



# Case Studies on 3D Digitization of Cultural Relics

Scantech • A World-leading Brand of 3D Digitization

01

# About Scantech-Company Intro

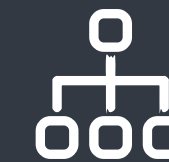


One of the earliest high-tech companies starting to research and develop handheld 3D visual measurement devices across the world. Reaching cooperation for joint R&D centers and co-development plans with multiple optical metrology companies in Europe. Products are sold to more than 60 countries and regions, serving over 5000 enterprises. Provide industrial frontier 3D measurement solutions for prominent enterprises and research institutions like Boeing, NASA, BMW, Volkswagen, Apple, Siemens, etc.

Scantech · 3D Digitizing Everything



PhD at the UMich



Independent patents



With optical metrology companies in Europe

01

## About Scantech-Brand Brief



# World-class Products

### R&D

- 45% of employees engage in R&D
- 60% of them hold master or doctor degrees

### Accuracy

- Industrial metrology
- Accuracy up to 0.020 mm

### Patent

- 51 Chinese patents
- 9 International patents
- Complete intellectual property system

### Algorithm

- Portable binocular vision technology
- High-precision stereo calibration algorithm

02

## Products-Portable 3D Scanners

HD color texture

**IREAL**



Multi-purpose, fine details

**KSCAN**



Non-marker scan, high accuracy

**TRACKSCAN**



02

## Products-Handheld Color 3D Scanner

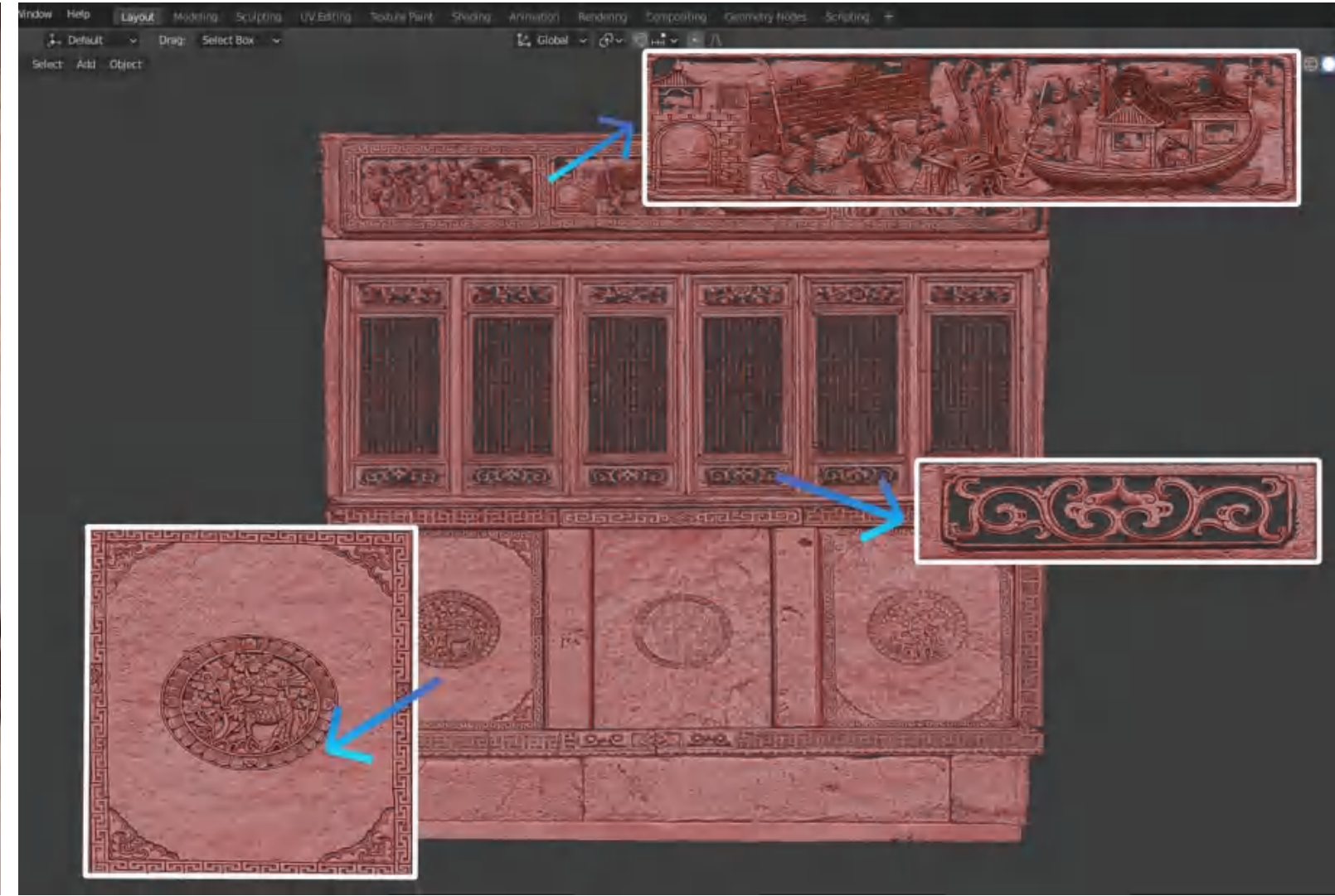


**3D scanner:** iReal 2E; **Highest accuracy:** 0.1 mm; **Highest resolution:** 0.2 mm

**Technical advantages:** It can obtain color texture directly, and can directly 3D scan items with rich geometric features/texture features without sticking markers. Easy to use and fast to get started with.

**Applications:** 3D scanning medium and large-sized carved artwork and objects with matte surfaces (the recommended scanning size should be larger than 50 cm, suitable when the requirements on color restoration and accuracy are relatively low).

