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## 3D as a Service for Cultural Heritage

Xavier Granier

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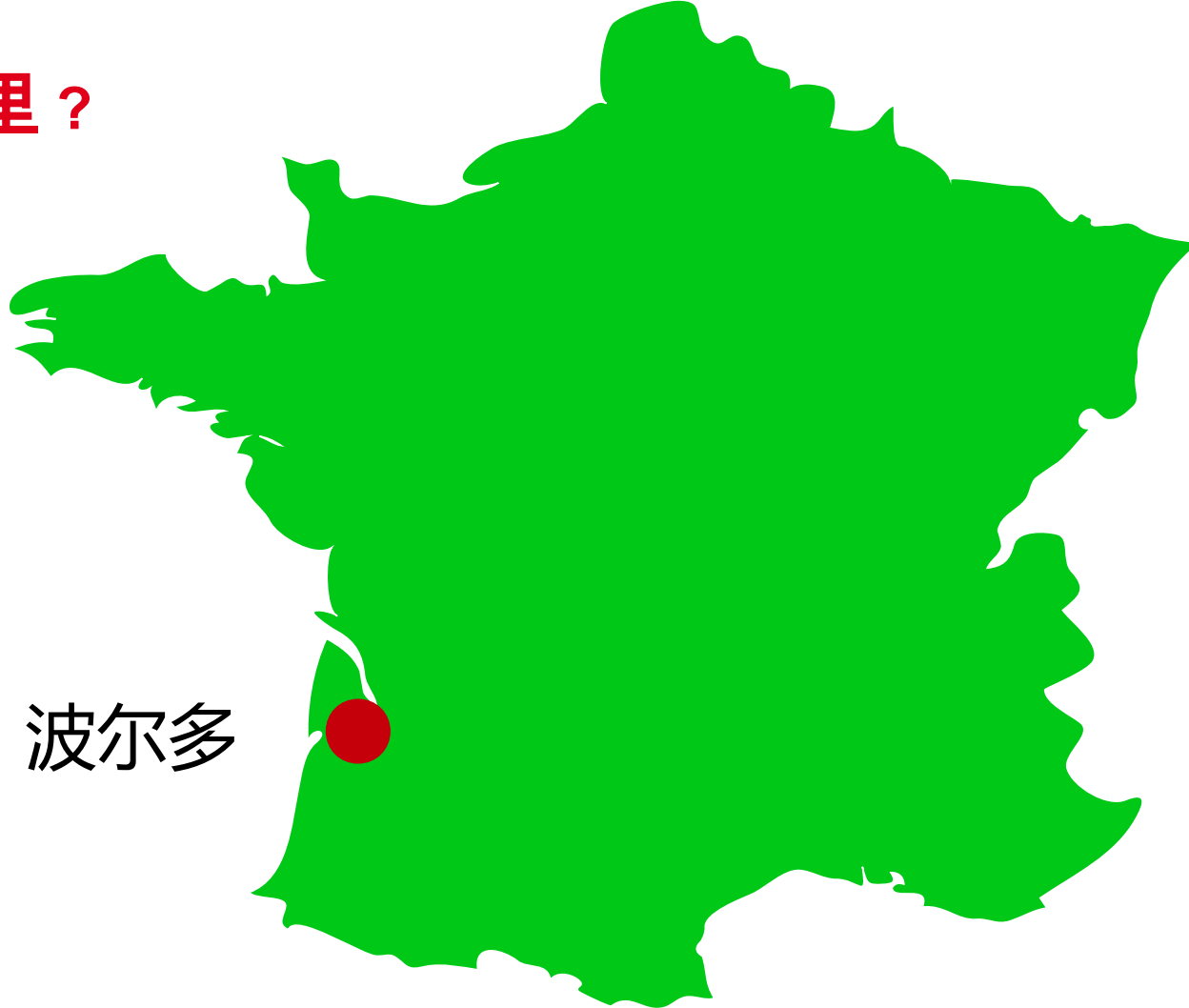
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# 3D as a Service for Cultural Heritage

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我们在哪里？



波尔多

法国

# Scientific Context

- Optic
  - Professor @ IOGS
  - Member of LP2N
  - Since 2012
- Computer Graphics
  - Head of MANAO team
  - 2011 – 2018
- Archeology
  - Archeovision
    - Scientific Director
  - 3D Constortium
    - Coordinator
  - Since 2017

# 3D for Cultural Heritage

- How to acquire
  - Still some progresses for geometry
  - Challenges for Appearance
- How to analyze
  - Extract important structures
- How and What to visualize
  - Rendering styles
  - Tools for archaeologist
  - Tools for museum
- How and What to archive

# 1

## Acquire

# Unpublished – New device for acquisition



With IFAO – Imaging in cervices – Medamoud temple – Egypt

# En cours – acquisition d'apparence

- Very Large collection
  - Clothes from Asia
  - XIX<sup>th</sup> century
- Difficulty to expose them
  - Too fragile
- Goal of the collaboration
  - Create an exhibition
  - Original or actual state



Robe - Fish skin - painted et sewn



# Vietnam – Woman Cloth



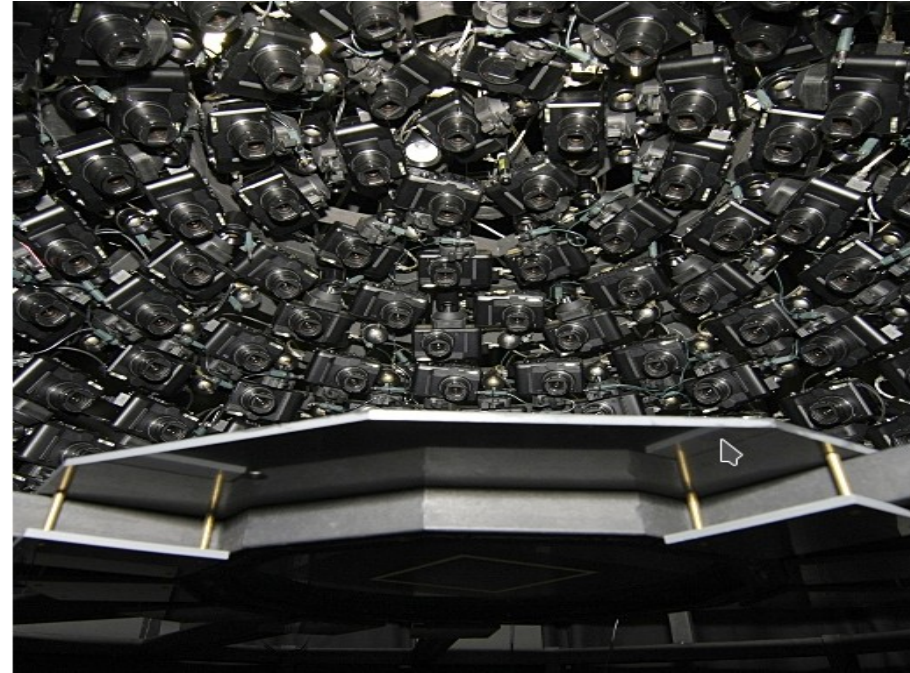
MEB | MUSÉE D'ETHNOGRAPHIE  
DE L'UNIVERSITÉ DE BORDEAUX



