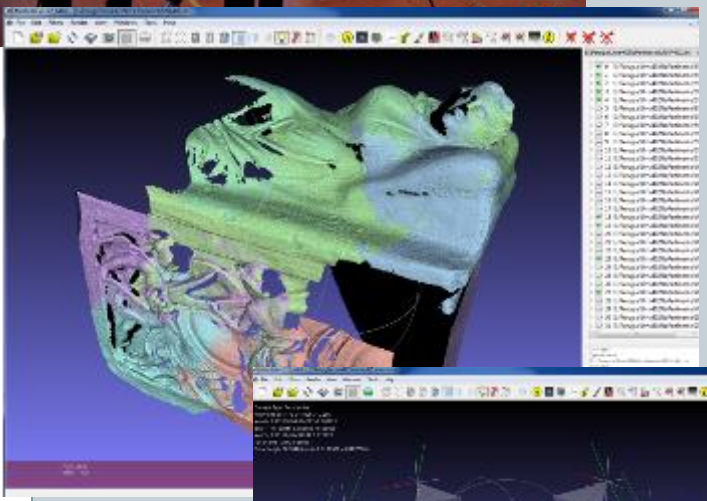
VISUALIZE

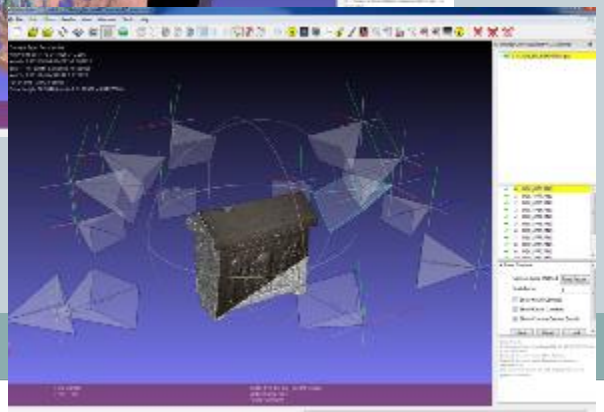
Background

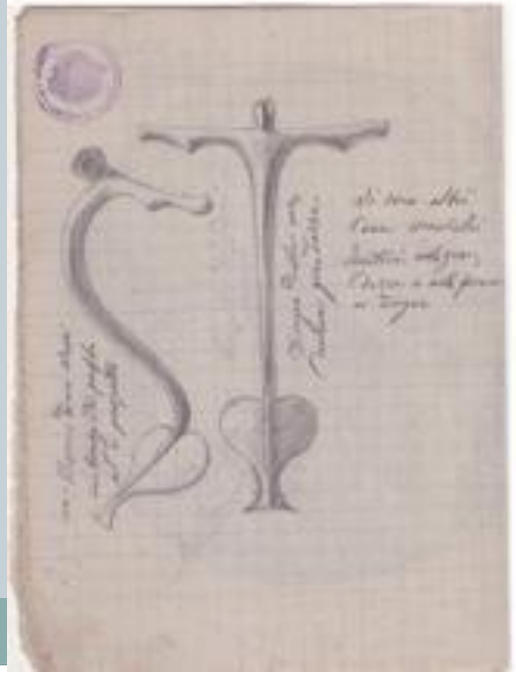
Didactic video describing a now-lost Aetruscan tomb, to be used in museum

- 3D scanning of remaining artefacts
- 3D Modelling of missing objects and environment, based on archaeological data
- The helm…

