CVL SEMINAR

Reassemble the second Khufu ship

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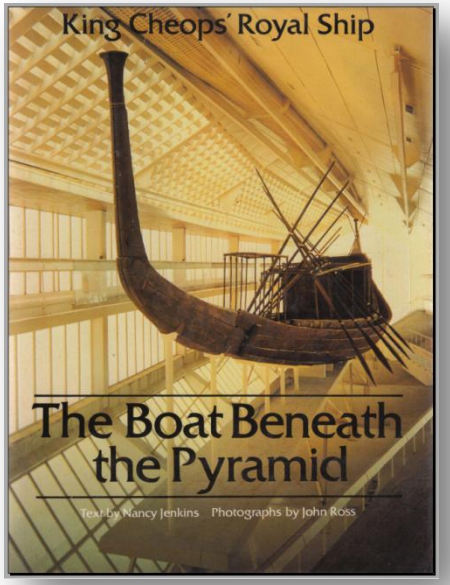
Overall Workflow

- 3D data acquisition
- 3D data modeling
- Non-planar 2D puzzle
- Global shape optimization

Material return from Waseda group

- 2 books
  - One overall introduction about the 1st ship
  - A technical report on the excavation
- 1 ppt
  - Technical preview of the excavation of the 2nd ship
- 1 essay
  - Technical report
- 1 video
  - Shot by national geography