## Products-Handheld 3D Laser Scanners



**TrackScan-P42:**

Ancient Building Carvings

Dinosaur Fossil Site Excavation

**3D scanners:** KSCAN-Magic, TrackScan 3D scanner series

**Highest accuracy:** 0.02 mm/m; **Highest resolution of ultra-fine blue light:** 0.01 mm

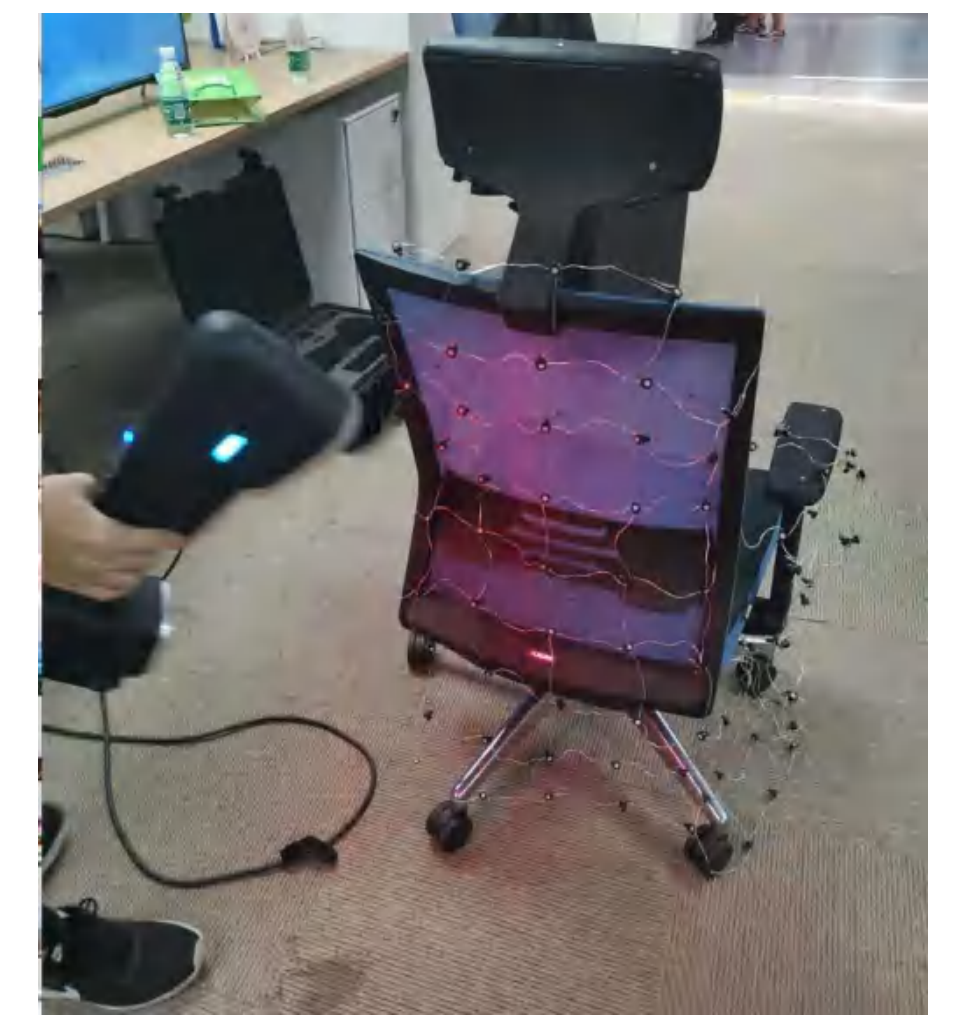
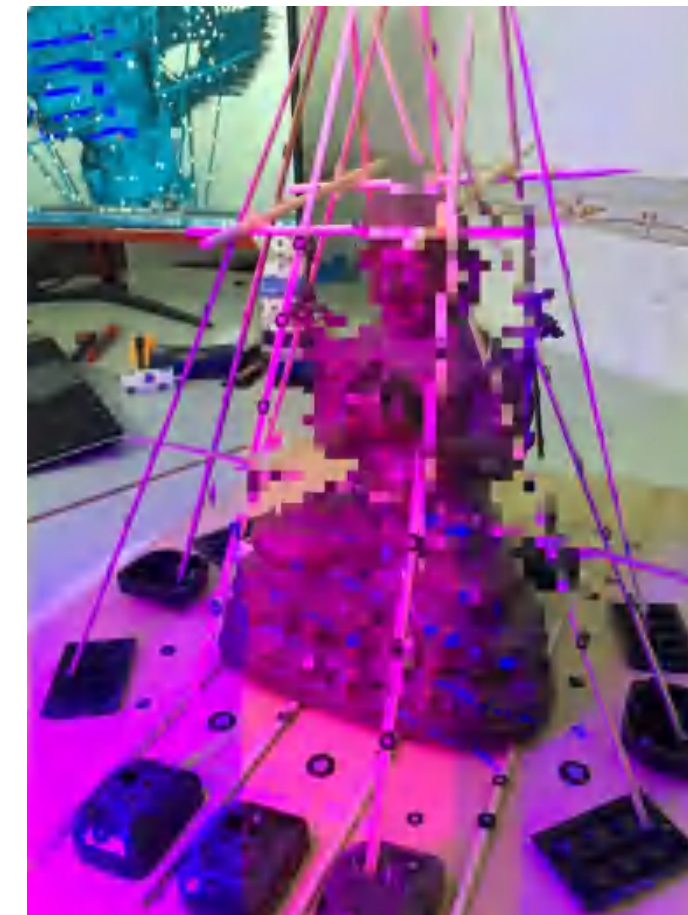
**Technical advantages:** Strong material adaptability (no need to spray powder for reflective/dark objects), ability to obtain complete 3D data of deep holes and dead corners, fine details (even for the patterns on the coins), no limitations on the size of the scanned object, and high accuracy.

**Notes:** When using KSCAN-Magic, you need to stick markers on the scanning auxiliary to obtain 3D data of the scanned object. If the scanned object cannot be stick with markers and the scanning auxiliary cannot help, it is more suitable to scan relics within 50 cm (if the size is too large, markers need to be placed on the scanned object). The price of KSCAN-Magic is moderate.

TrackScan can realize non-marker scanning, especially for medium and large-sized cultural relics, however, its price is relatively expensive.

02

## KSCAN-Magic - Auxiliary Tools for Sticking Markers



Note: With clever use of auxiliary tools and magnetic markers, you can scan without sticking markers on the scanned items.

## Overview-3D Digitization of Cultural Relics

Using the 3D digital modeling technology of cultural relics, accurately obtain the 3D information of their texture and size, establish 3D models of precious cultural relics, and effectively carry out digital protection for them. 3D digitization can provide important data support for the digital protection of precious cultural relics.

There are three major types of 3D models that 3D digitization of cultural relics normally outputs:

- High-precision 3D model: used in data archiving, scientific research analysis, heritage restoration, 3D printing and reproduction, damage identification, etc.;
- Line map of cultural relics: Draw line maps faster based on 3D models, record relics scientifically and vividly in the form of points, lines and surfaces, and use them to study the decoration, craftsmanship and other information on cultural relics;
- True color 3D modeling: applied to digital display system, panoramic reconstruction of virtual exhibition hall, animation production of education display, 3D model display system on mobile terminal (such as WeChat), offline multimedia touch display system, etc.