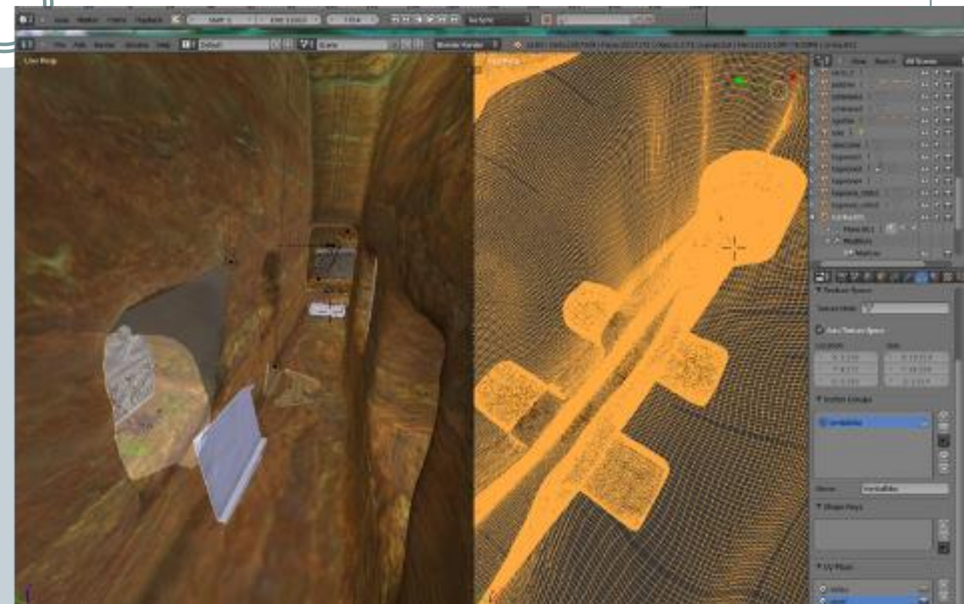
3D assets

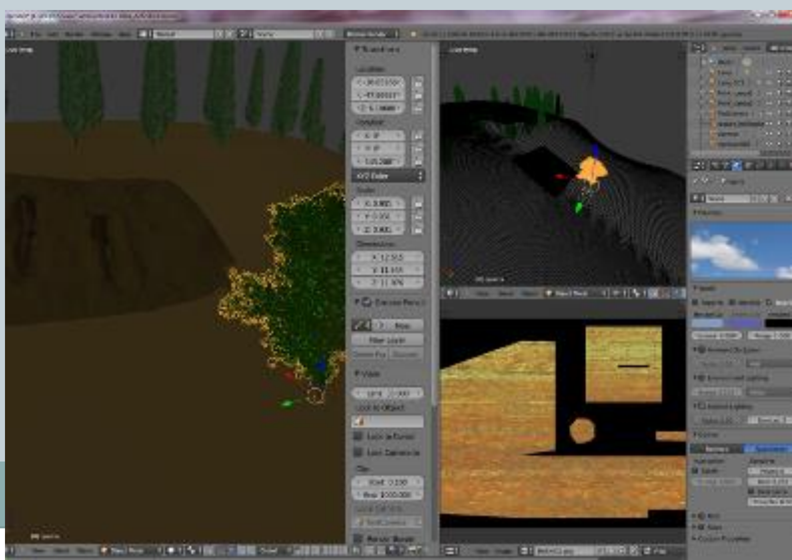


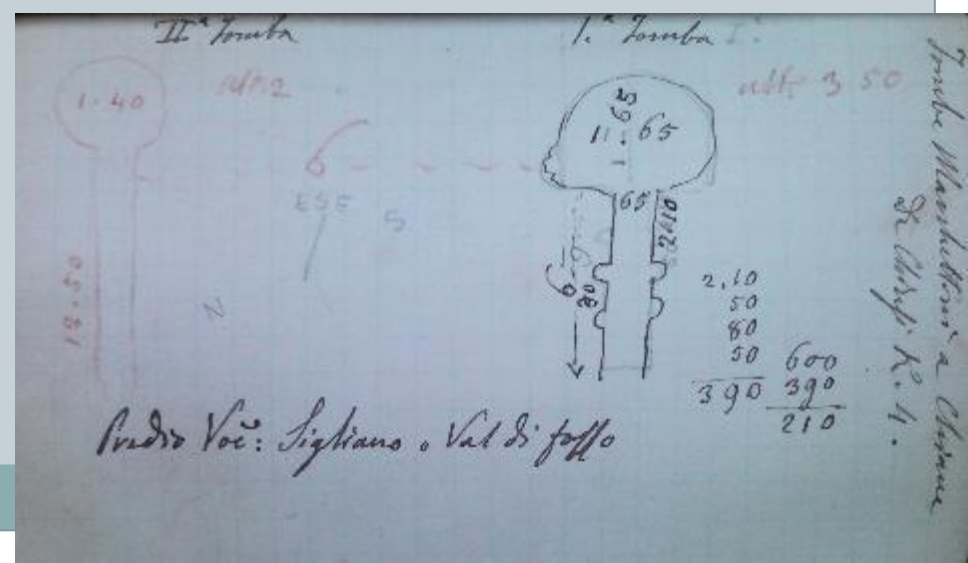




3D assets







3D model - Helm

3D scanned (0.5mm), color mapped from photos

Virtual Restoration

The Helm is the most iconic piece of the tomb, in order to appreciate its importance we wanted to show it as it WAS…

- Symmetry (global and local scale)
- Drawings/annotations of archeologists, work done under the supervision of an archeologist
- Analogies with similar
- Measured data

Straightening

Restore global symmetry,

Bridge the gap

Rough filling of the missing area for later sculpting