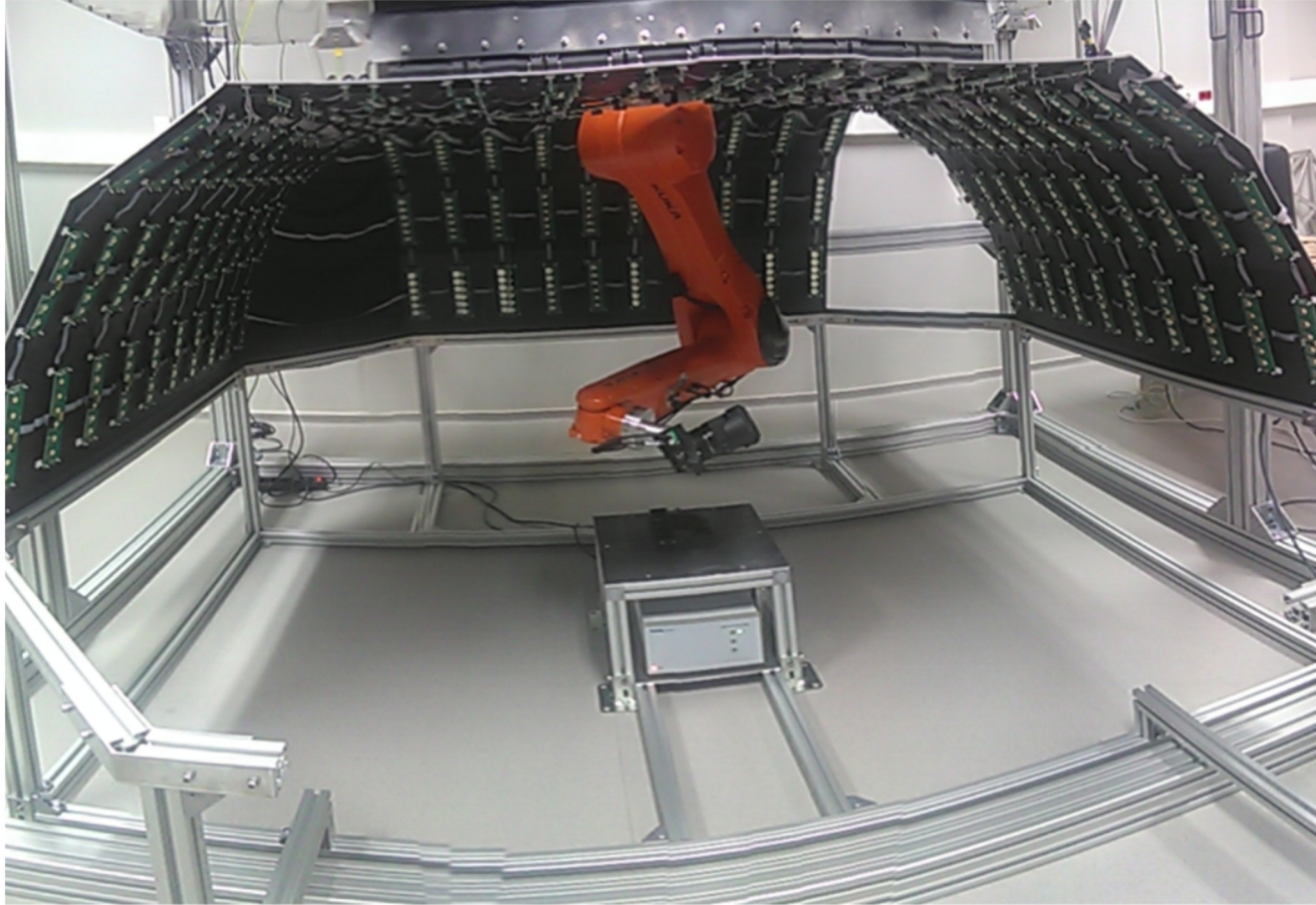
# New acquisition platform

- Prev. : *Integrated High-Quality Acquisition of Geometry and Appearance for Cultural Heritage*
  - Schwartz, Weinmann, Ruiters, and Klein
  - VAST 2011
- Scan whole clothes
  - > 1000 LEDS
  - 3D Scanner
  - Robot arm