04

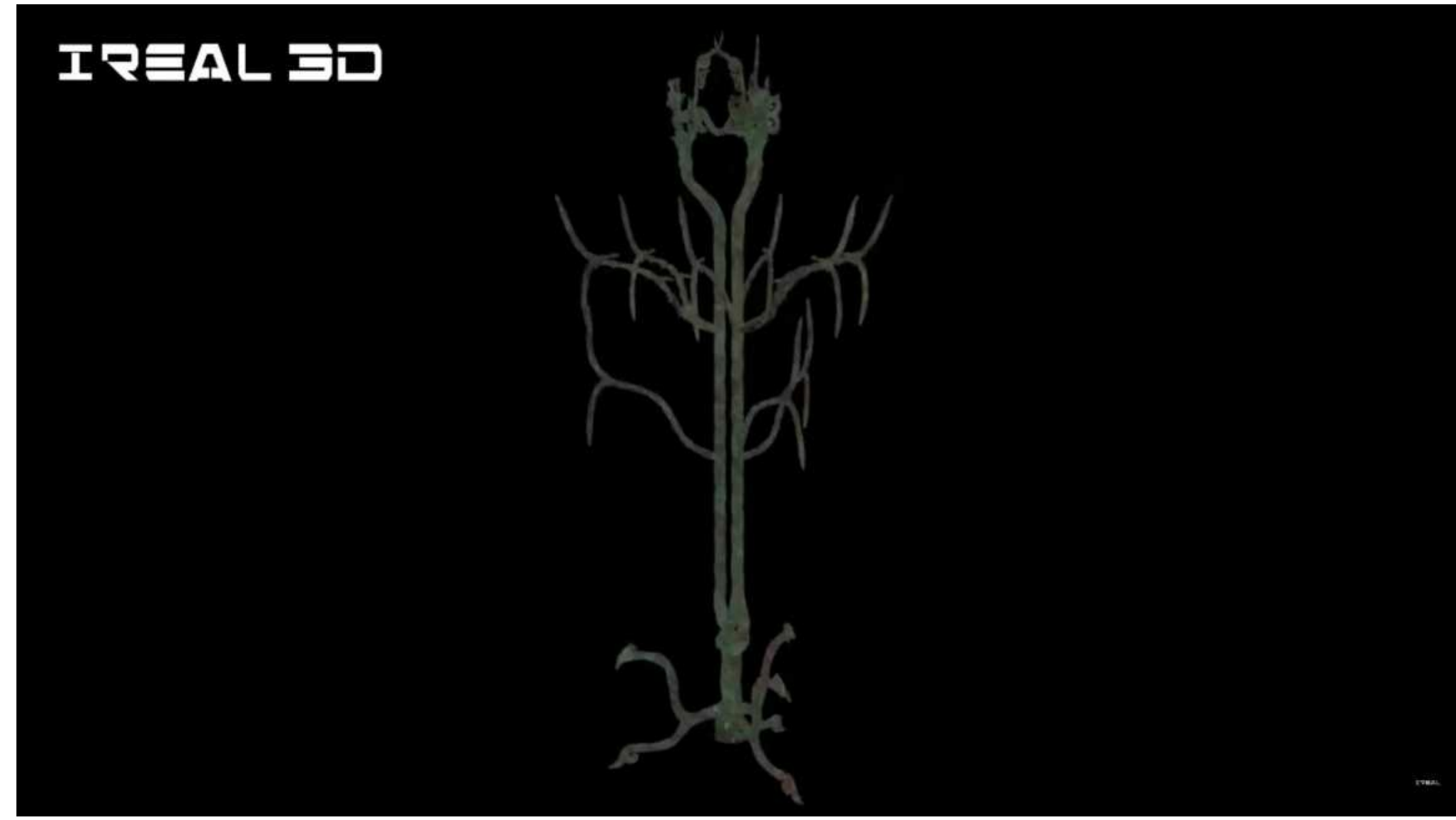
# Case Study: Yunnan Lufeng Dinosaur 3D Digital Protection



Watch the HD video of this case study:  
<https://www.youtube.com/watch?v=BGe6y84-kQo>

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## Case Study: 3D Virtual Repair of Bronze Sacred Tree of Ancient Sanxingdui Ruins



Watch the HD video of this case study:

[https://www.youtube.com/watch?v=mQC\\_1QmNXL4](https://www.youtube.com/watch?v=mQC_1QmNXL4)

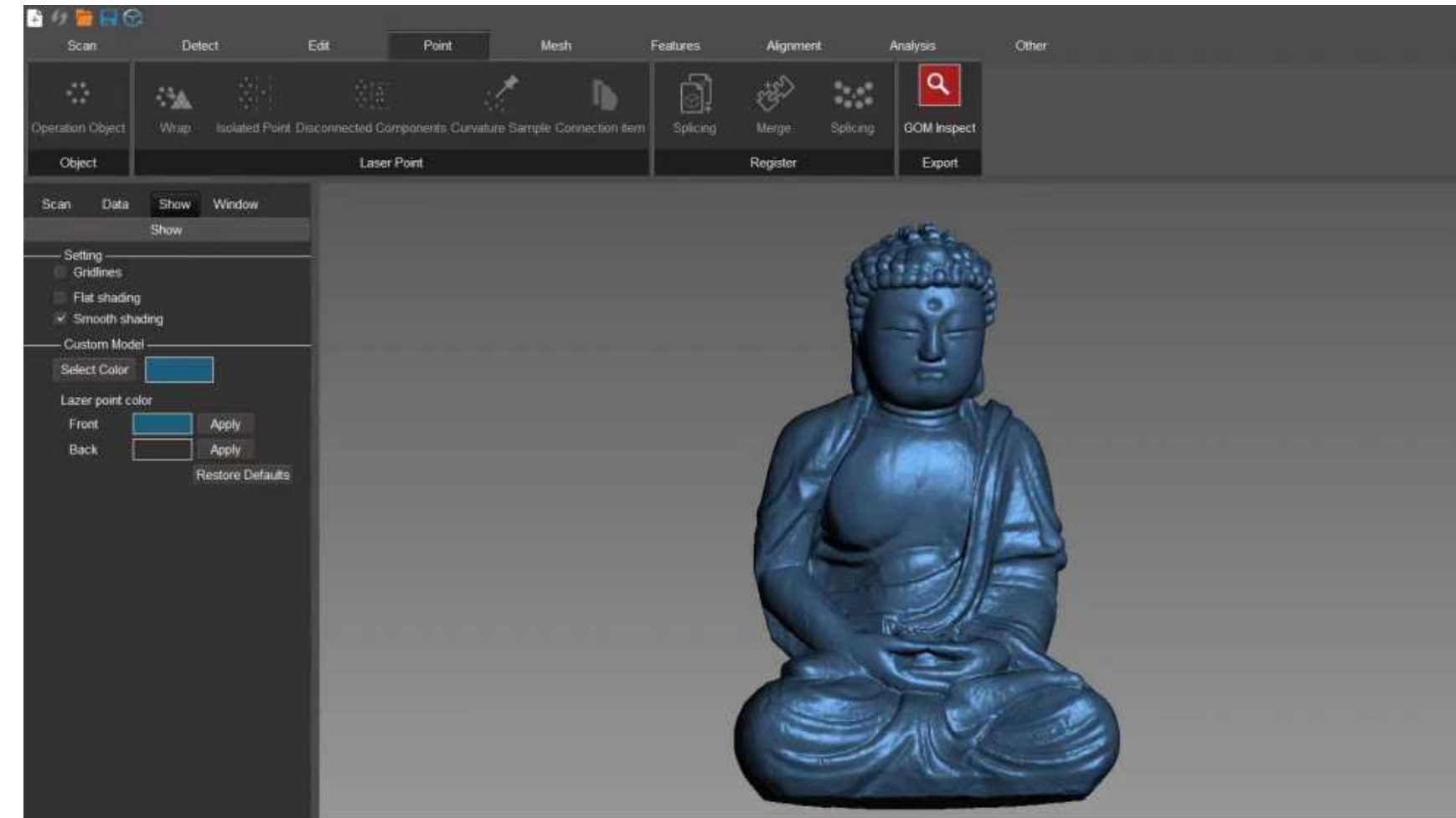
# Case Study: 3D Restoration of Yungang Grottoes



Cultural conservation workers of Zhejiang University restore the world cultural heritage: Yungang Grottoes in 1:1 ratio, through Scantech 3D scanning and 3D printing technology to regenerate cultural relics!