Sculpting

“digital sculpting” on the high-resolution model using a specifc tool (Zbrush).

Smoothing of oxidized areas.

Bring out details of the decoration.

Completely missing areas filled by copy-past of simmetric parts.

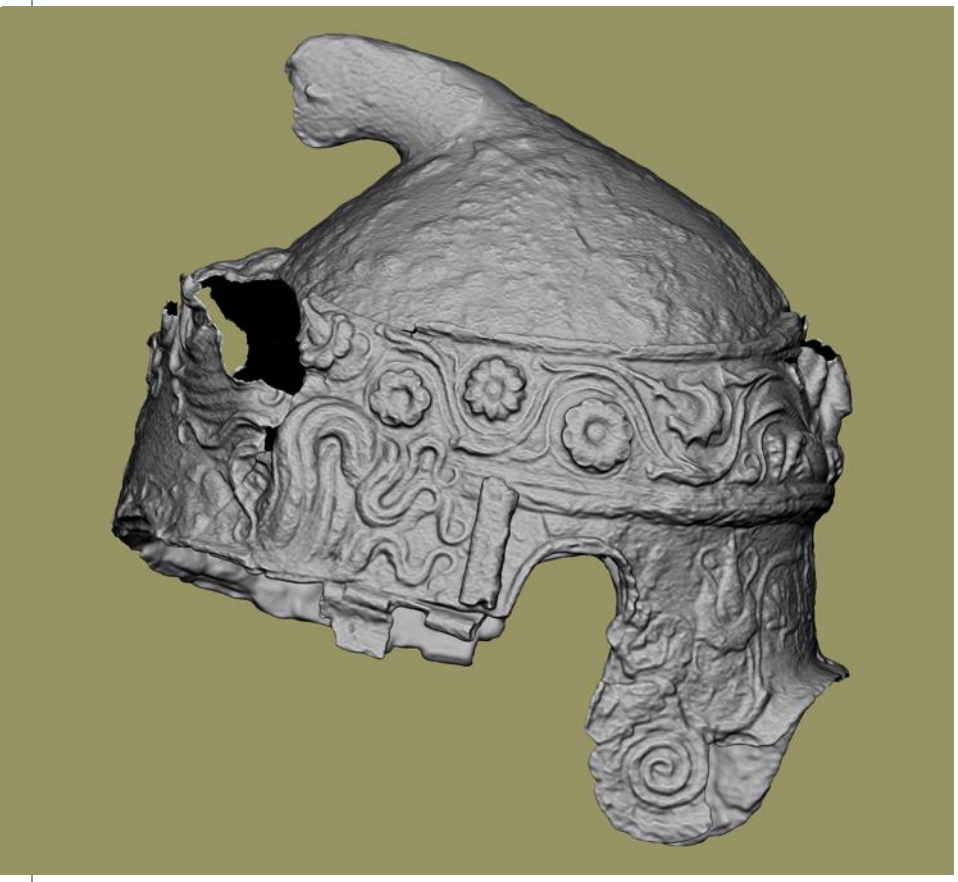
Virutal restoration

The change is indeed impressive, and may appear too extreme

BUT

It is still based on the principle of minimum intervention, rely on the direct use of the sampled data, is based on comparison with similar artefacts, follows the excavation and archival info/drawings of the helm, and has been guided by experts