Overall Workflow

3D data acquisition

- Raw data acquisition
- Alignment, registration and merging
- Repair

3D data modeling

Non-planar 2D puzzle

Global shape optimization

Raw data acquisition

- Inside view of the second pit

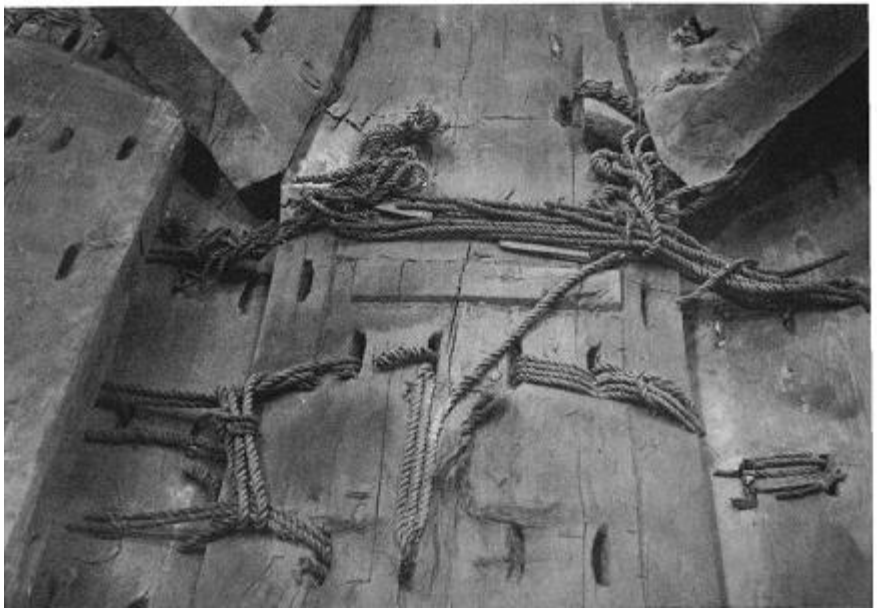
Comparison between two pits

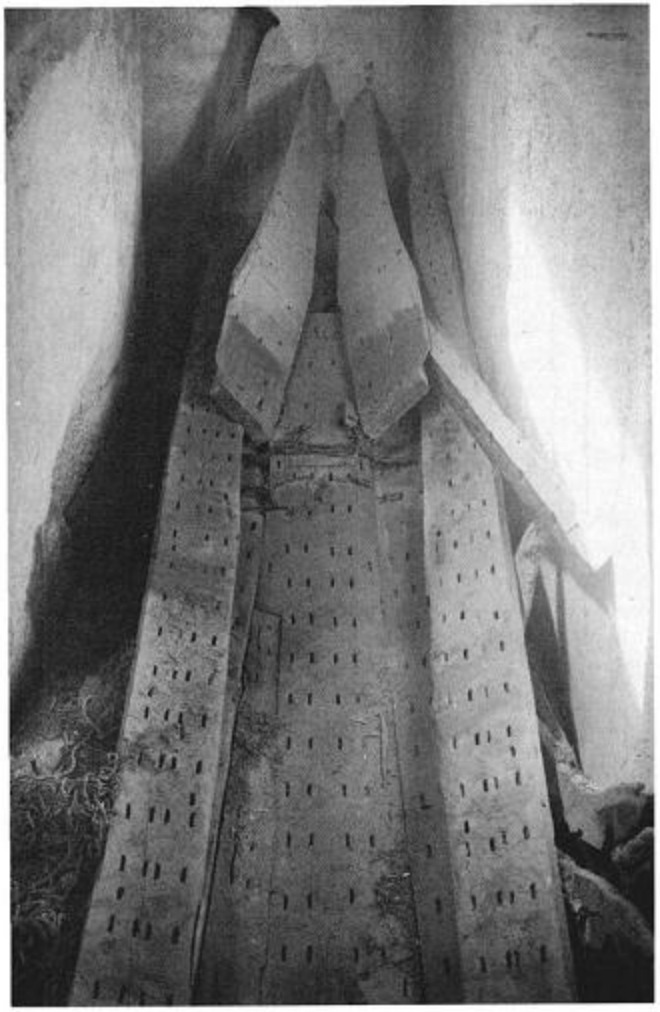
- 1st pit

2nd pit

Raw data acquisition

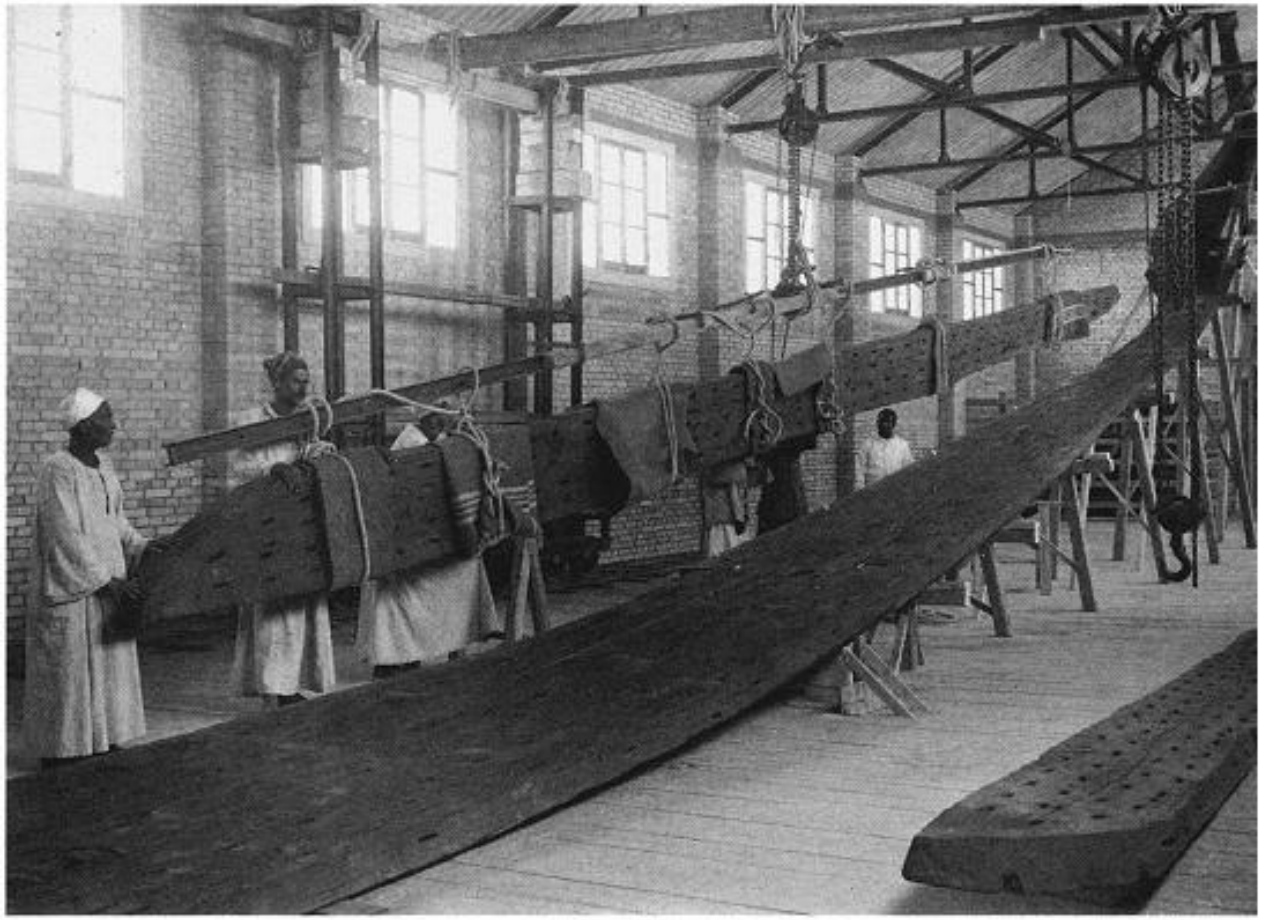
- Holes





Raw data acquisition

- Deformation



Overall Workflow

