

## Iberian sculptures from the Museum of Jaen (Spain) using 3D scanning and photography

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University Research Institute for  
Iberian Archaeology



CAAI



Provincial Archaeological Museum of Jaén

## The Iberians. VI-I a. C.



- 1- Oppidum of Puente Tablas (Jaén):
- 2- Cemetery of Piquía (Arjona, Jaén)
- 3- Cemetery of La Noria (Málaga)
- 4- Cemetery of Tutugi (Galera, Granada)
- 5- **Sculptures of Cerrillo Blanco (Porcuna, Jaén, Spain)**
- 6- Burial chamber of Toya (Peal de Becerro, Jaén)
- 7- The Provincial Museum of Jaén
- 8- Sculptures of El Pajarillo:
- 9- Sanctuary of Castellar
- 10- The site of Castulo and the museum of Castulo
- 11- The Hill of Albahacas: the battle field of Baécula:
- 12- Wall of the Iberian oppidum of Ibros (Jaén)
- 13- Wall of Iberian oppidum Cerro Miguelico (Torredelcampo, Jaén)
- 14- Burial Chamber of Hornos de Peal (Hornos de Peal, Jaén)



# A JOURNEY TO THE TIME OF THE IBERIANS



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## HALL OF THE GROUP OF DE CERRILLO BLANCO (PORCUNA) PROVINCIAL ARCHAEOLOGICAL MUSEUM OF JAÉN (JAÉN, SPAIN)



V ct. b. C.

The most most relevant group of sculptures discovered in Spain attributed to the Iberians

The group represents the Iberian aristocracy in different stages of development

Nº sculptures: 40



## WARRIORS



## HEROIC STRUGGLES AGAINST FANTASTIC ANIMALS



## ANCESTORS



## The purpose of this work:

Analyzing the conditions under which the sculptures are exhibited and the problems generated

Proposing the most appropriate 3D scanning based on the types of conditions and constraints affecting the sculptures

Main problems:

- Lighting conditions: Transparency/Reflectance
- Complex morphology of the object
- Location and Accessibility:
  - Sculptures set on raised wooden platforms a meter high and with little space around.
  - Relocate or move the sculptures require the payment of insurance