Results



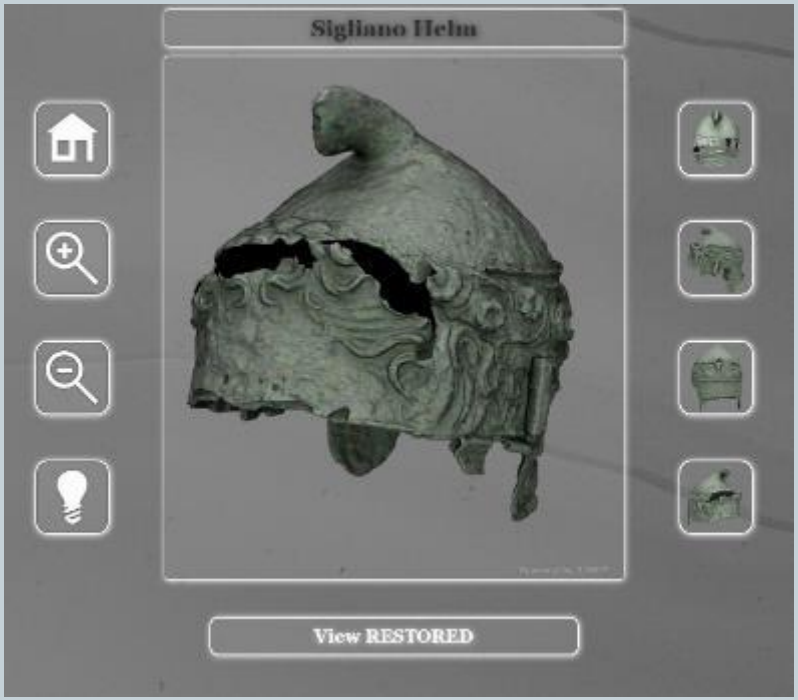
Rendering

For the video, we rendered the helm using a gold shader (the bronze was originally gilded), using placeholders for the totally missing elements (plume and cheekpieces)…

Rednering

Interactive 3D online

Before-after state, high-res geometry (5+5 millions of triangles), with bookmarks.