3D data acquisition

- Raw data acquisition
- Alignment, registration and merging
- Repair

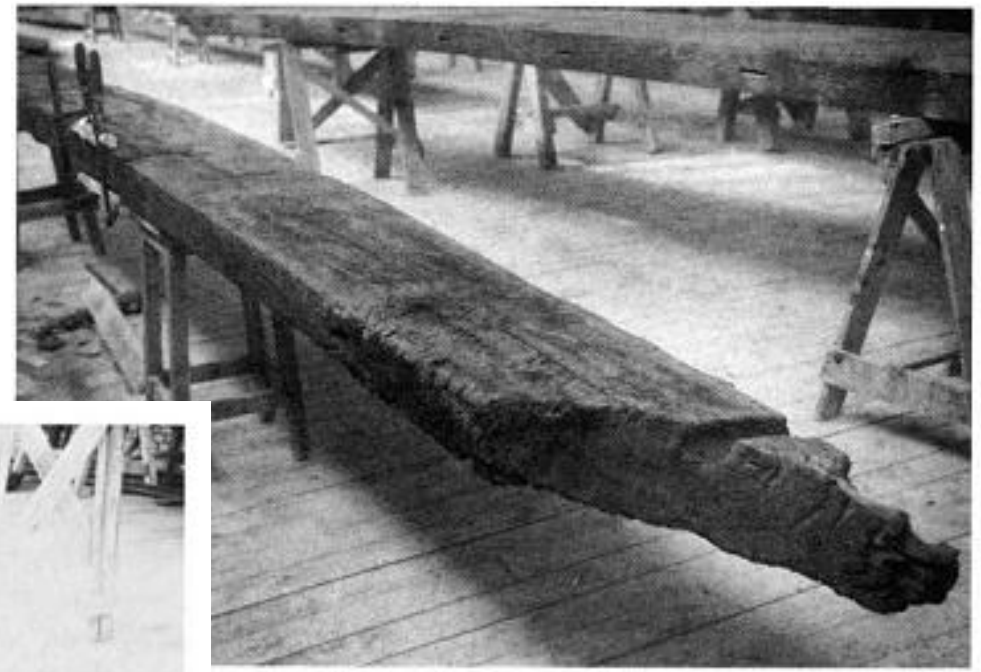
3D data modeling

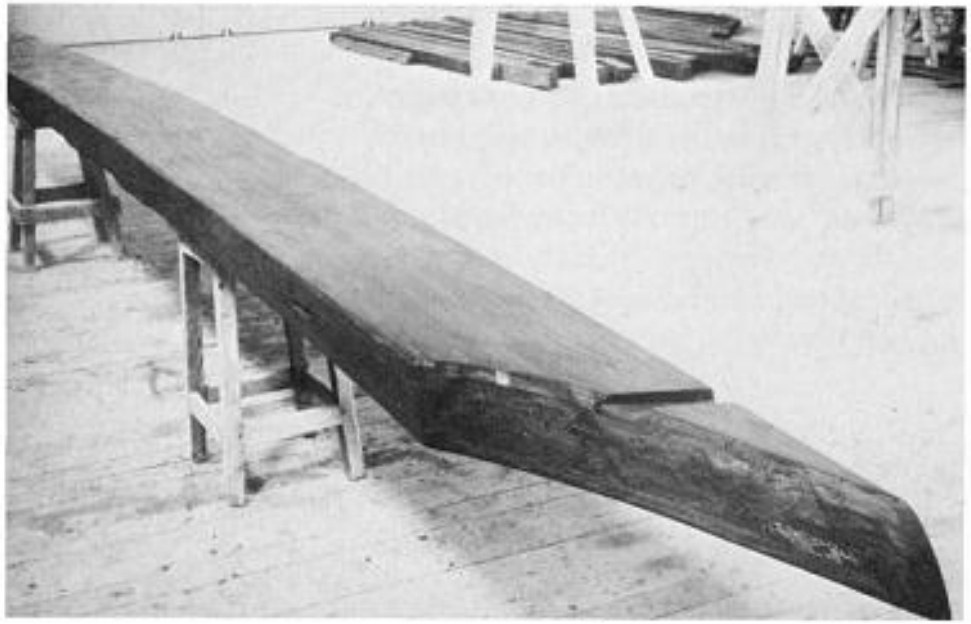
Non-planar 2D puzzle

Global shape optimization

Repair

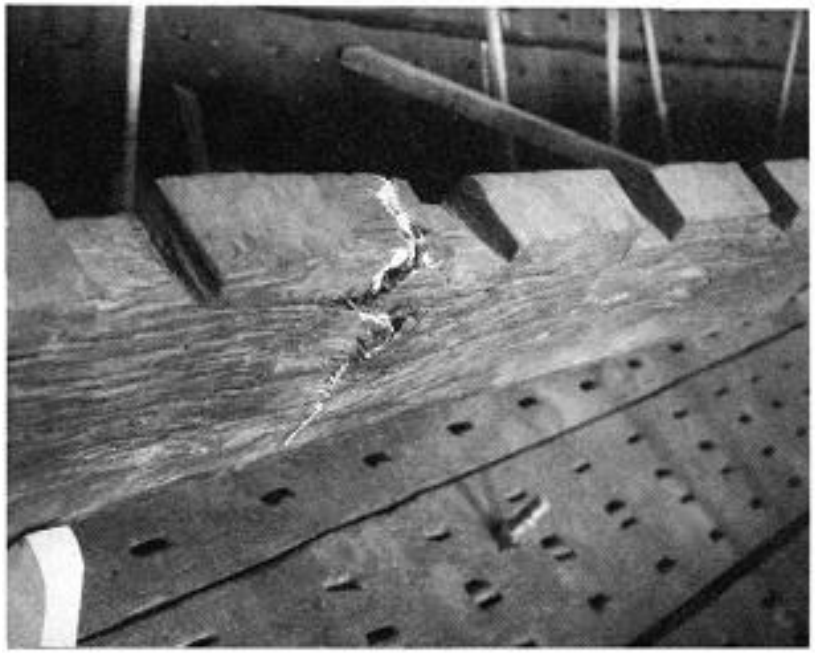
- Corruption





Repair

- Fissures or even fractures



Overall Workflow

3D data acquisition

3D data modeling

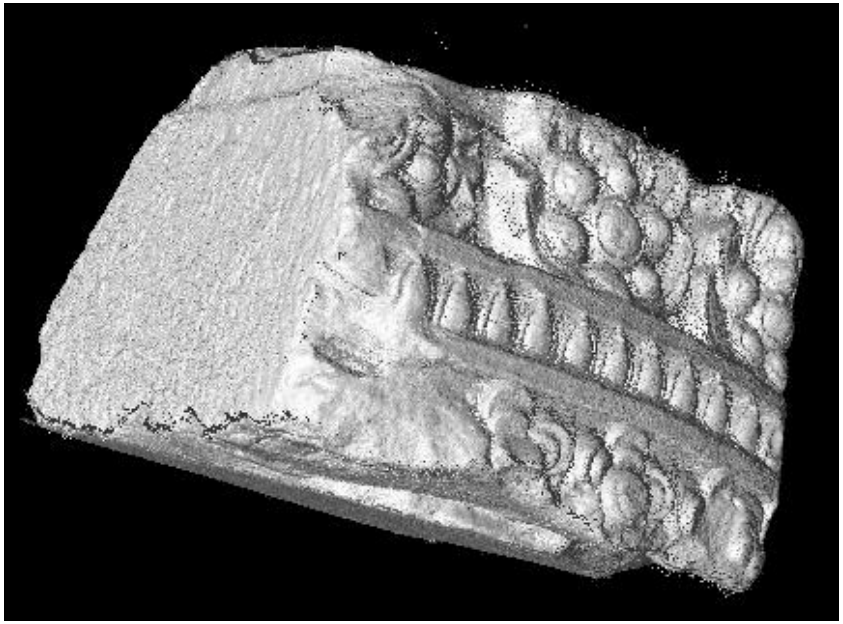
- Feature extraction
- Free deformable model