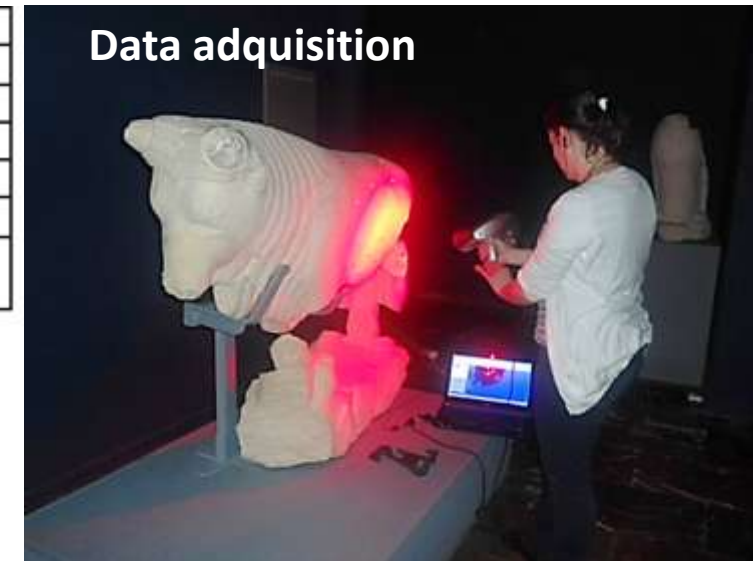




## Data acquisition, modeling and edition : Laser scanner

Model Z-Scann 800

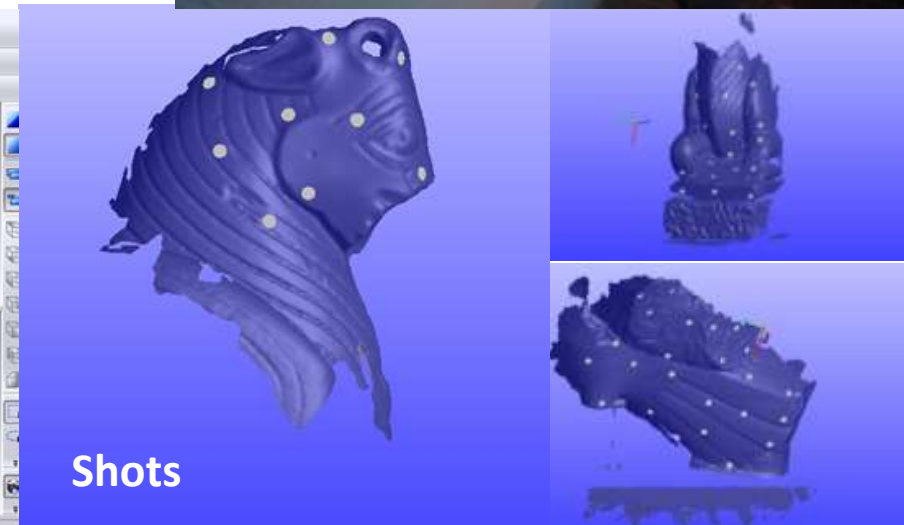
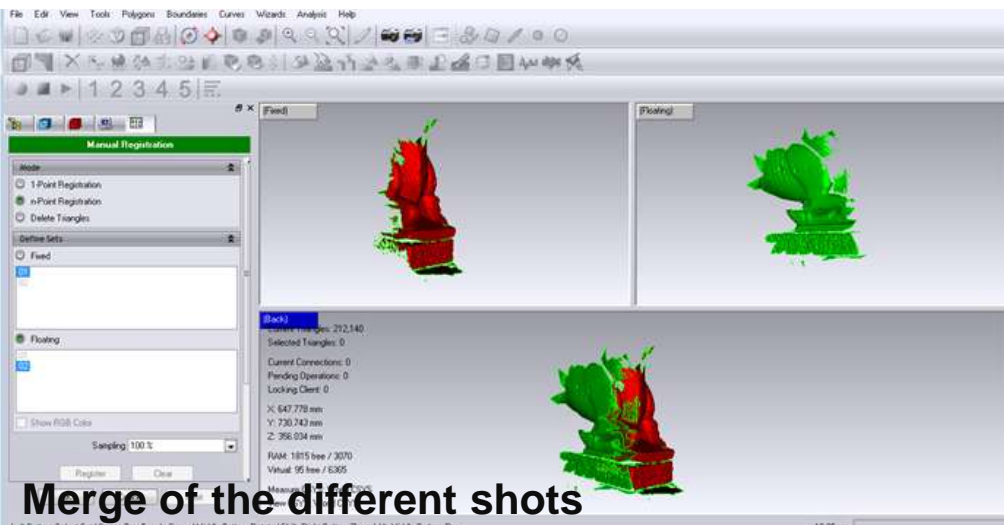
Frecuency of the sample	25.000 measurements per second
Laser	Class II
Accuracy XY	40 micras
Resolution	0,050 mm XYZ (XYZ 0,0019)
ISO	20 $\mu\text{m}$ + 0,1 L/1000
Depth of field	30 cm
Export file formats	DAE, .FBX, .MA, .OBJ, .PLY, .STL, .TXT, .WRL, .X3D, .X3DZ, .ZPR



Data acquisition

Data acquisition: software *VXelements*

Edition: Geomagic v.10.0



Shots

Merge of the different shots

## Data acquisition, modeling and edition : Photogrammetry

### Cameras:

Canon EOS 40D

### Lenses:

SIGMA DC 18-200mm (general)

EOS APO MACRO 350mm (details)



### Software used for image-based 3D reconstruction :

Autodesk 123D Catch

Agisoft PhotoScan Professional Edition

### Processes of image-based 3D reconstruction.

- Automatic matching of images
- Automatic computation of camera calibration
- Automatic dense matching for depth map generation.