Bringing back the color

DIGITIZE

RECONSTRUCT

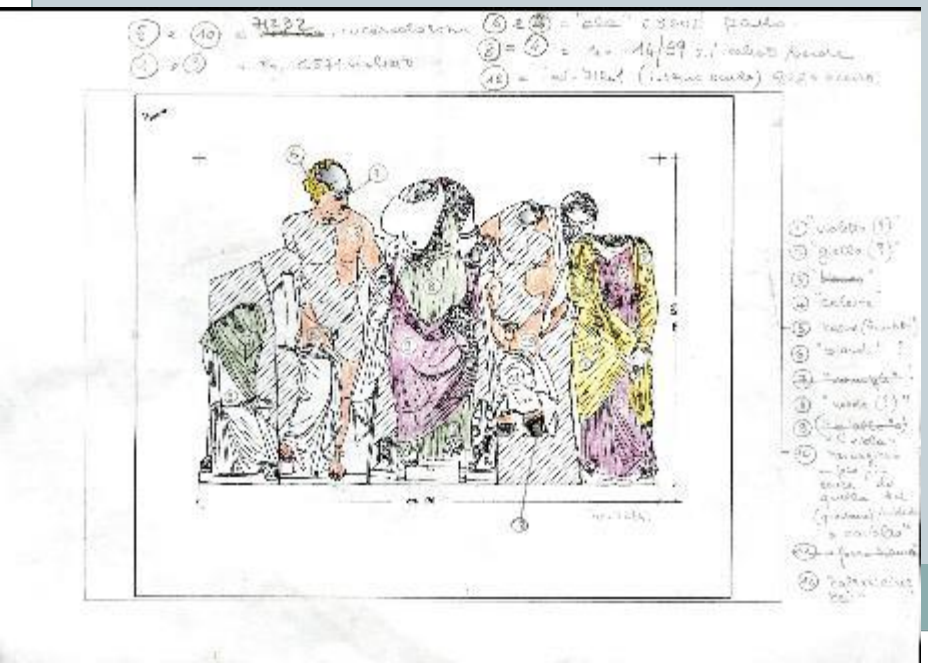
PAINT

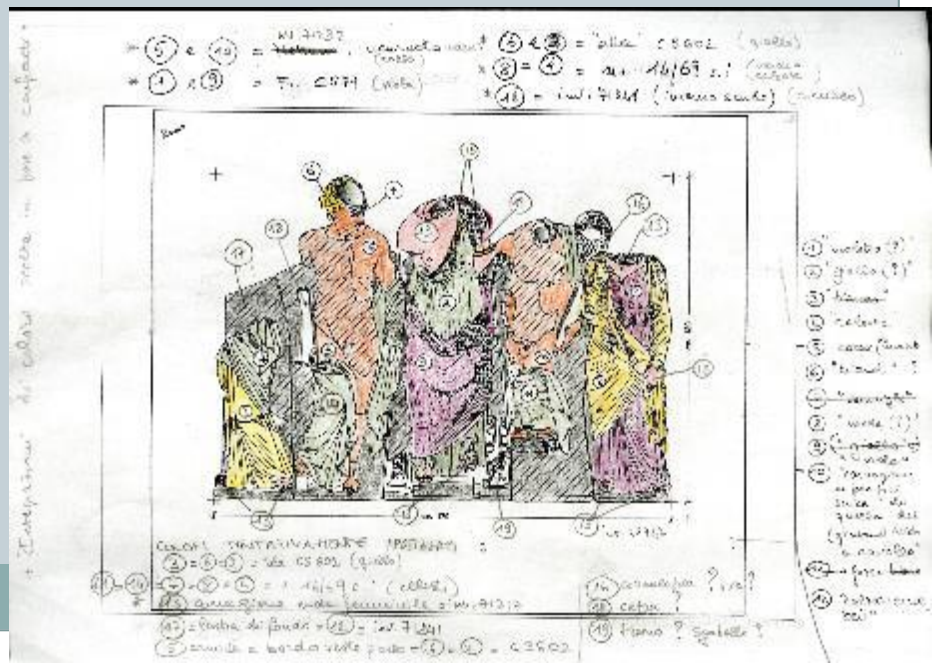
The Luni statues

A series of terracotta statue from the pediment of the Great Temple of Luni. We have the 3D models for the full group, and one of the things we tried on it was to repaint them

Surface Painting

There is a description of the original color (at the time of the excavation), and a 3D model can be “painted”… but where to get the color information?





From example…

Extract color and its variations from calibrated photos.

Yes, it is not colorimetric, but it is almost impossible to get a clear measure out of these spots…

Surface Painting

Pietranico's Madonna

Years later, we did a similar test on a different object…

We had better 3D mdoel, better painting tools, we tried perfecting the way we measured/painted color