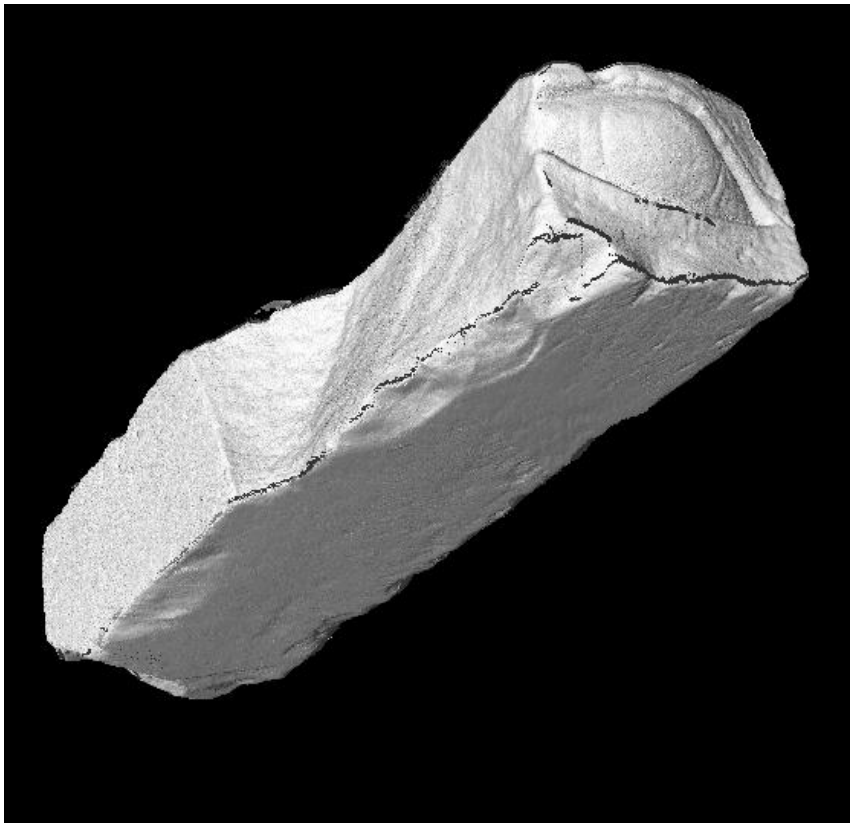
Non-planar 2D puzzle

Global shape optimization

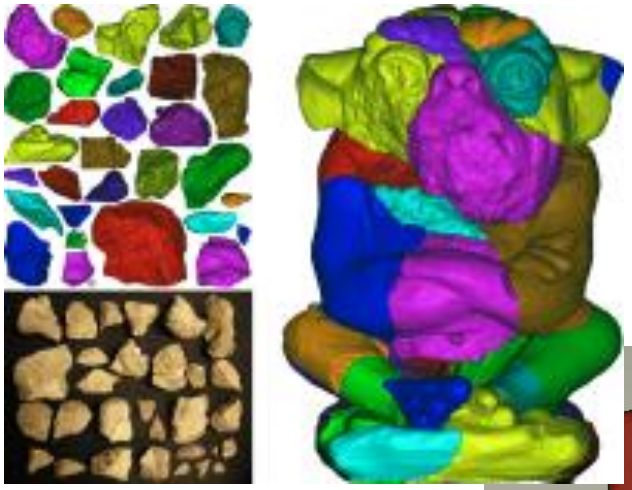
Feature extraction

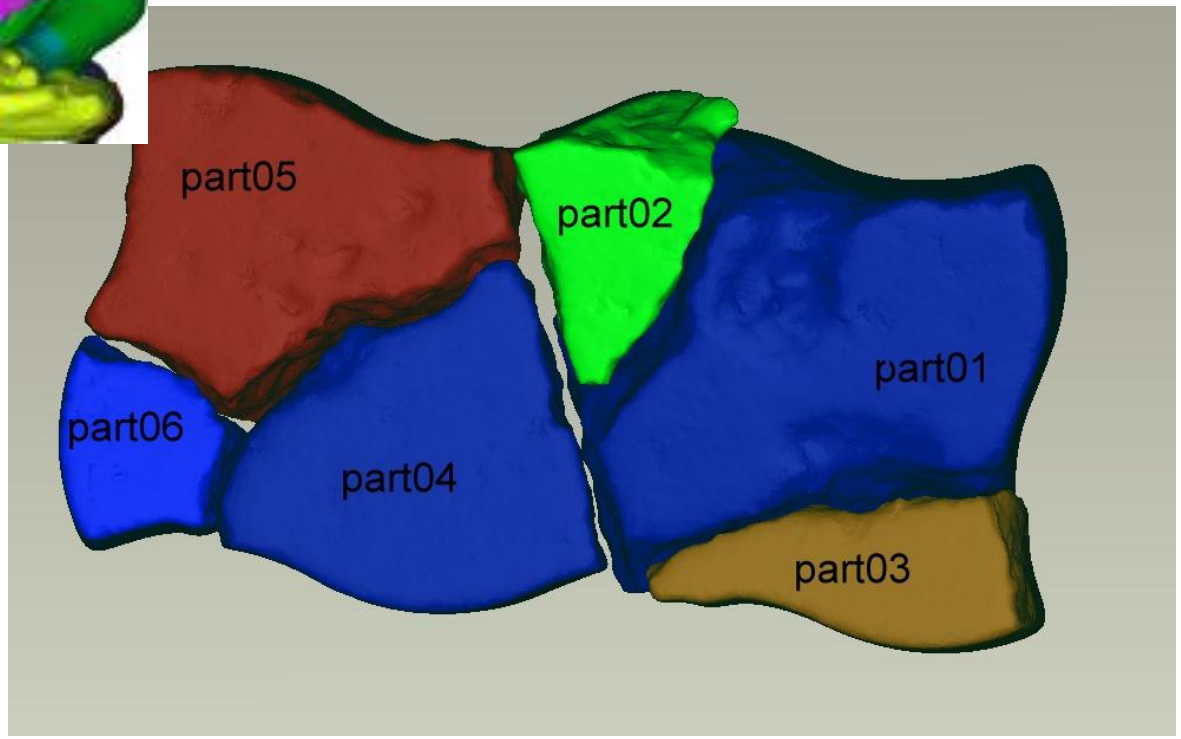
- The 3D EP (explicit polynomials) Descriptor
- Test the descriptor by fragment data