<http://btf.cs.uni-bonn.de/viewer/>



## Current status



# 2

## Analyze

# Illustrative Shading



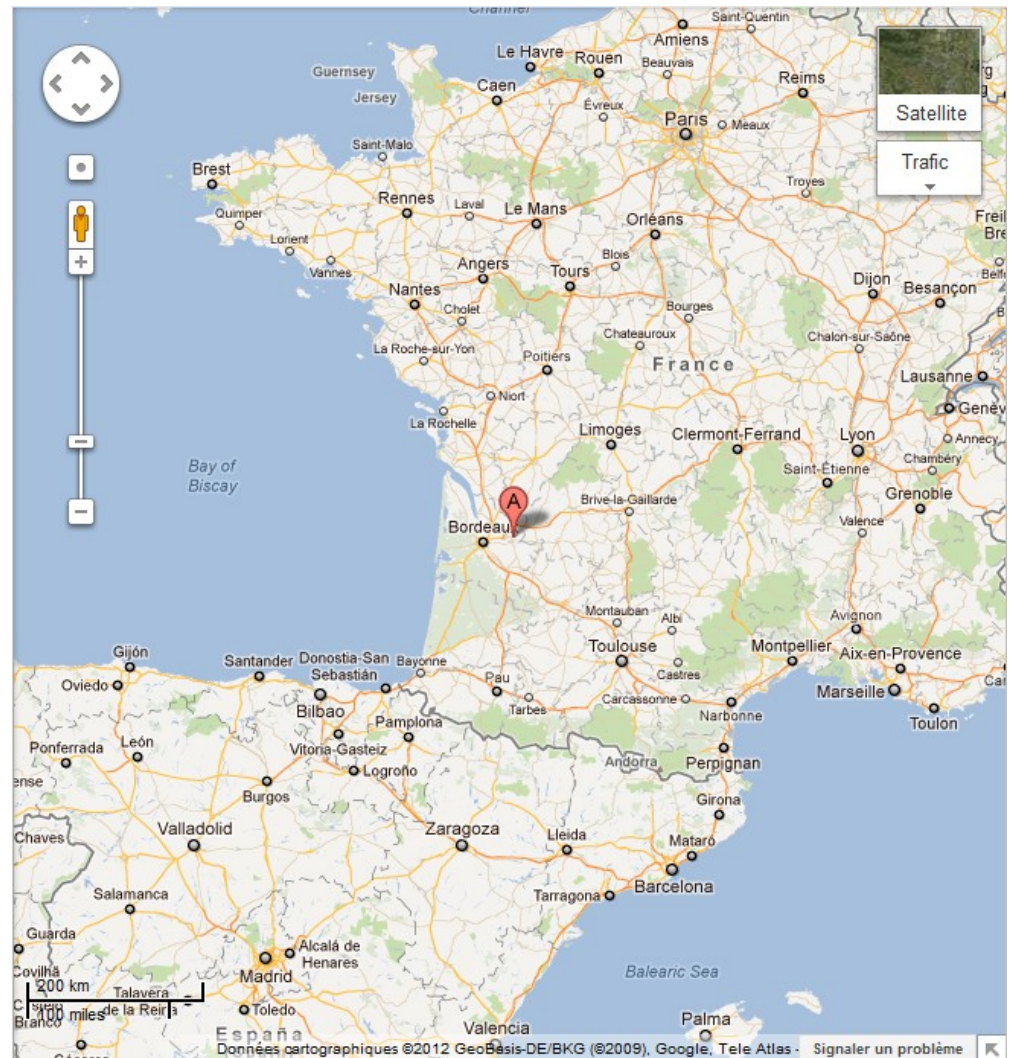
Classical Phong Shading



Illustrative Material

3D model of d'Isis (d'Alexandria Lighthouse)  
Acquired by **CEAlex** & **Archéovision**

# Epitaph of St. Emilion



# Epitaph of St. Emilion

- Discovered between 1934 and 1951
- Oldest written trace of St Emilion relics ?



Frédéric Boutouille (Univ. Bordeaux, CNRS)  
Pascal Mora (Archéovision, Univ. Bordeaux, CNRS)  
Romain Vergne (Inria, Univ. Bordeaux)



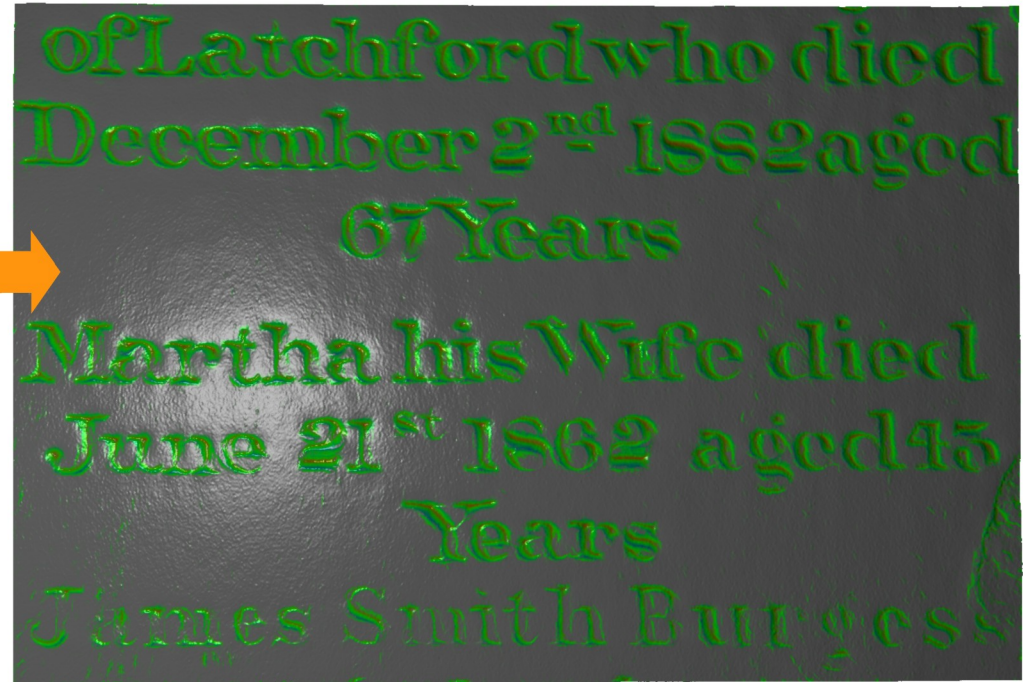
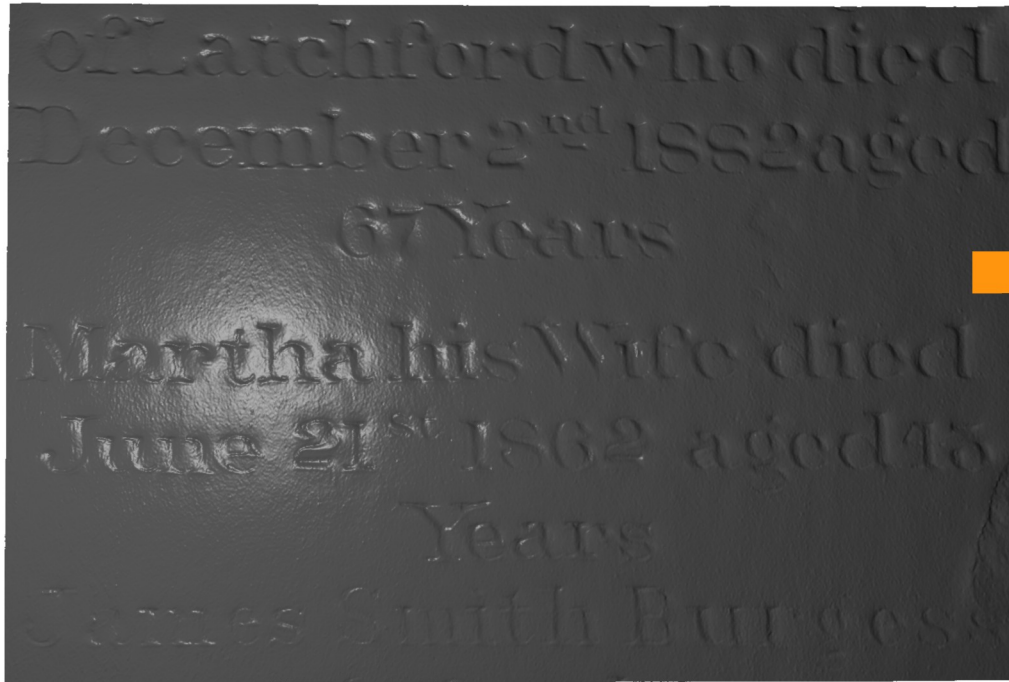
# Epitaph of St. Emilion