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# Case Study: 3D Restoration of Yungang Grottoes

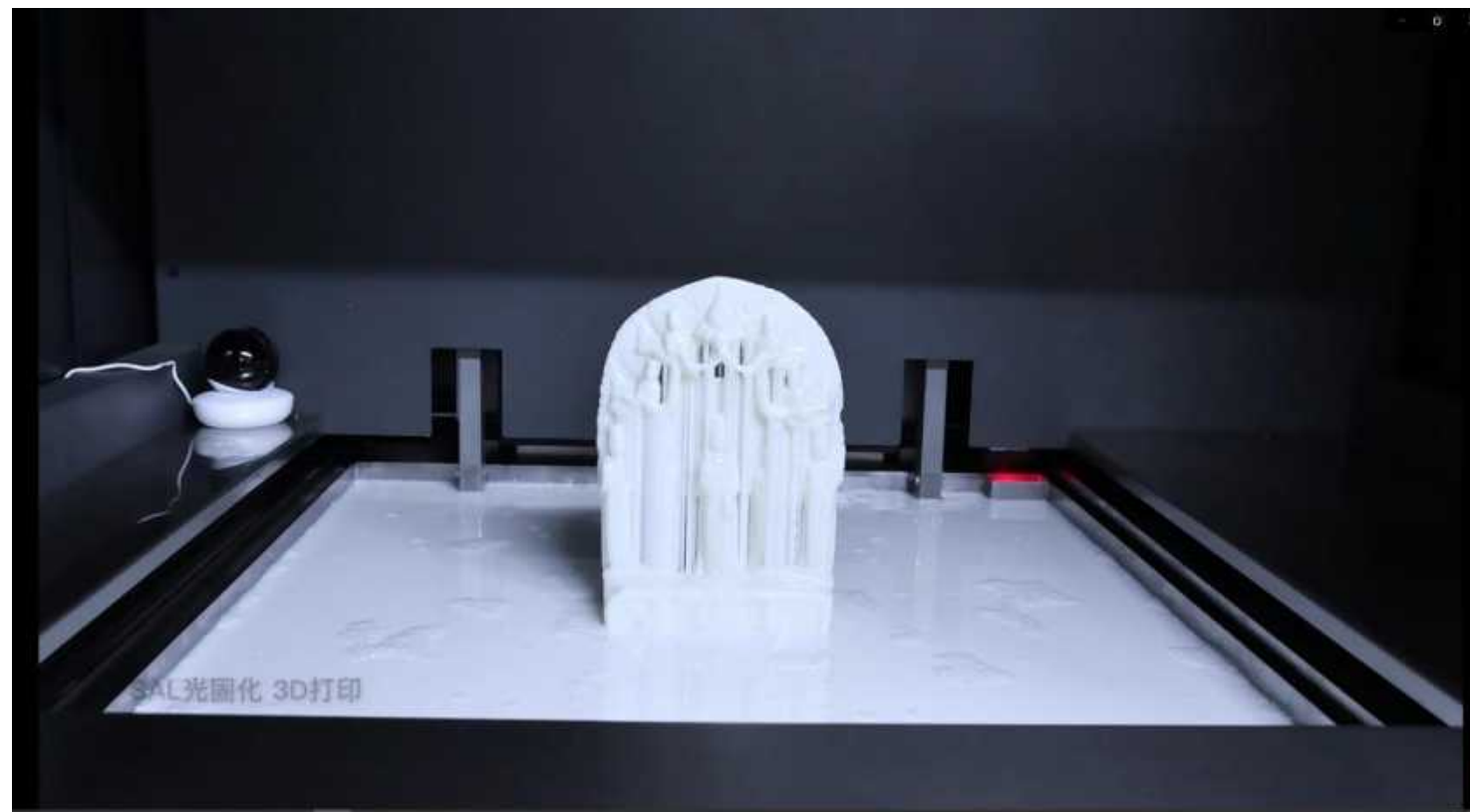


Watch the HD video of this case study:

<https://www.youtube.com/watch?v=oJnW2X7OlaI&t=2s>

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# Case Study: 3D Restoration of Yecheng Museum



Scan the QR code to view the full story

Watch the HD video of this case study:  
<https://www.youtube.com/watch?v=ju13o5ePIUU&t=130s>

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# Case Study: 3D Printing and Restoration of Root Carving



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# Case Study: 3D Derivative Production of Wulin Ancient Building



Field study → Partial scanning of buildings → Data processing (forward + reverse) → 3D printing