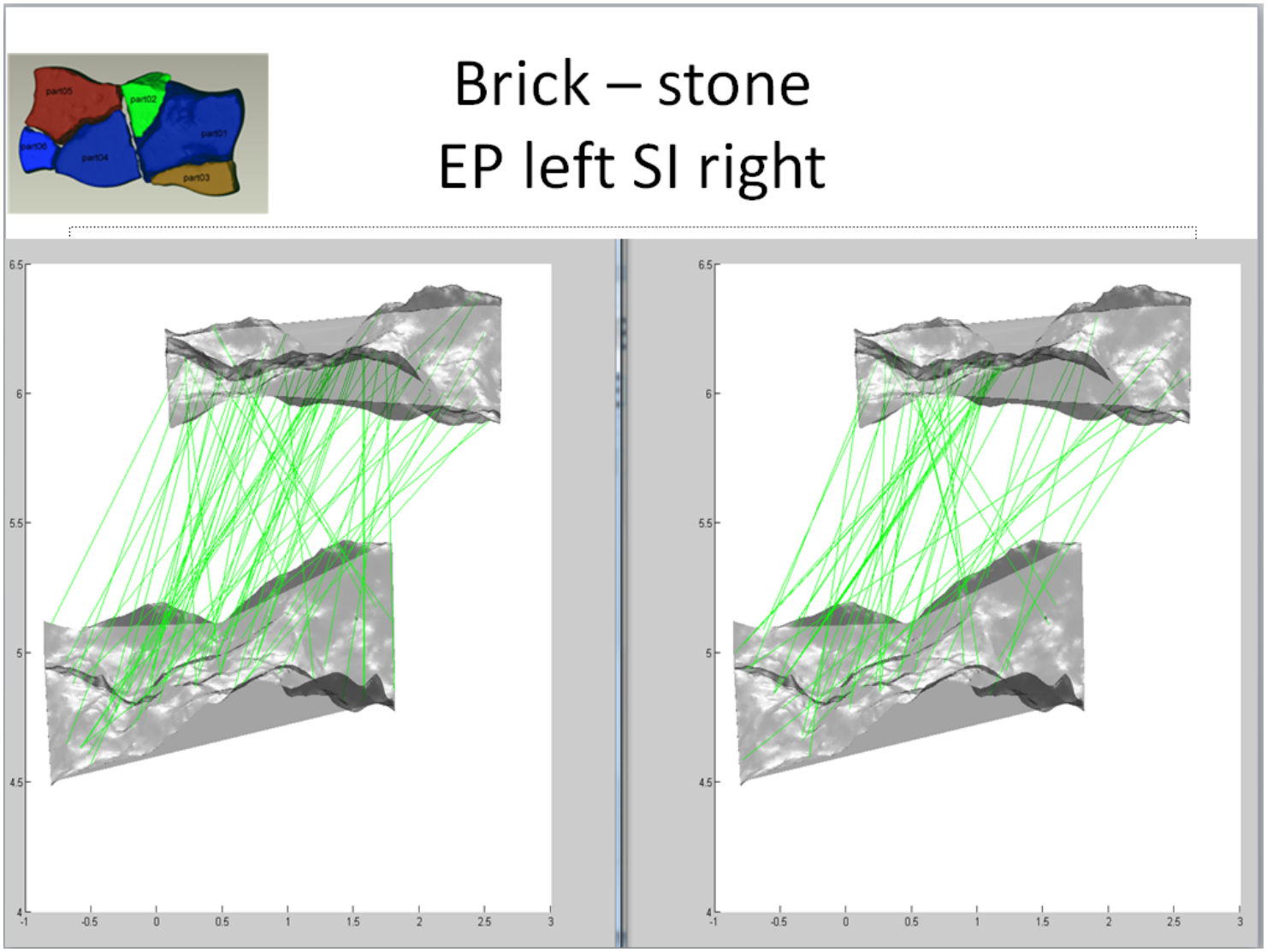


The open data from GMIG



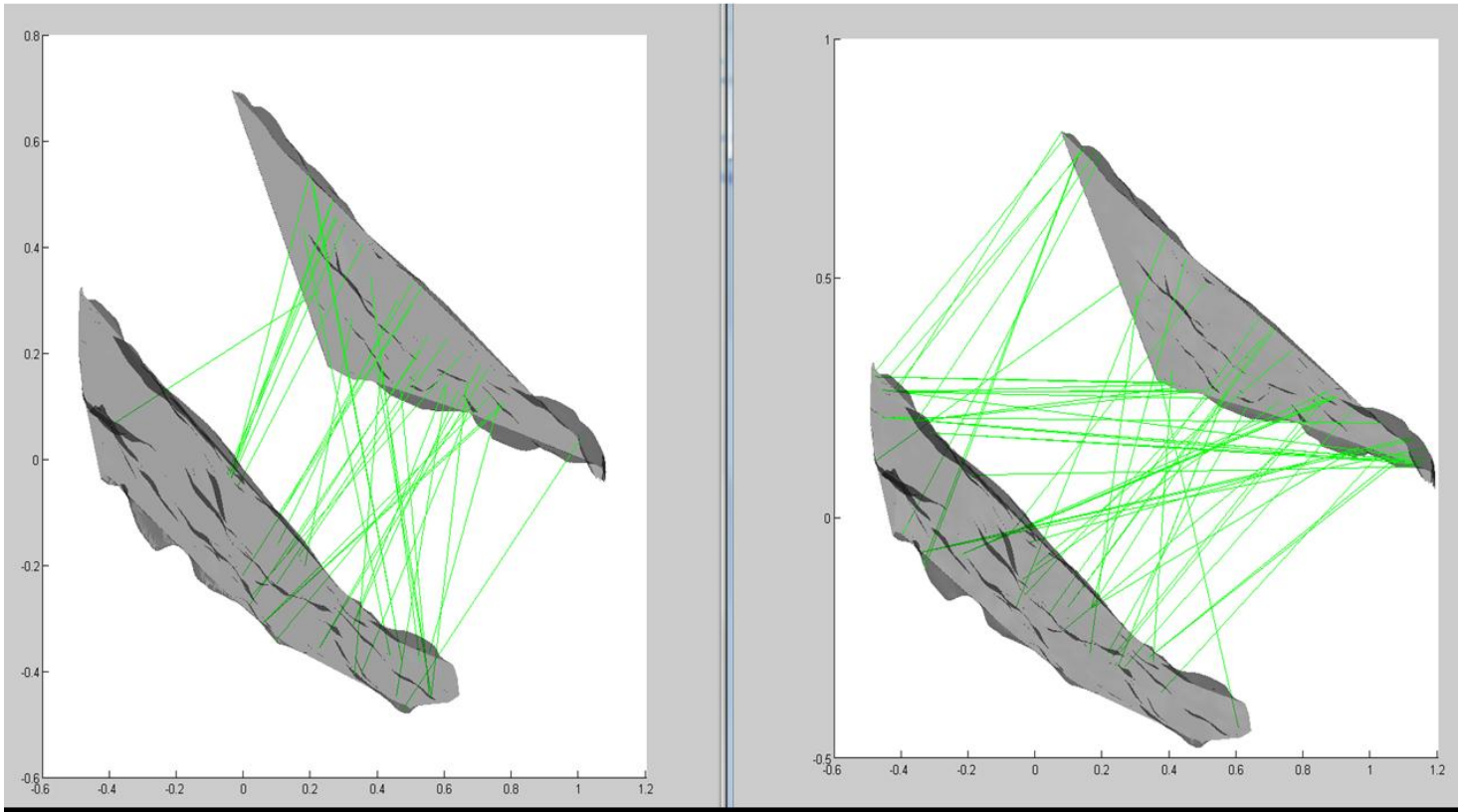


Compare with Spin Image



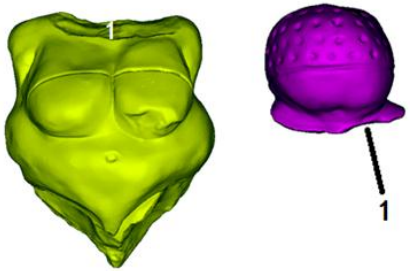
Compare with Spin Image