### Software used for editing and cleaning

Meshlab

Blender



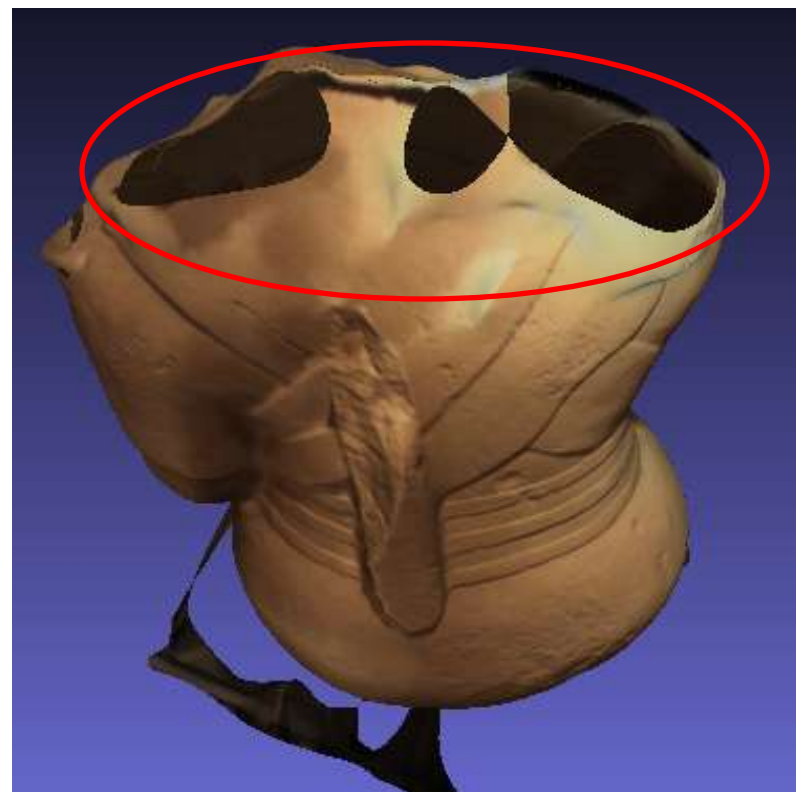
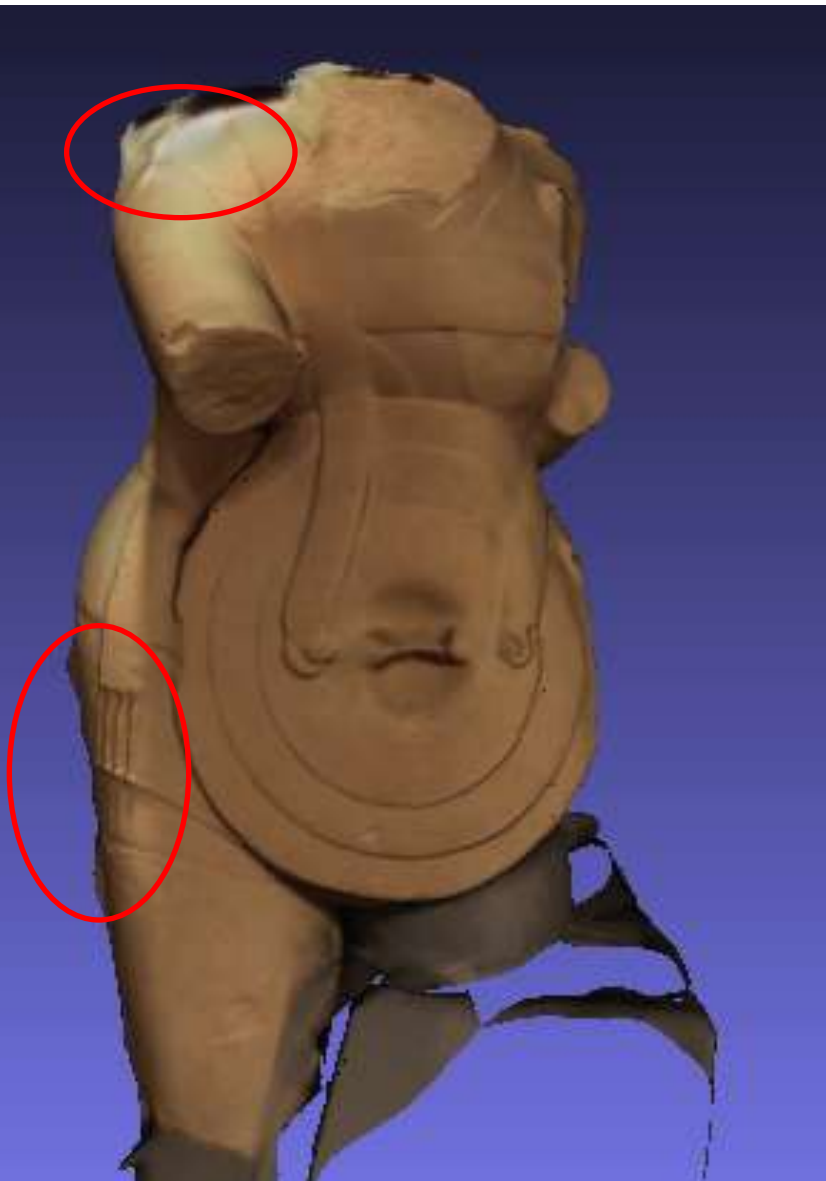
The hall conditions make it very difficult planning a new lighting