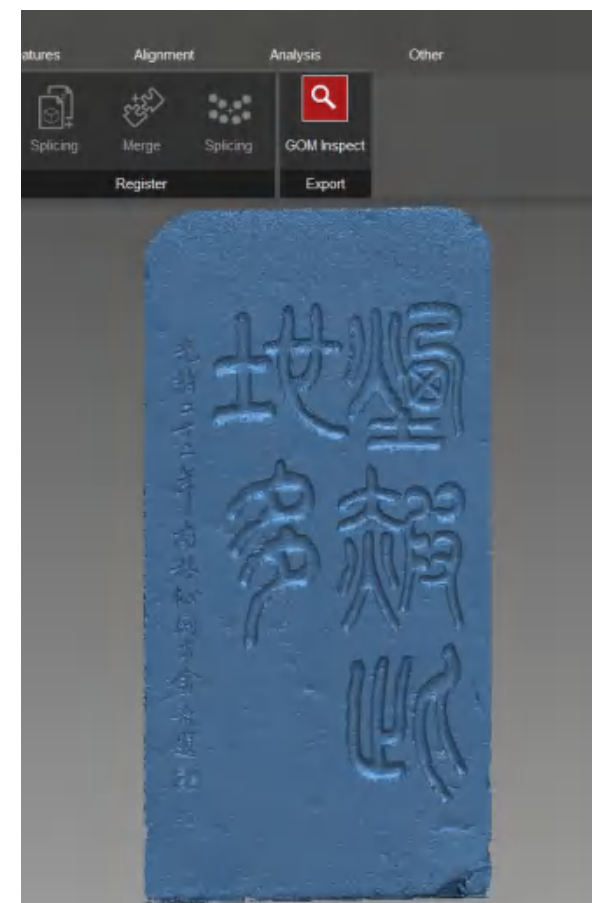
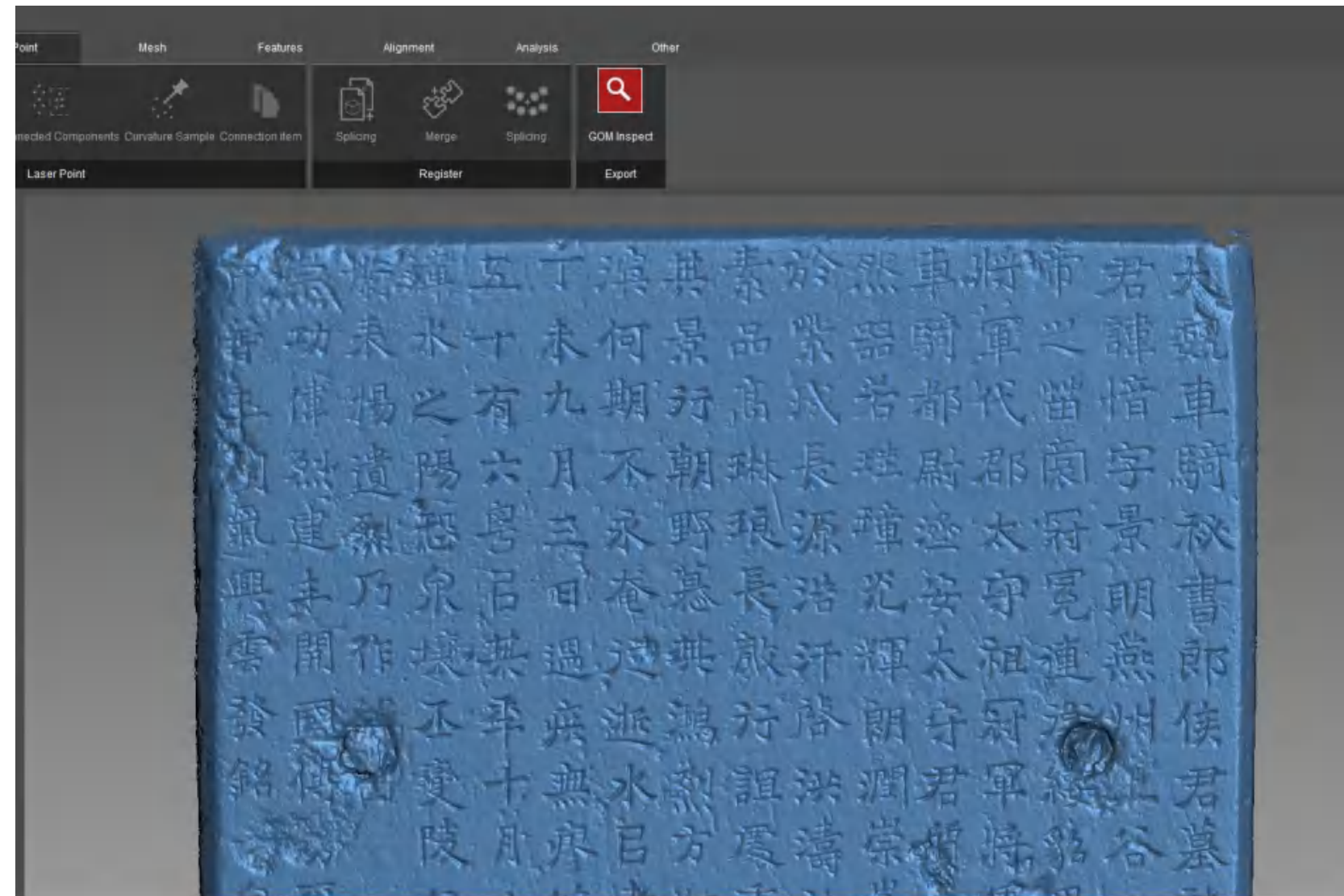
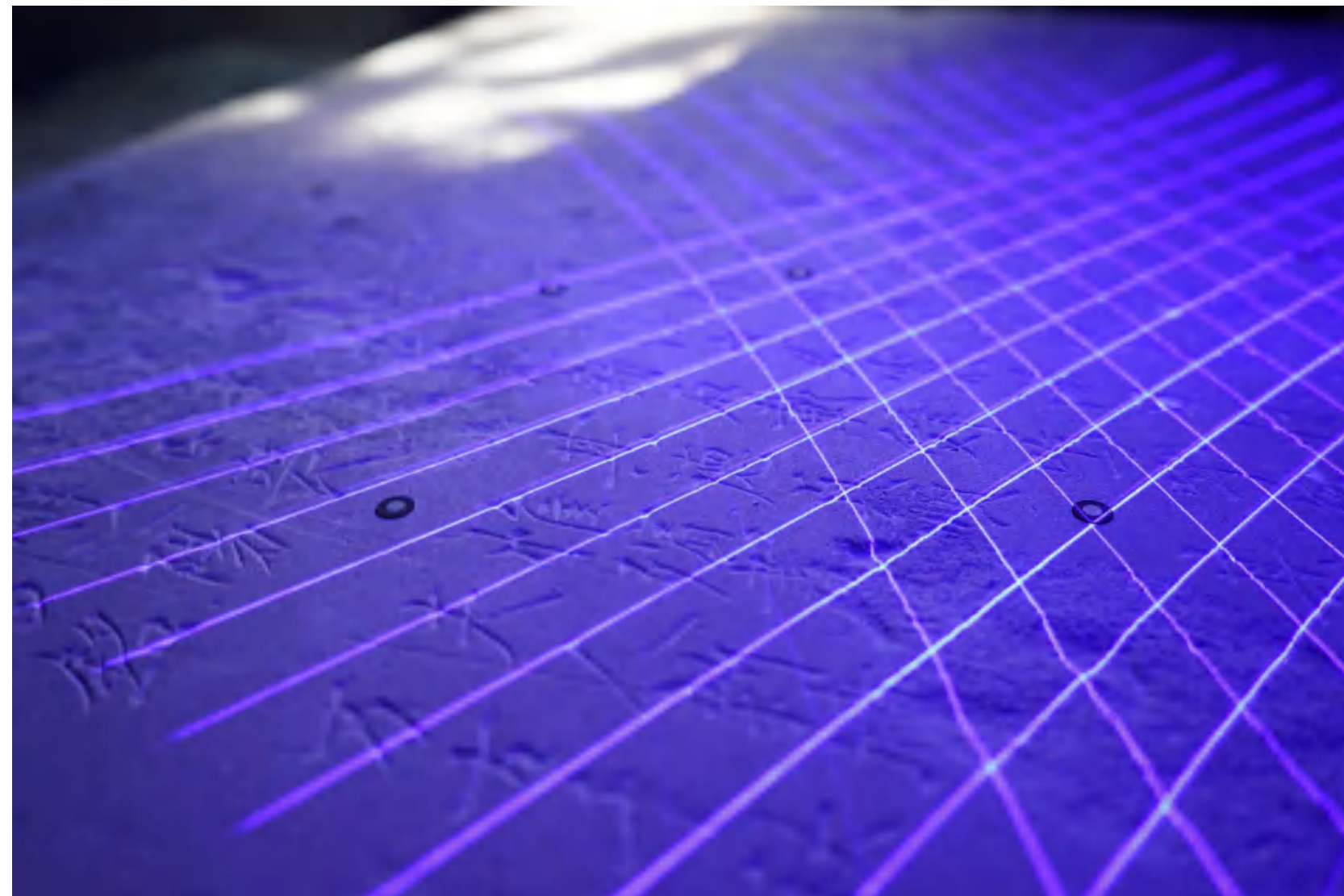
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# Case Study: 3D Data Archiving of Cliff Inscriptions