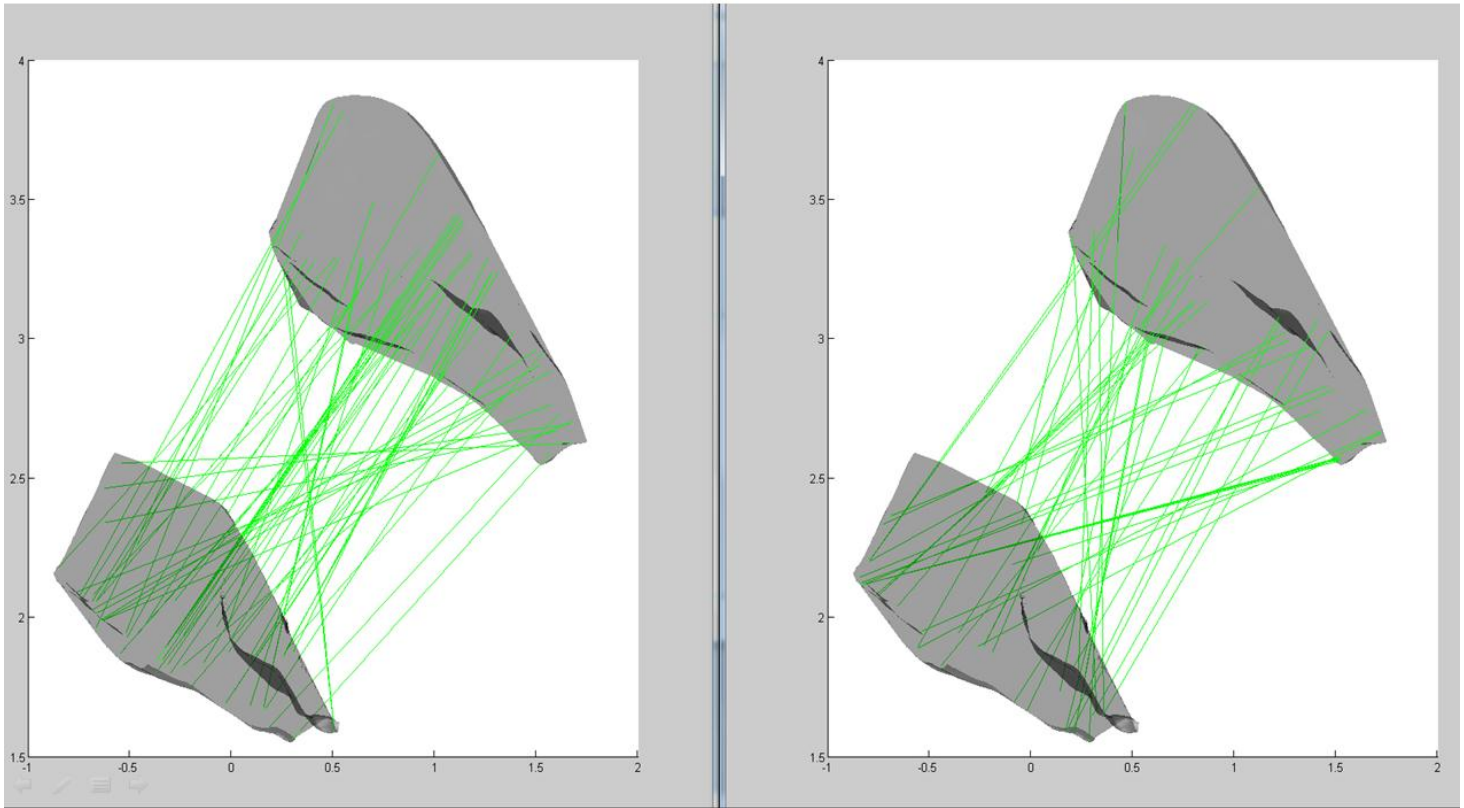
Cake – mortar
EP left SI right



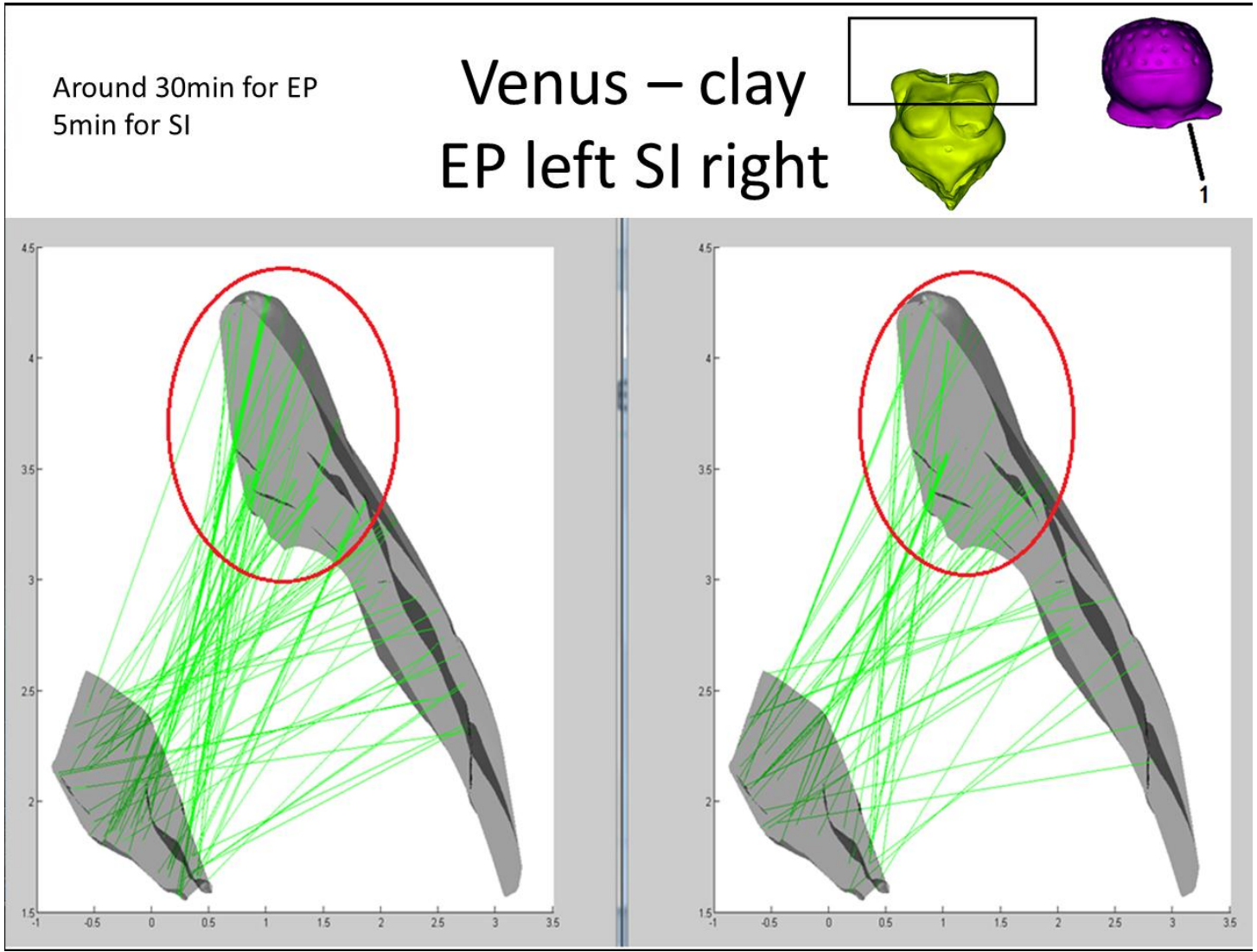
Compare with Spin Image

Venus – clay
EP left SI right





Compare with Spin Image



Speed up 3D EP descriptor

- Non-essential