## Taking into account scale + filtering

### For Digital Squeeze



# Taking into account scale + filtering

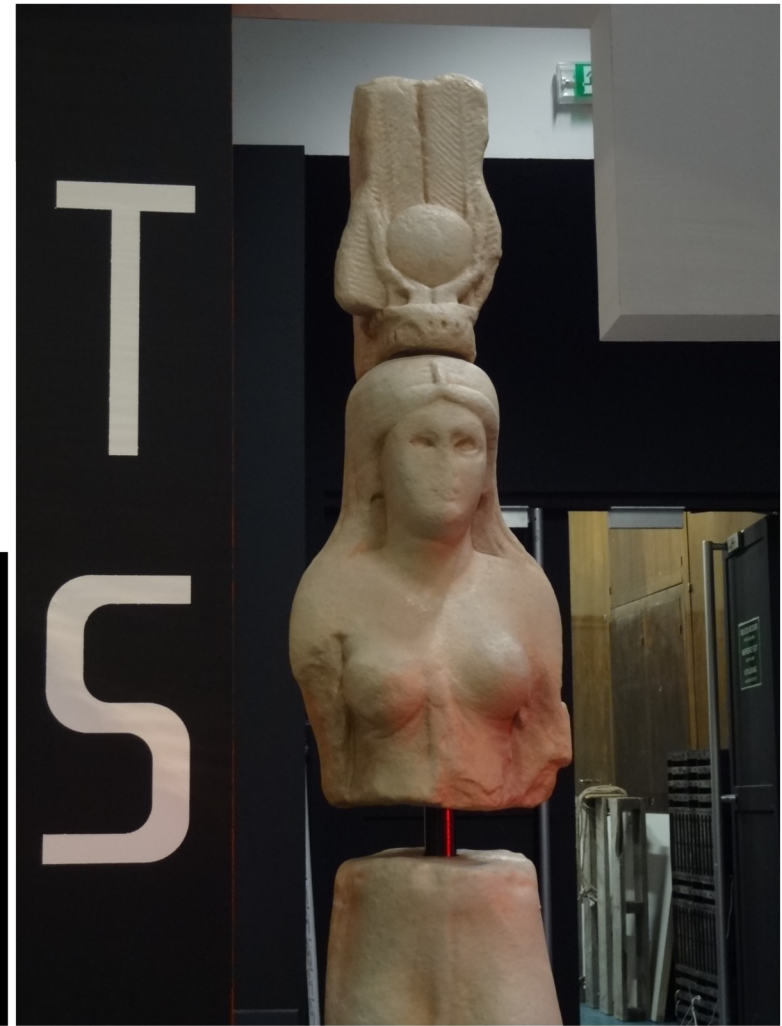
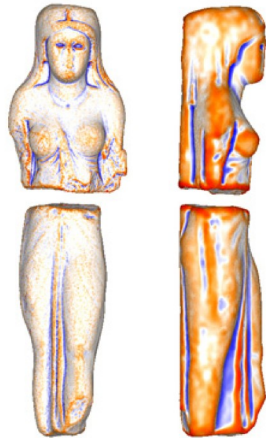
L. Amman, P. Barla, G. Guennebaud, X. Granier & P. Reuter  
*CGF 2012*