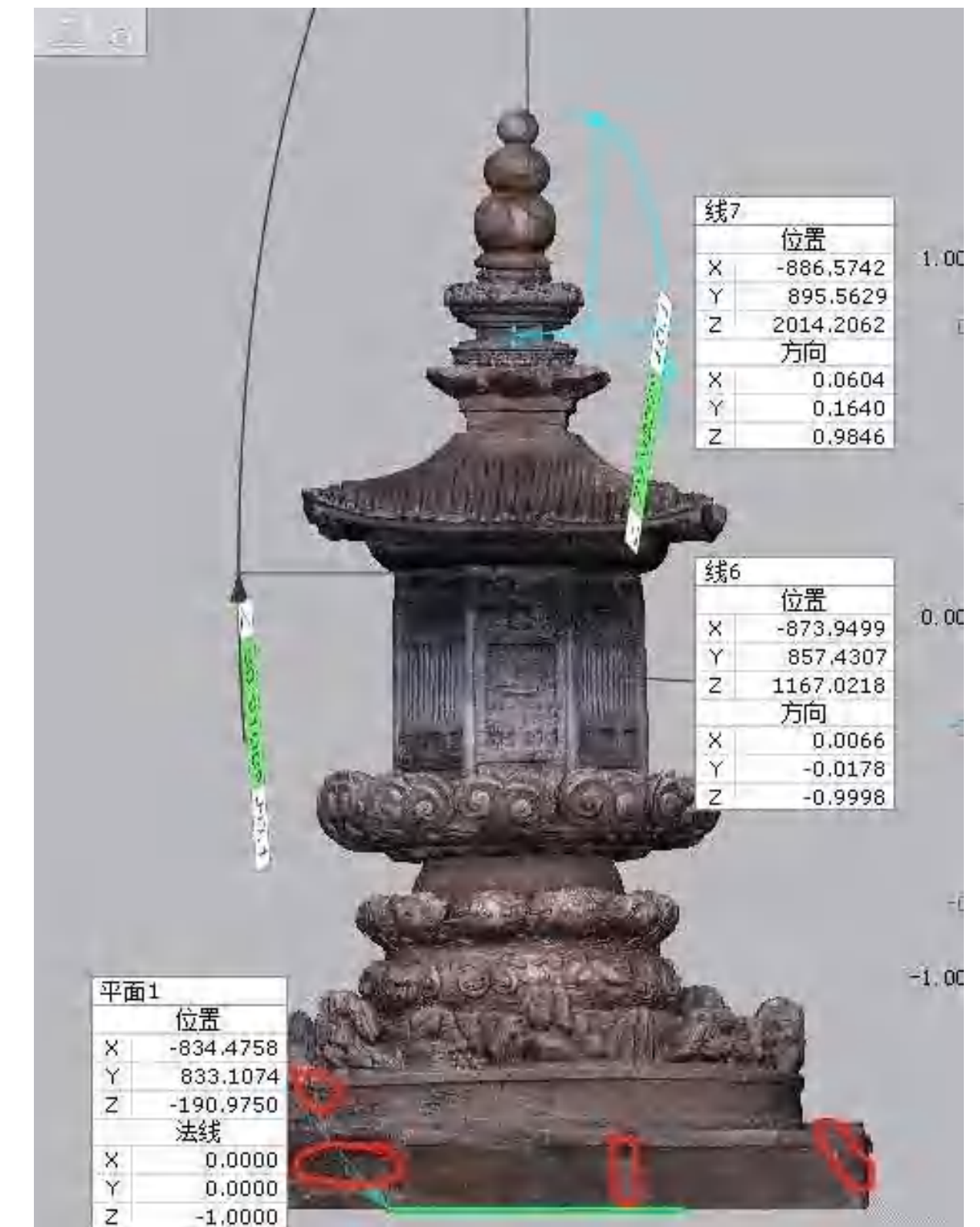


# Case Study: 3D Rubbings of Ancient Epitaph



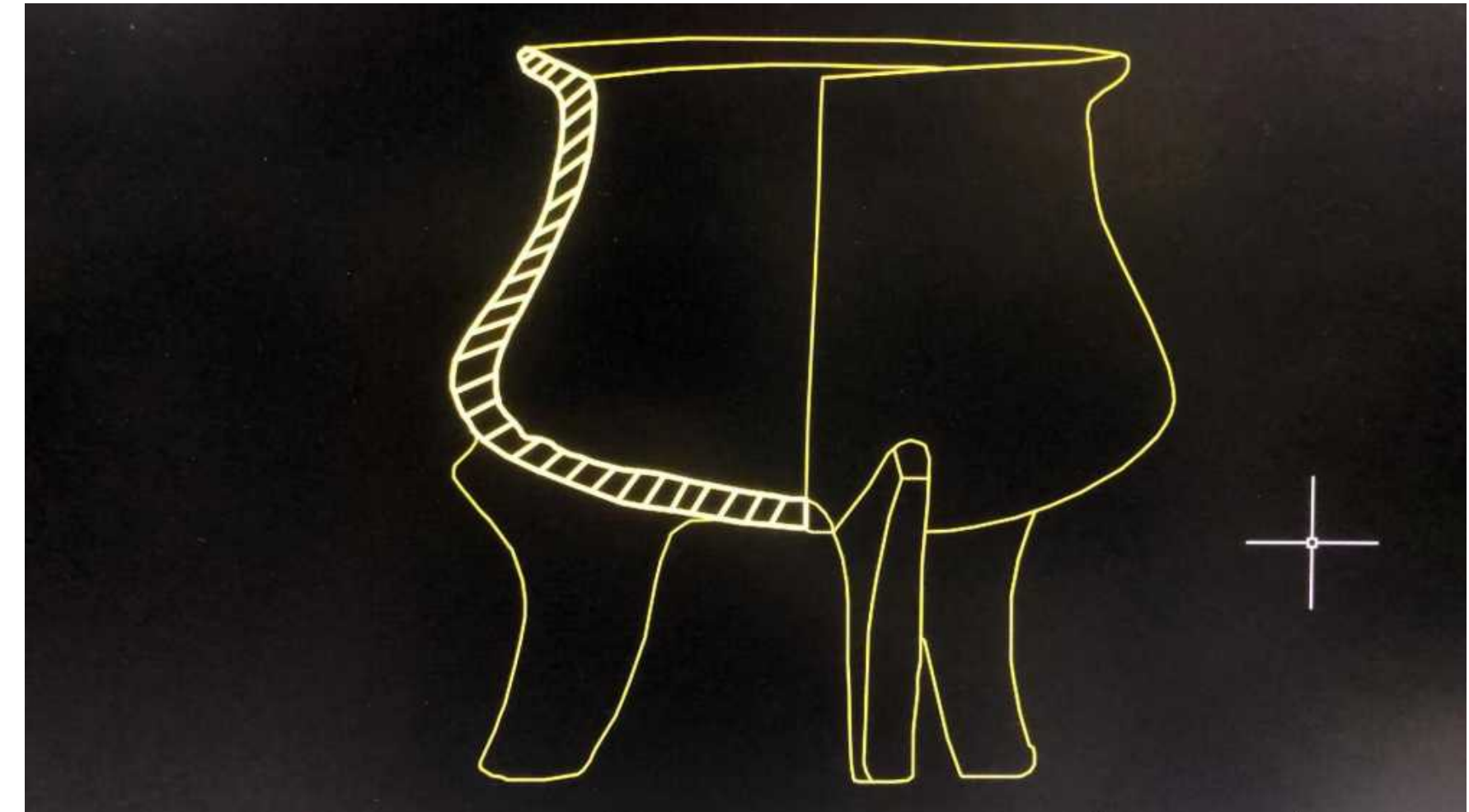
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# Case Study: 3D Mapping Analysis of Xi'an Caotang Temple