  - Power function against multiplication

$$x^i y^j z^k \quad i + j + k \leq L$$

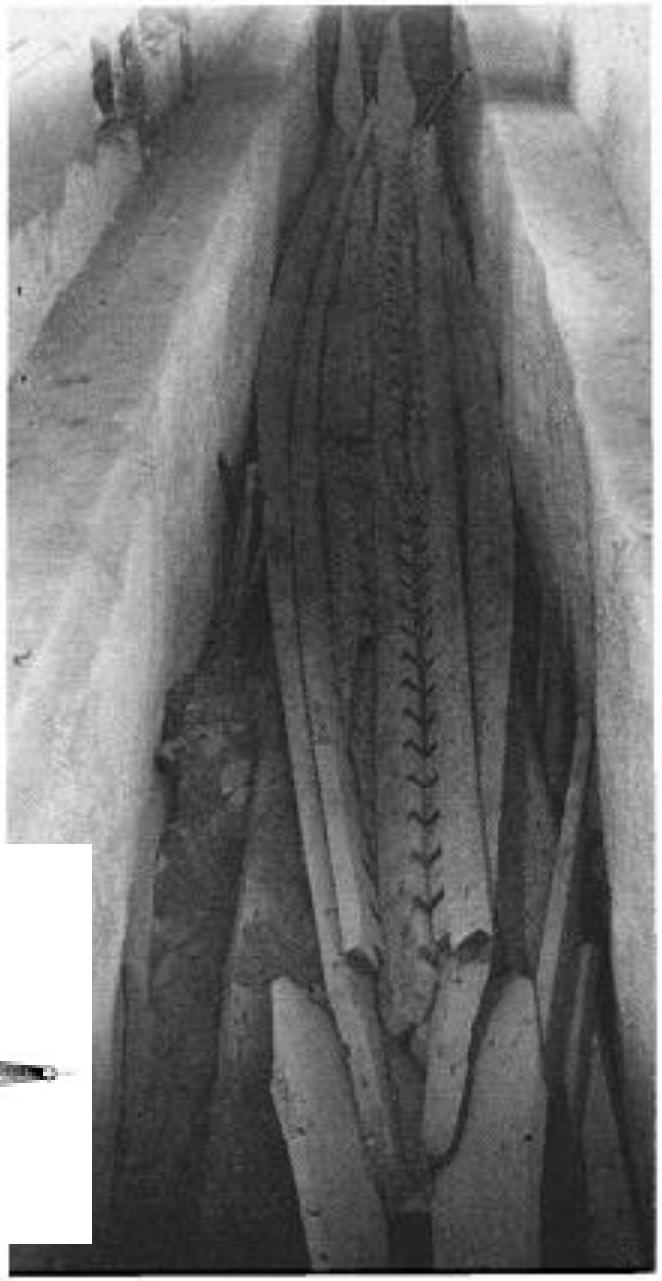
- Essential
  - Using a detector
  - Observe the invariant subspace, see if there is any invariants