# 3

## Visualize

## Ex : Maritime museum (Paris)



# Spatial Augmented Reality

- From Prototype to museum
  - Real world as display support



# Spatial Augmented Reality

- From Prototype to museum
  - Real world as display support

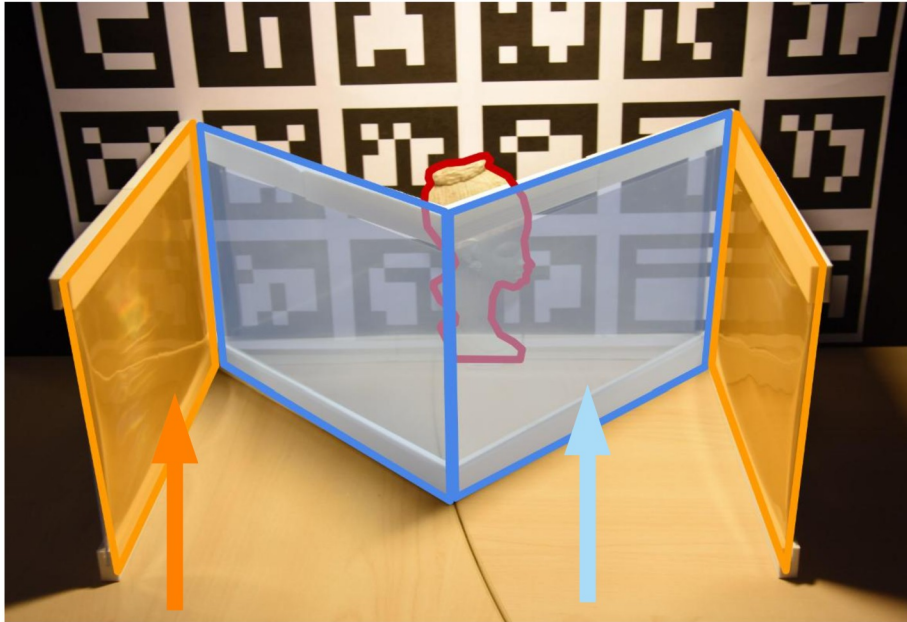


**Mercati di Traiano  
Museo dei Fori Imperiali**



ACM JOCCH 2014

# EgoSAR : Spatial Augmented Reality for Multiple Users

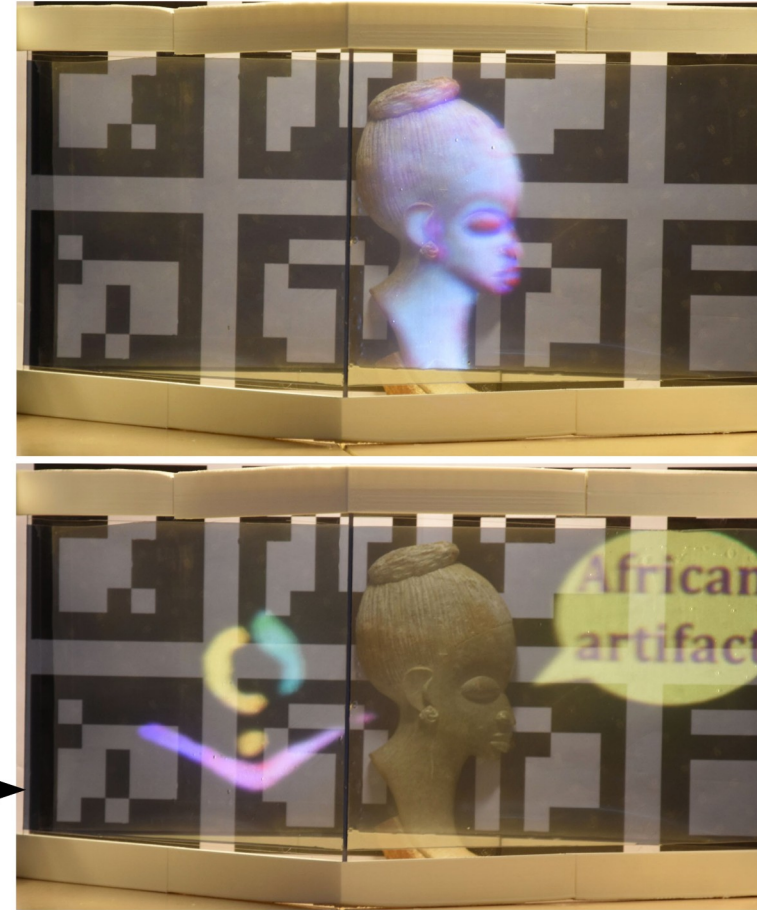


Retroreflection

Beam splitter

Personalized & view-  
dependant augmentation