3D data archiving and 3D measurements of key sizes/angles

# Case Study: 3D Scanned Model Helps Accurate Line Drawing



Through 3D scanned models, the line diagram of the utensil of different angles can be depicted more accurately.



Line artwork of cultural relics: scientifically and vividly record and express cultural relics in the form of points, lines and surfaces.

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## Case Study: 3D Digital Exhibition of Folk Culture in Saihan District



Watch the HD video of this case study:

<https://www.youtube.com/watch?v=r0YisFkWD5g>

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# Case Study: Online 3D Exhibition of Jingdezhen Ceramic Institute



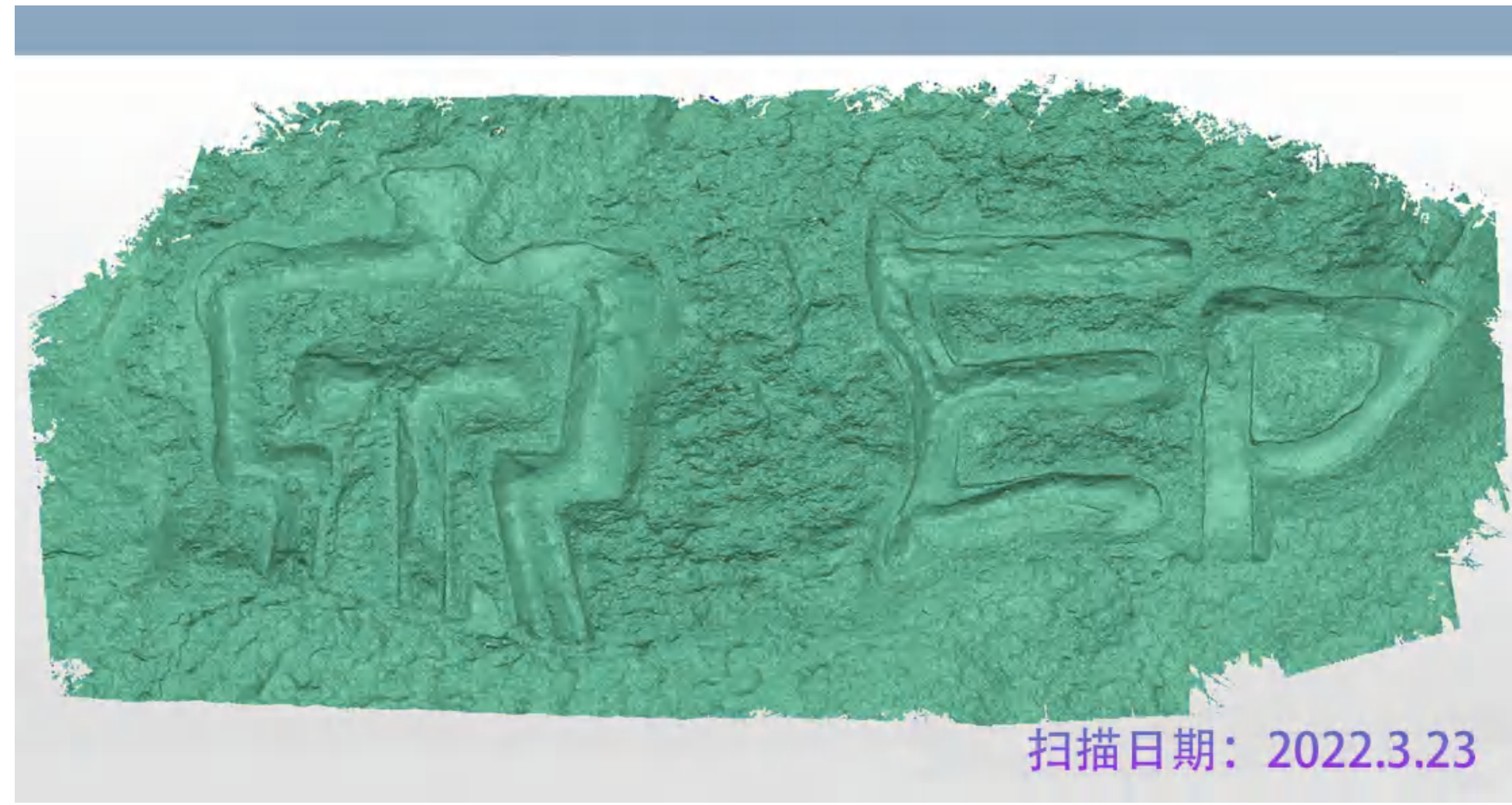
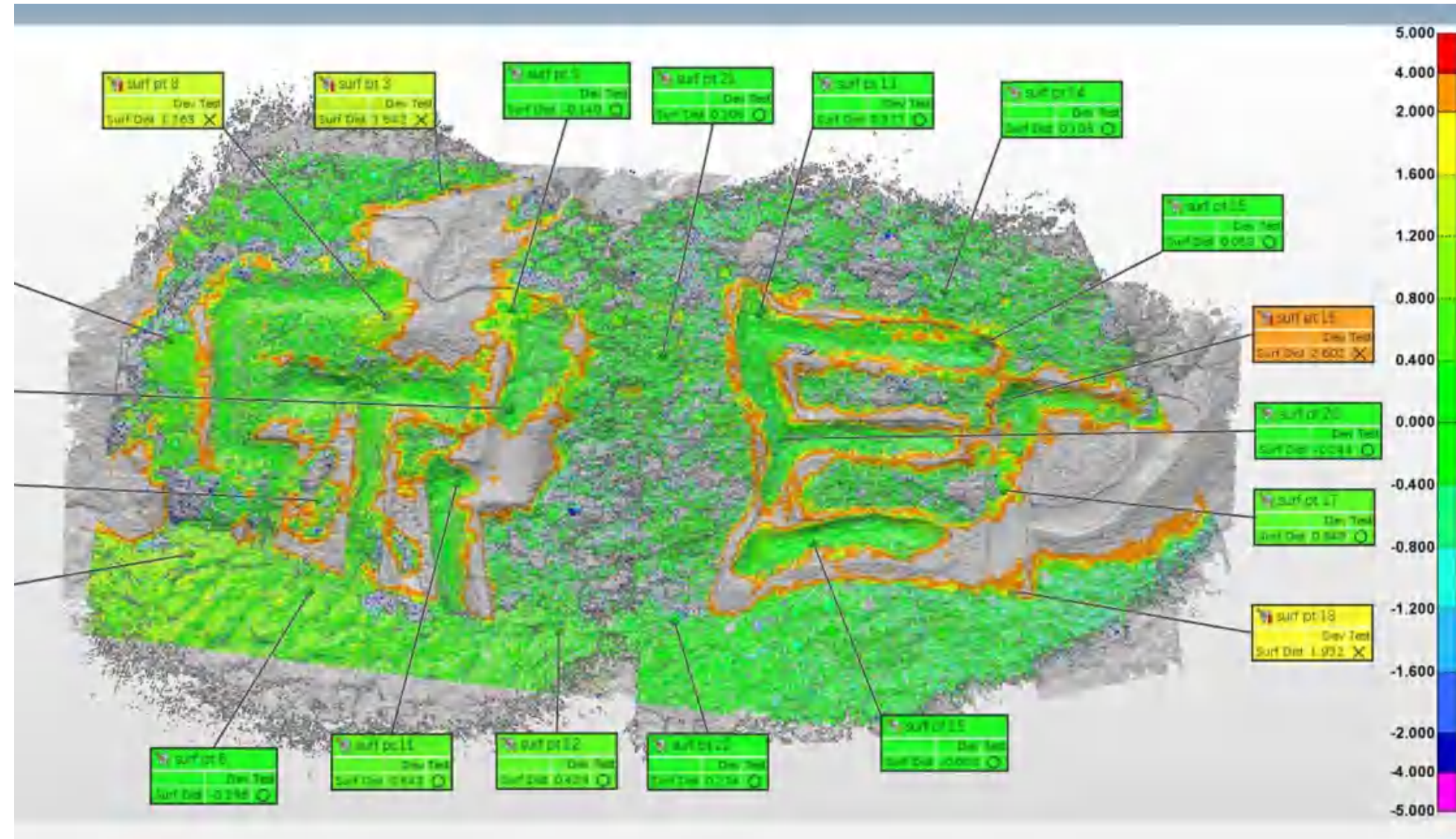
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# Case Study: 3D Digital Monitoring and Protection of Three Elders' Stela