Pietranico’s Madonna

Texture synthesis based on cropped photos of the residual color areas

Pietranico's Madonna

Ulpia Domina Sarcophagus

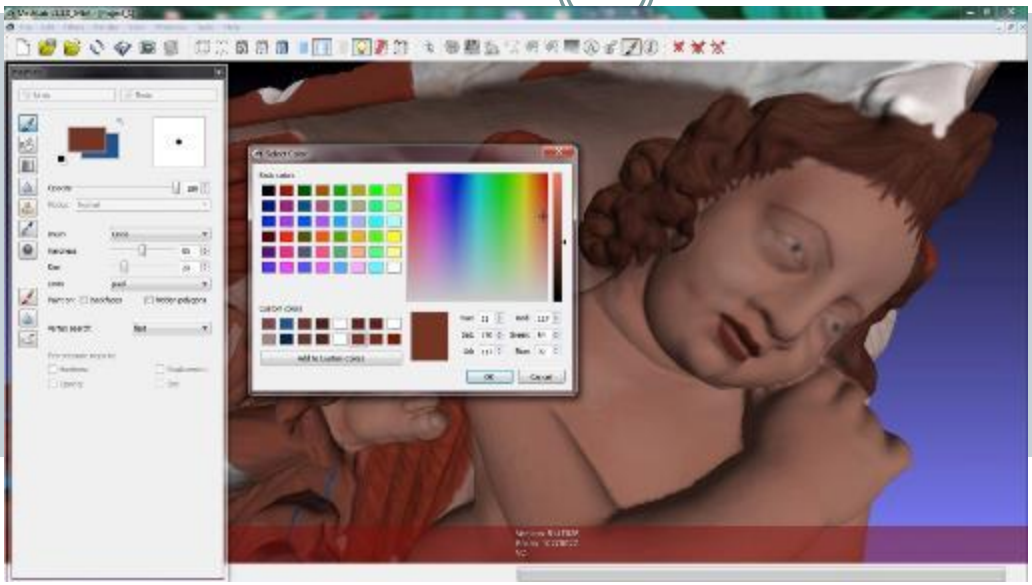
Recently, we tried again (yes, we are stubborn), but with a more scientific orientation towards the identification of pigments and paints.

Ulpia Domina Sarcophagus

A series of studies carried out to determine layers of paint, pigments used, colors and patterns

- Calibrated photos
- Microphotography
- Micro-section stratigraphy
- Chemical analysis
- Near-visible lighting