Great contrast of light in the same sculpture. Overexposed and underexposed areas



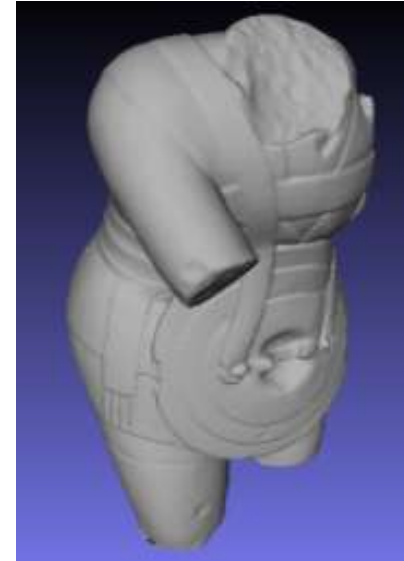
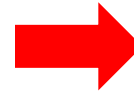
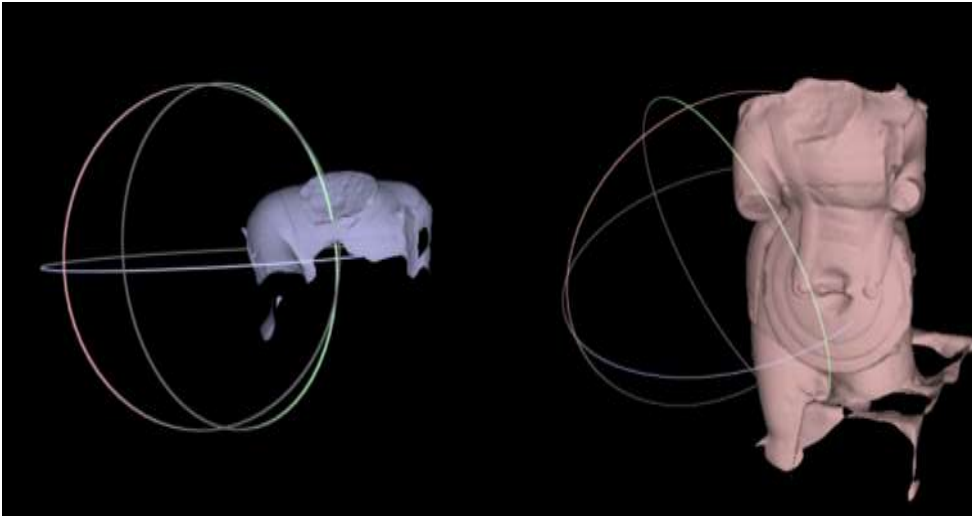
## Consequences:

- Bad reconstructions in areas of high contrast
- The model is not generated in the overexposed areas



## Solutions:

A-Data acquisition by parts , obtaining several 3D models to be merged in only one model (time consuming)