IEEE ISMAR 2016



# 4

## Archiving





archéovision



Archeo**transfert**



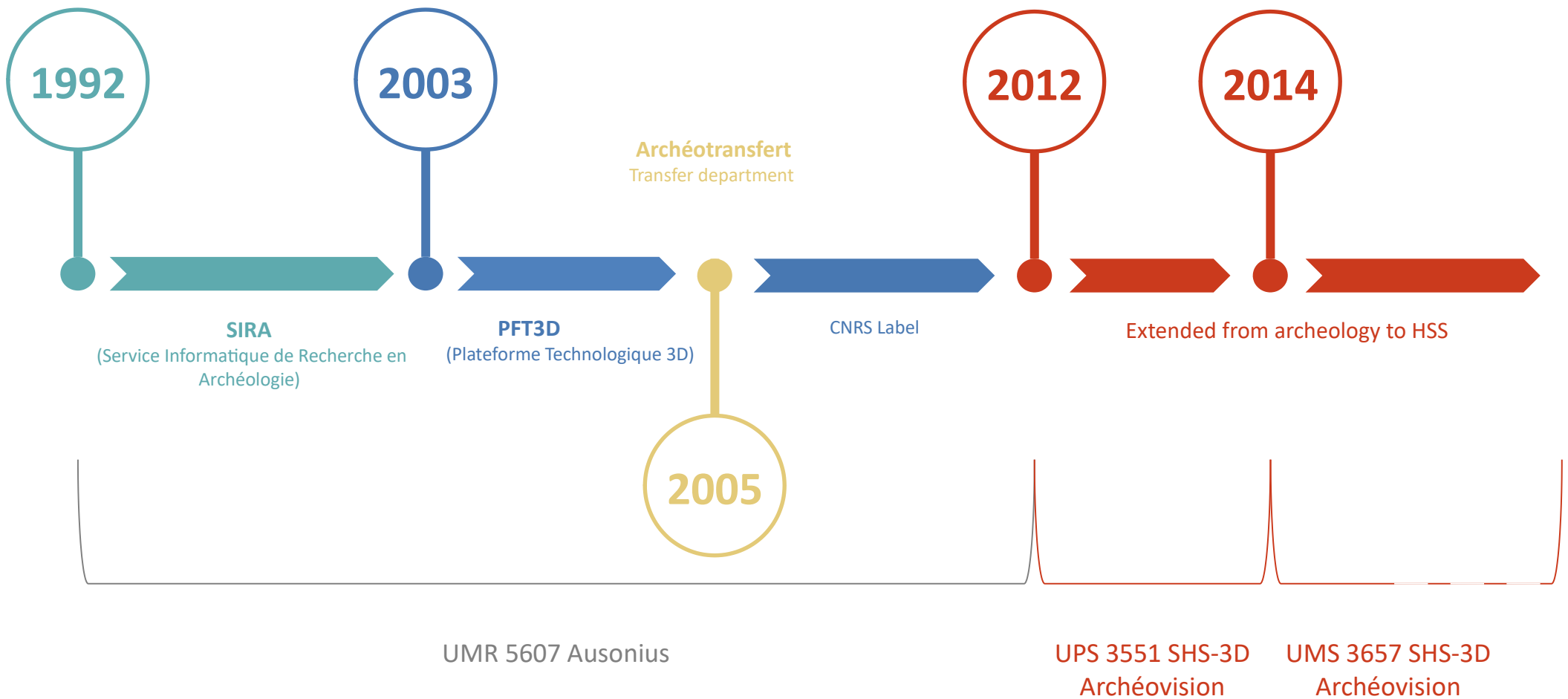
UMS SHS-3D 3657

Cellule de transfert d'Archéovision



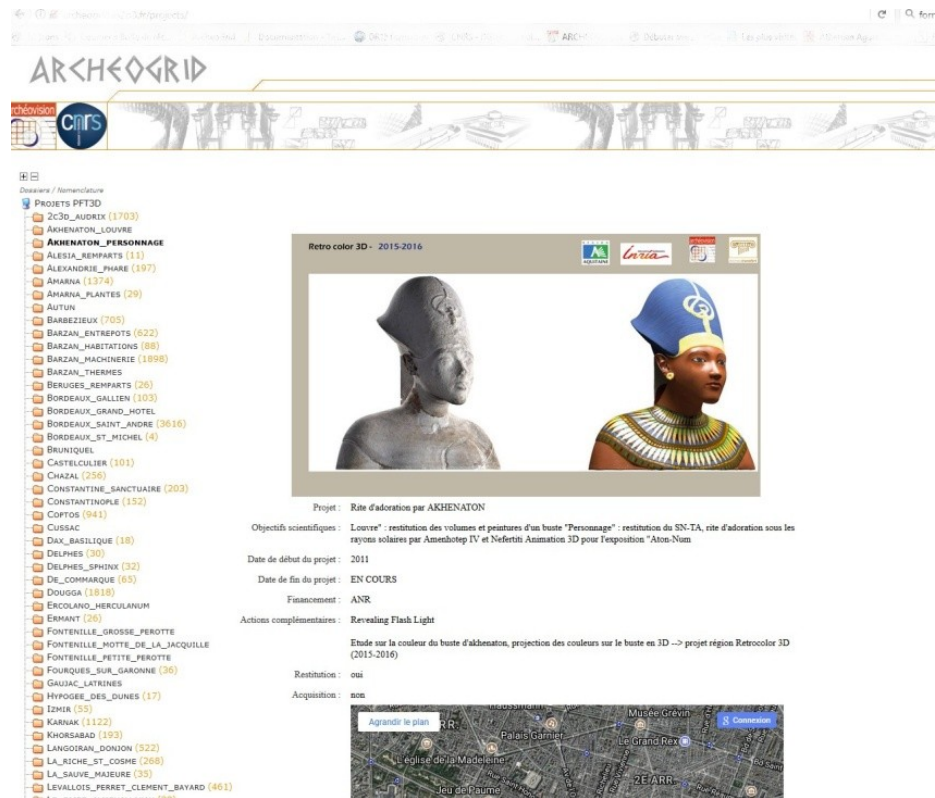
université  
de **BORDEAUX**

# 25 years of experience



# Archeogrid : more than 15 years of data organization

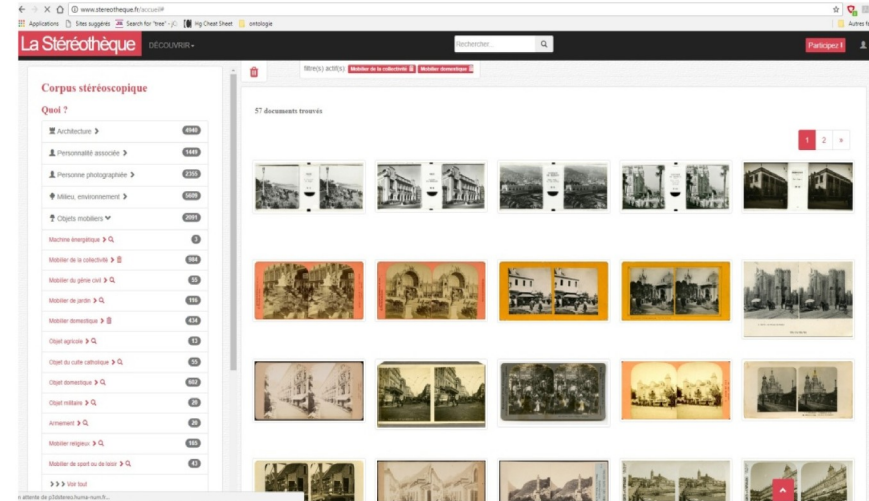
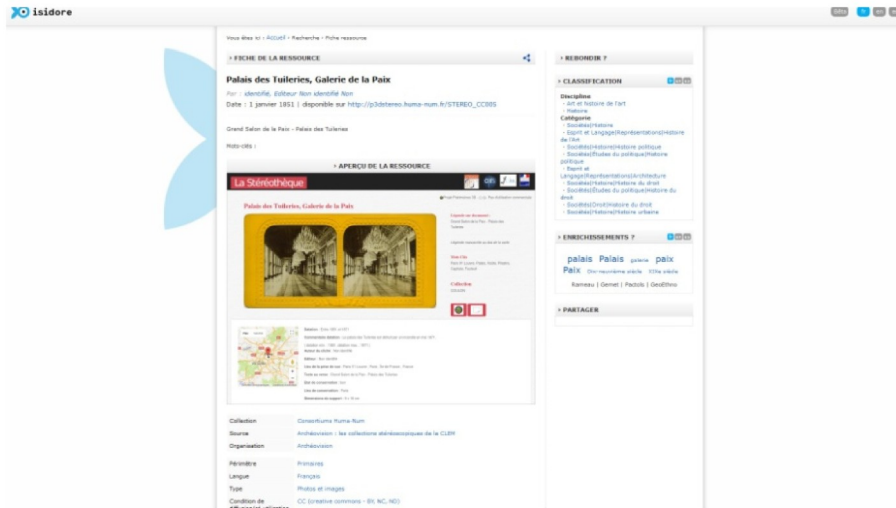
- Organize data from the team
- Data management
- Metadata enrichment
- Collaborative work with partners