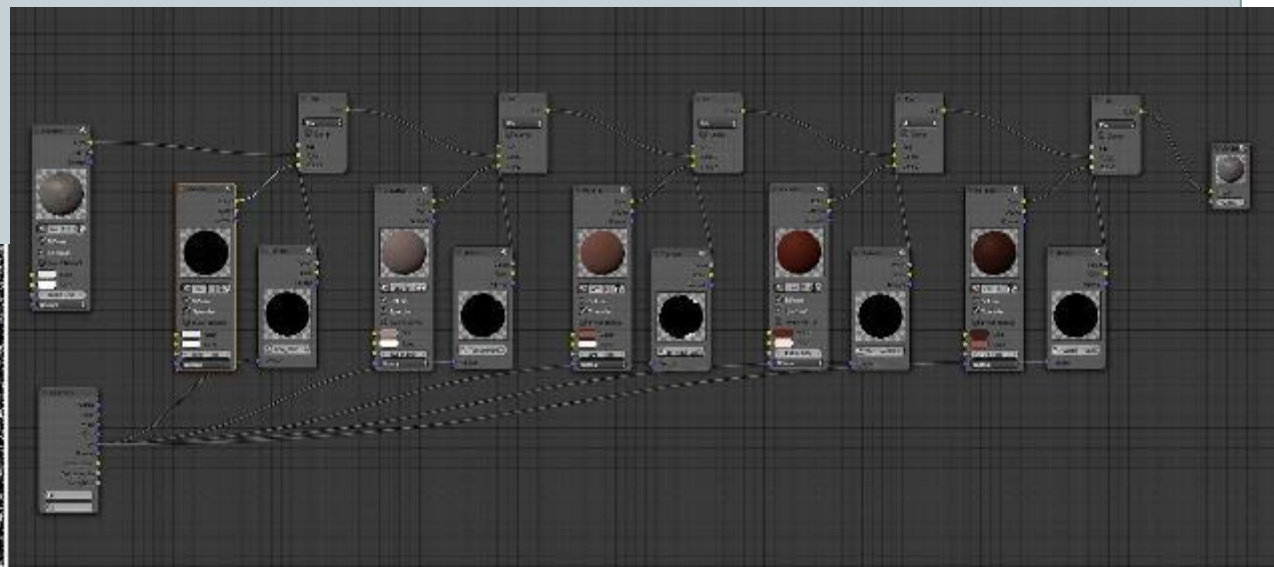
Ulpia Domina Sarcophagus



Ulpia Domina Sarcophagus

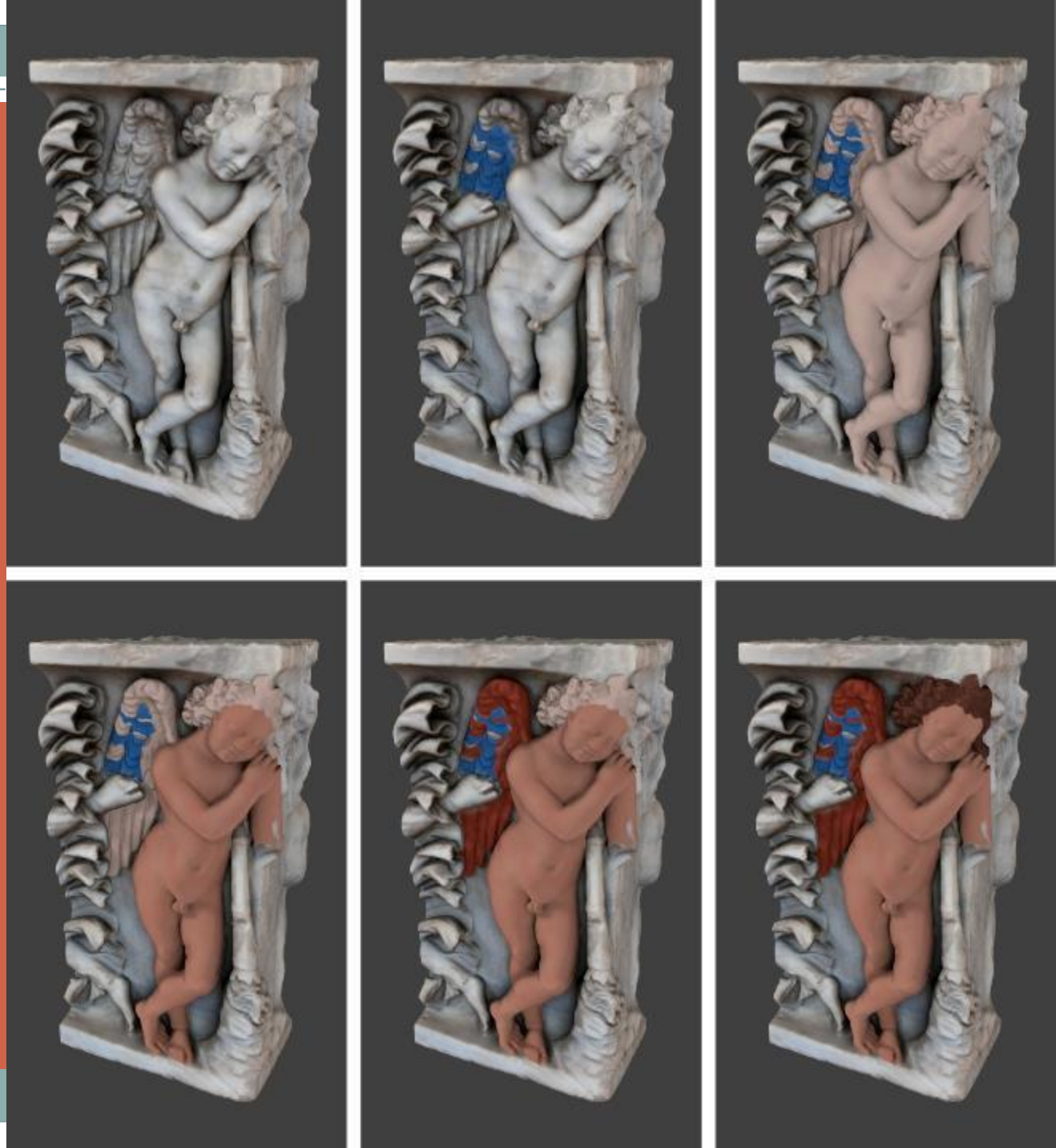
In Blender, we tried describing the layering of paints using a specific material for each paint, and a shader cascade (to simulate the superimposition of paints)…

it works, as a proof of concept, but we still need a measured physically-based shader for each paint



Layering

The different layers of paint, visualized one after another, for an area of the sarcophagus



Question Time

THANKS FOR YOUR ATTENTION…

callieri@isti.cnr.it