## B-Laser scanner

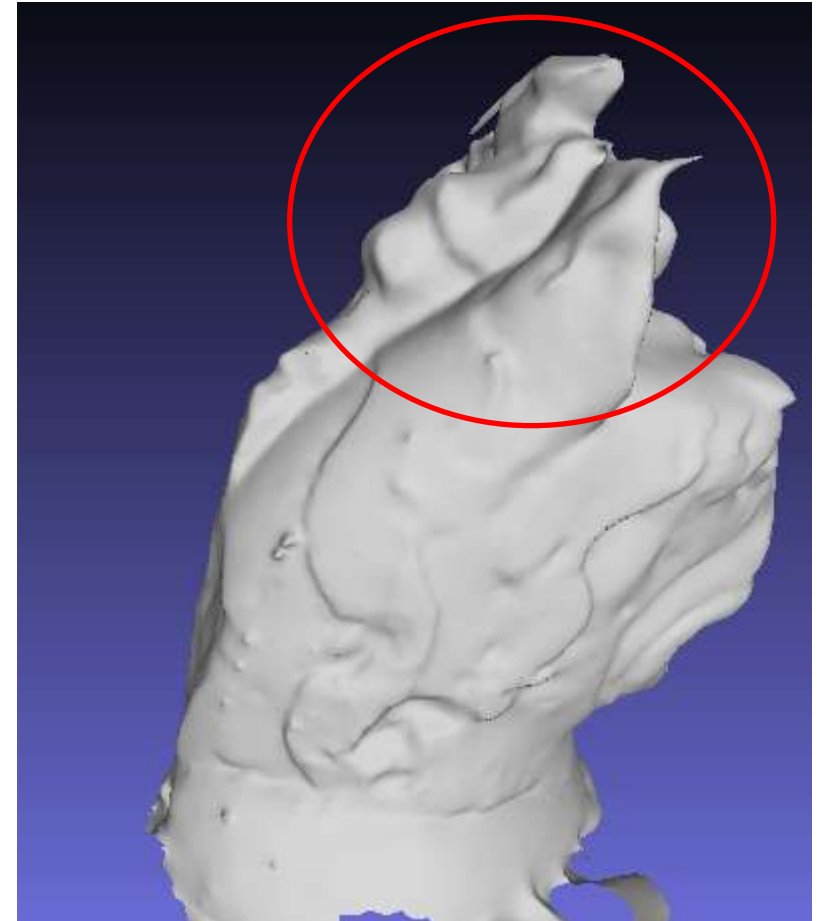


## COMPLEX MORPHOLOGY: 5 SCULPTURES

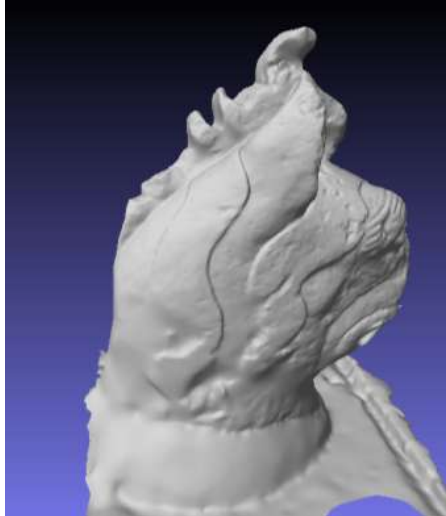
- Complex areas can present problems of reconstruction
- Poor lighting helps it