The screenshot shows the Archeogrid website interface. At the top, the logo 'ARCHEOGRID' is displayed next to the CNRS logo. Below the header is a navigation menu and a list of projects. The project list includes various archaeological sites and their corresponding counts, such as 'PROJETS PFT3D', '2C3D\_AUDREX (1703)', 'AKHENATON\_LOUVRE', 'AKHENATON\_PERSONNAGE', 'ALESSA\_REMPARTS (113)', 'ALEXANDRIE\_PHARE (1497)', 'AMARNA (1374)', 'AMARNA\_PLANTES (29)', 'AUTUN', 'BARBEZIEUX (705)', 'BARZAN\_ENTREPOTS (622)', 'BARZAN\_HABITATIONS (88)', 'BARZAN\_MACHINERIE (1898)', 'BARZAN\_THERMES', 'BERUGES\_REMPARTS (26)', 'BORDEAUX\_GALLIEN (103)', 'BORDEAUX\_GRAND\_HOTEL', 'BORDEAUX\_SAINTE ANDRE (3616)', 'BORDEAUX\_ST\_MICHEL (4)', 'BRUNIQUEL', 'CASTELCULIER (101)', 'CHAZAL (255)', 'CONSTANTINE\_SANCTUAIRE (203)', 'CONSTANTINOPLE (152)', 'COPTOS (941)', 'CUSSAC', 'DIAZ\_BASILIQUE (18)', 'DELPHES (30)', 'DELPHES\_SPHINK (32)', 'DIE\_COMMARQUE (65)', 'DOUGGA (1818)', 'ERCOLANO\_HERCULANUM', 'ERMANT (26)', 'HYPOGEE\_DES\_DUNES (17)', 'IDRIS (55)', 'KARNAK (1122)', 'KHORSABAD (193)', 'LANGOSRAN\_DONJON (522)', 'LA\_RICHE\_ST\_COSME (268)', 'LA\_SAUVE\_MAJEURE (35)', 'LEVALLOIS\_PERRIT\_CLEMENT\_BAYARD (461)'. A project titled 'Rite d'adoration par AKHENATON' is highlighted, showing a 3D model of a bust. The project details include: 'Objectifs scientifiques: Louvre: restitution des volumes et peintures d'un buste "Personnage": restitution du SN-TA, site d'adoration sous les rayons solaires par Amenhotep IV et Nefertiti Animation 3D pour l'exposition "Aton-Num"', 'Date de début du projet: 2011', 'Date de fin du projet: EN COURS', 'Financement: ANR', 'Actions complémentaires: Revealing Flash Light', 'Etude sur le couleur du buste d'akhenaton, projection des couleurs sur le buste en 3D -> projet région Retrocolor 3D (2015-2016)', 'Restitution: oui', 'Acquisition: non'. A map at the bottom shows the location of the project in Paris, near the Louvre and the Grand Rex.

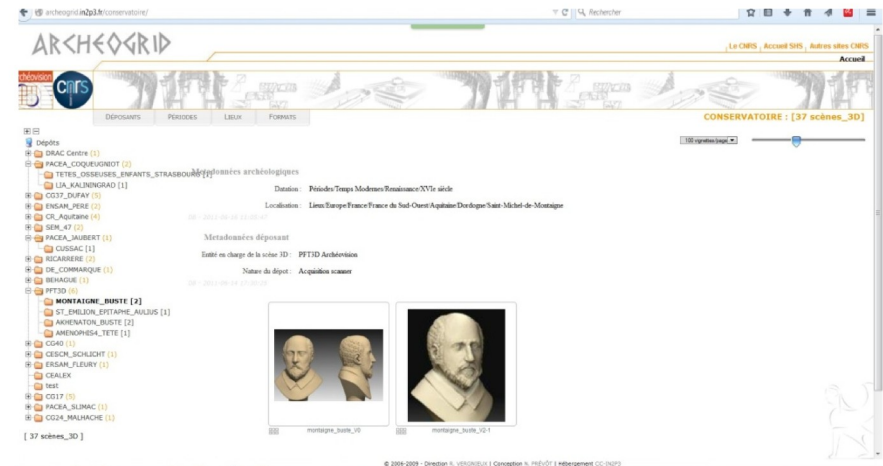
# Archeogrid: 3D data diffusion

- Publication of Corpus for research and other public with the Stereotheque
- Gathering and managing metadata



# Archeogrid: Data archiving

- Saving into Conservatory of 3D data for HSS, preparation to final archiving to CINES
- Servers from TGIR Huma-Num
  - National Digital Infrastructure for HSS



# 3D Consortium for Human & Social Sciences

*3D for all HSS*



Equipes membres du consortium 3D



<https://shs3d.hypotheses.org/>

# Goals

## Development & good use of 3D tools for HSS

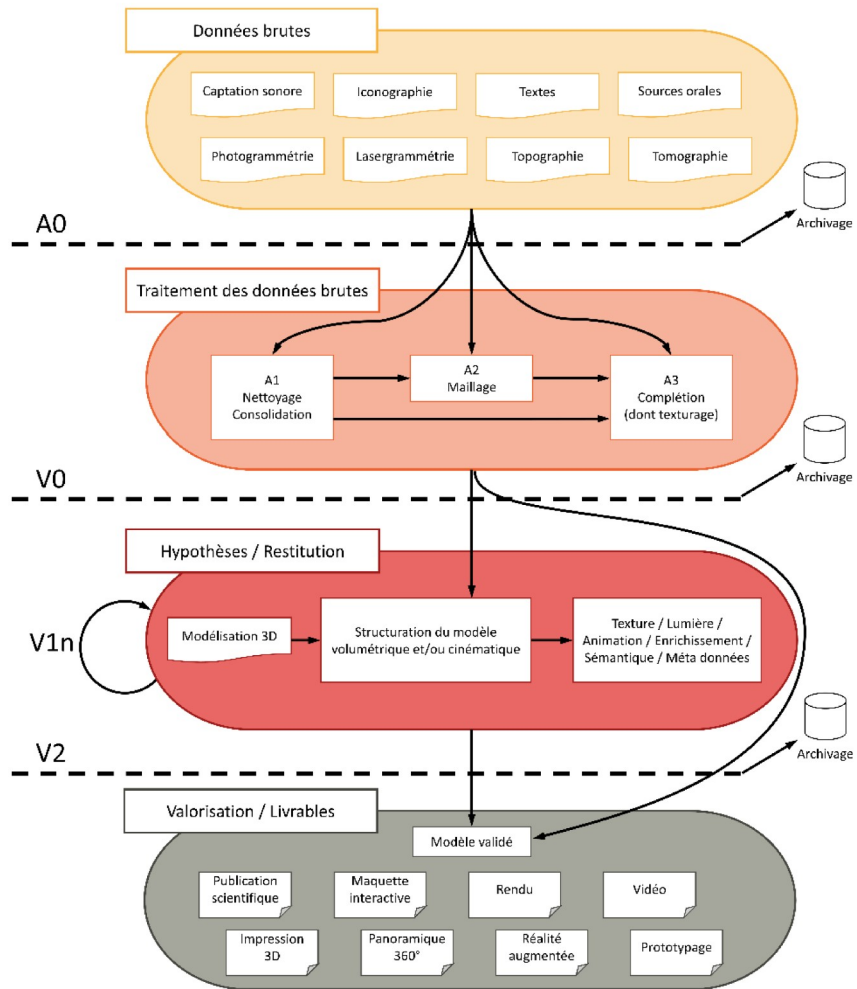
- 4 axes
  1. Technological review
  2. Elaboration and Transmission of Knowledge
  3. Life cycle, interoperability & archiving
  4. HSS meetings: exchanges of uses, communication & formation