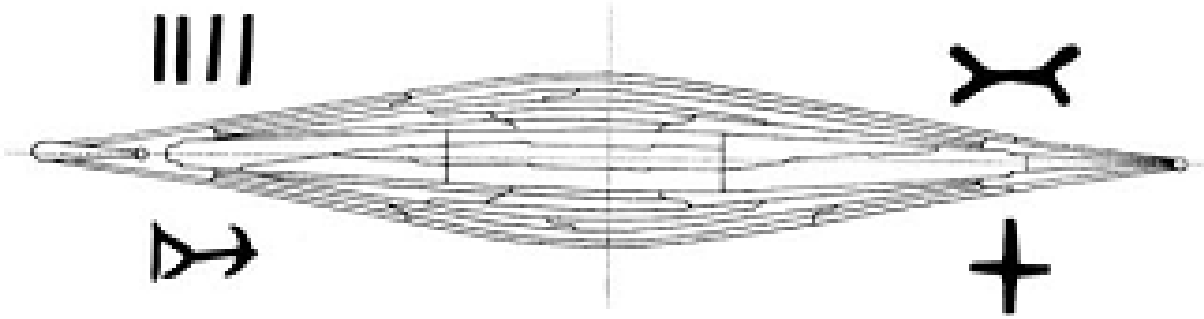
Overall Workflow

- 3D data acquisition
- 3D data modeling
- Non-planar 2D puzzle
- Global shape optimization

Non-planar 2D puzzle

- Clues
  - Well arranged
  - Symbols used by ancient carpenter





Overall Workflow

- 3D data acquisition
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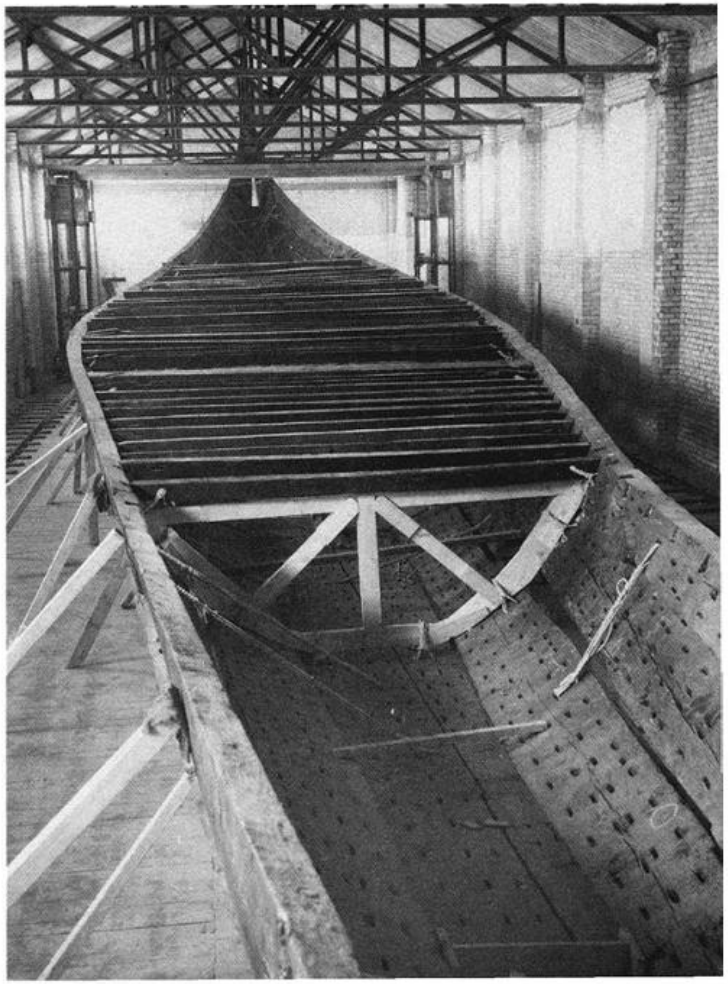
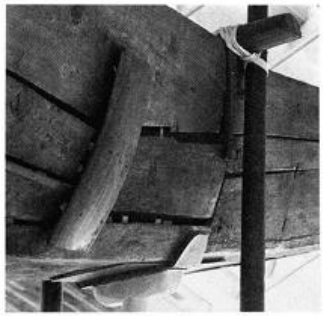
Global shape optimization

- Incomplete inside support

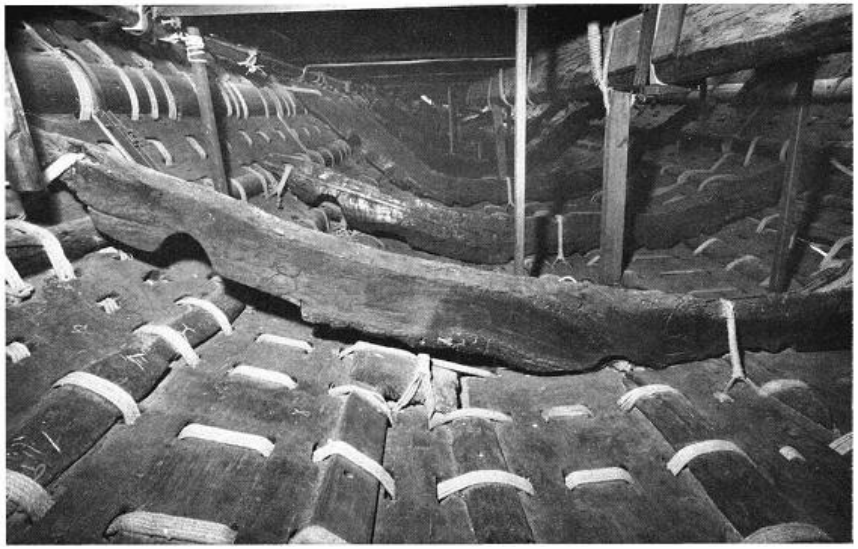


Global shape optimization

- Places can be improve



81–83 (Above) *A drawing of the strakes of the Royal Ship (bow to the right) shows the relationship of the hull timbers and the way they have been hooked and scarfed together.* (Left) *Curved rectangular battens conceal the ropes lashing the papyriform stern piece to the stern section of the boat. Similar battens serve the same function in the bow.* (Below) *The interior of the completed hull, showing the over-and-under stitching that binds the timbers together (cf. ill. 80). Modern steel braces help to support the deck hatches overhead. Some carpenter's marks can be seen in the left foreground.*



Thank you !