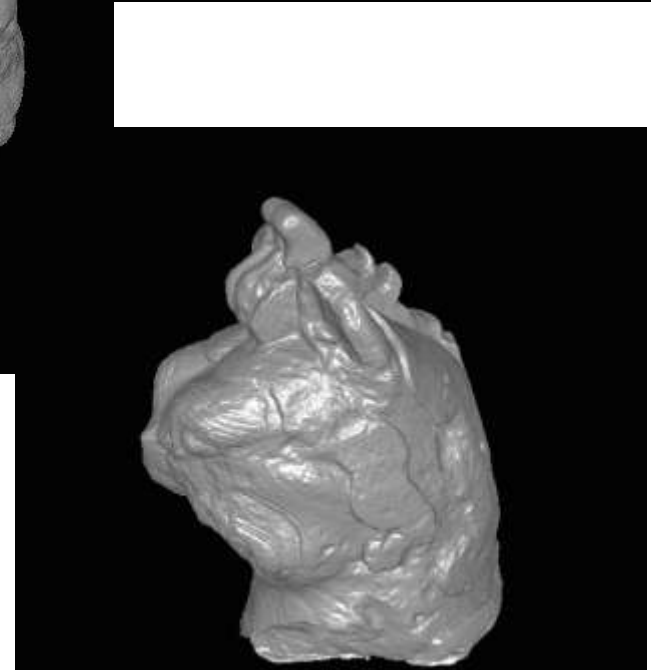
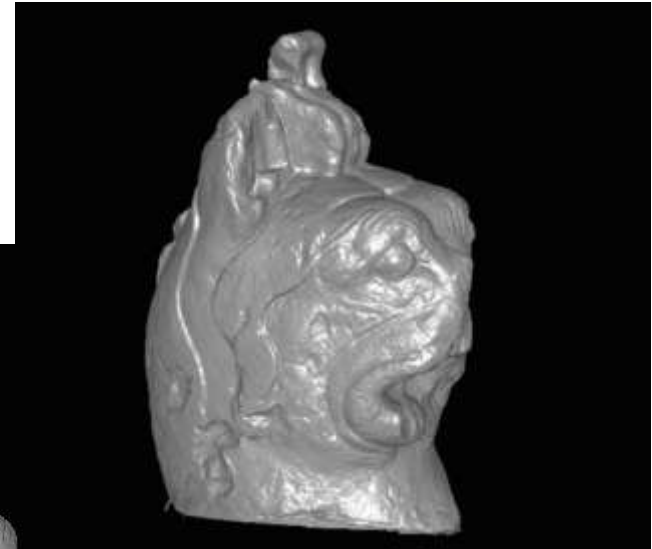
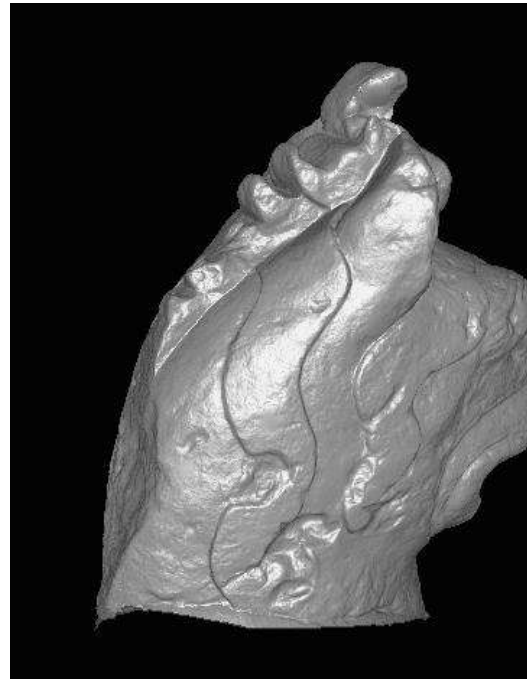
Deformation



A- Manipulation of images or  
HDR imaging (greater time)



B-Laser scanner



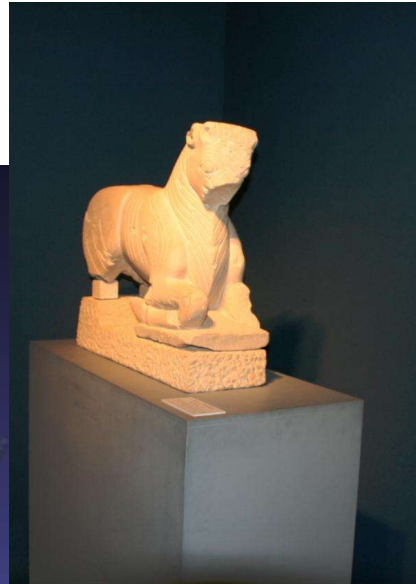
**LOCATION-ACCESIBILITY: 3 sculptures**

-Sculptures near the wall (less than 40 cm). The photograph on the perimeter is almost impossible. Their weight, the need of an insurance to move them, the extended visiting hours prevent positional changes





In sculptures located near walls photogrammetry is not working



Photogrammetry

Laser scanner



## CONCLUSIÓN

- Half the sculptures very affected by any of the problems discussed above
- Choosing only one method: laser scanner. Good resolution and quick (an average of 6 hours per sculpture)
- Problem in laser scanner models: textures  
In this case, no texture models allow to appreciate the details of surface.  
When included white texture of stone is difficult to perceive the relief