[consortium3d-coordination@services.cnrs.fr](mailto:consortium3d-coordination@services.cnrs.fr)

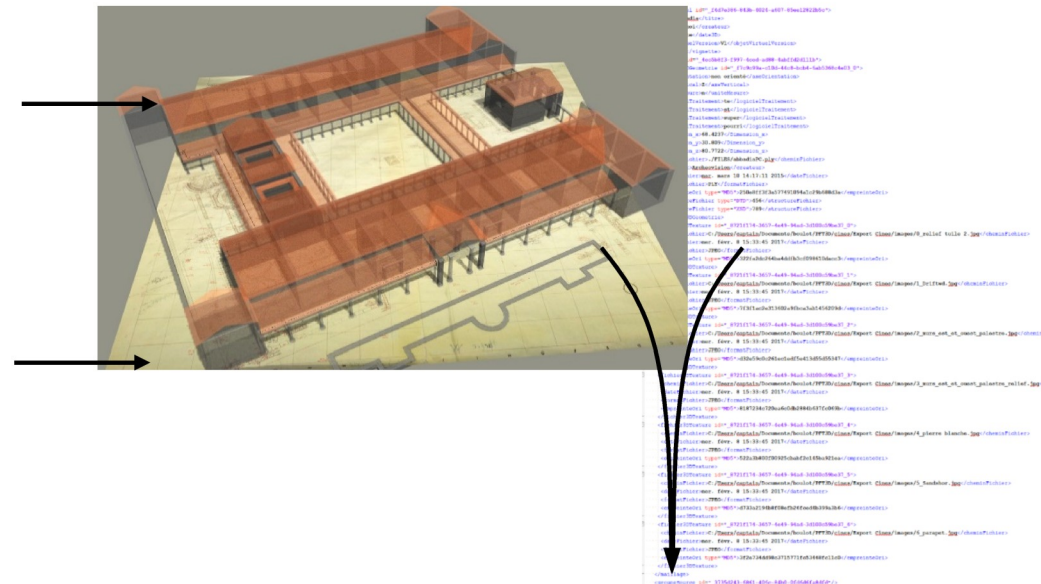




# Graphe séquentiel de la production de données 3D



# Archiving 3D data





# 3D Repository for HSS

- aLTAG 3D
  - Archiving software
  - Easy to create metadata
  - Packet creation
- Archiving @ CINES
  - Format ply / dae (COLLADA)
  - Currently in the process of finalisation

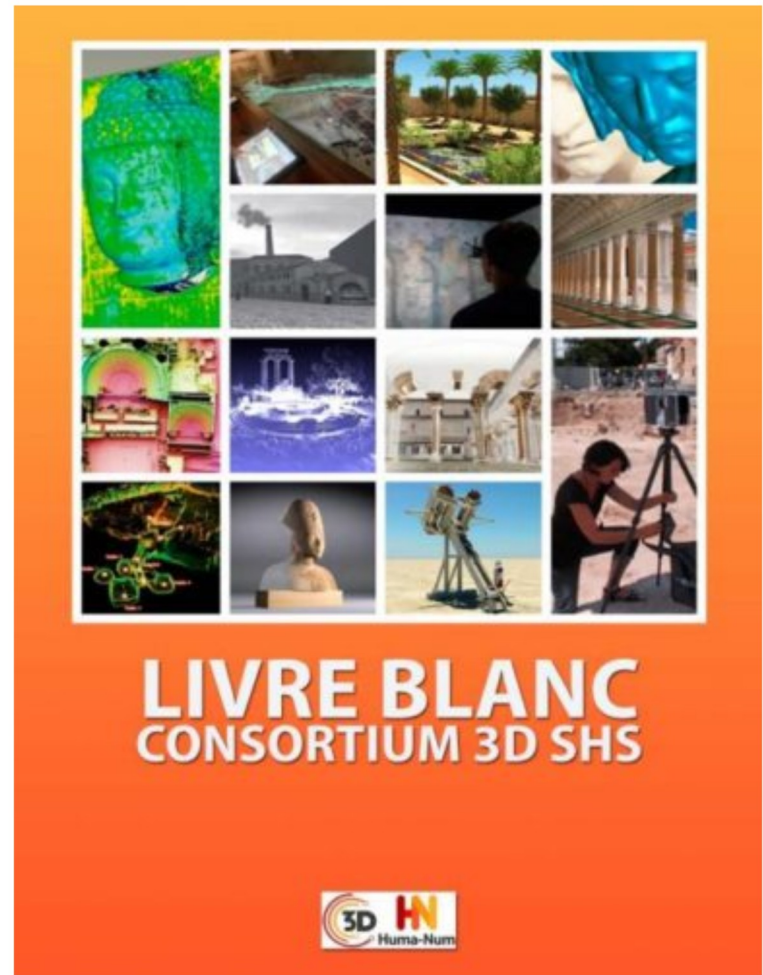


[consortium3d-coordination@services.cnrs.fr](mailto:consortium3d-coordination@services.cnrs.fr)

# White Paper

- Tools &
- Good Practices

<https://hal.archives-ouvertes.fr/hal-01683842/>



# 5

## Open to Collaborate

## We are open to collaborate

- Spreading the use of 3D for HSS
  - More international
  - What about a Chinese white paper ?
- Appearance Acquisition
  - New challenges
  - Development of tools for on-site acquisitions
- Visualization
  - New display systems
  - New HCI
- Archiving
  - Challenge: development of tools to explore the archived data
    - Semi-Automatic classification
    - Matching
    - ....

# 谢谢

<http://xgranier.free.fr>