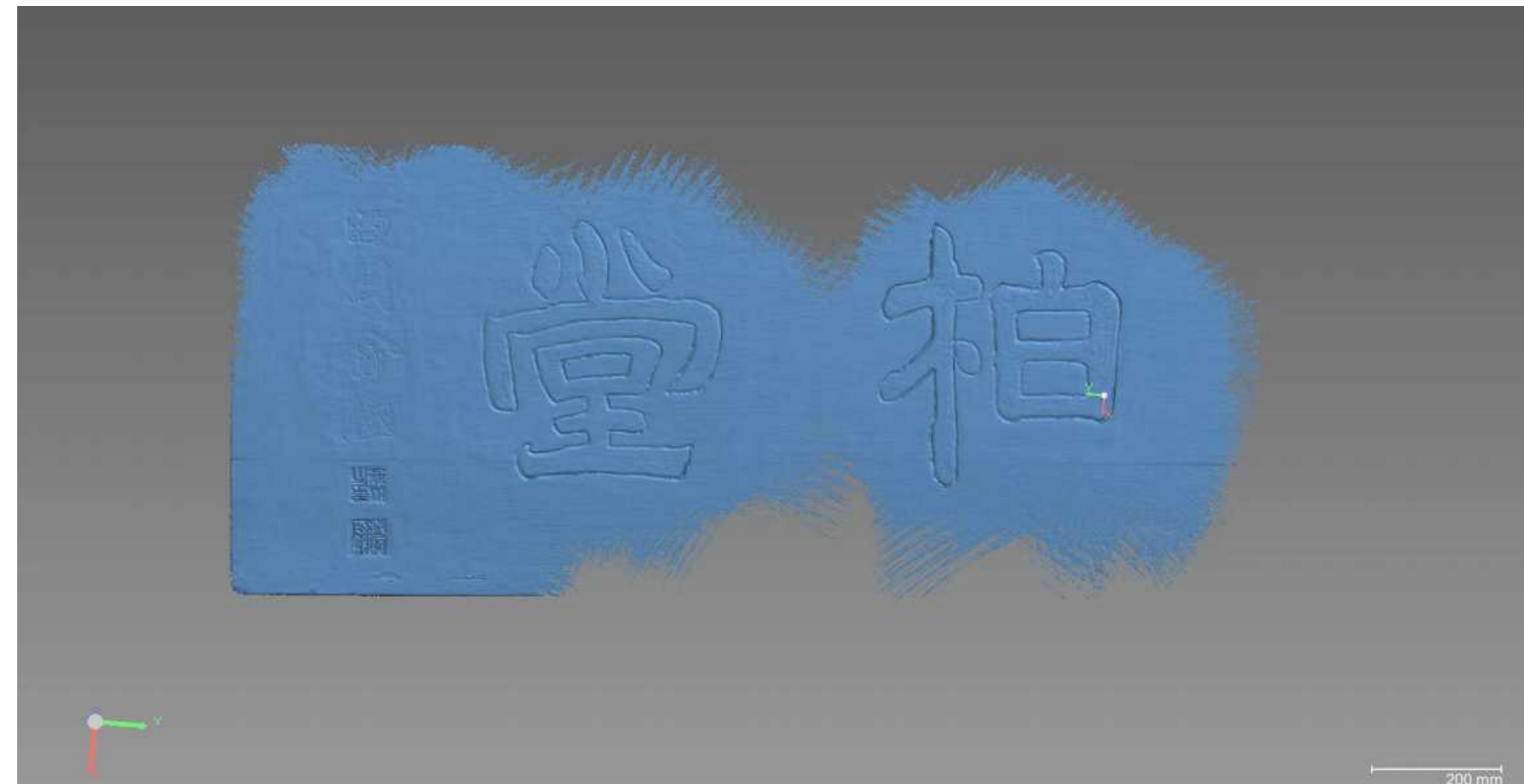
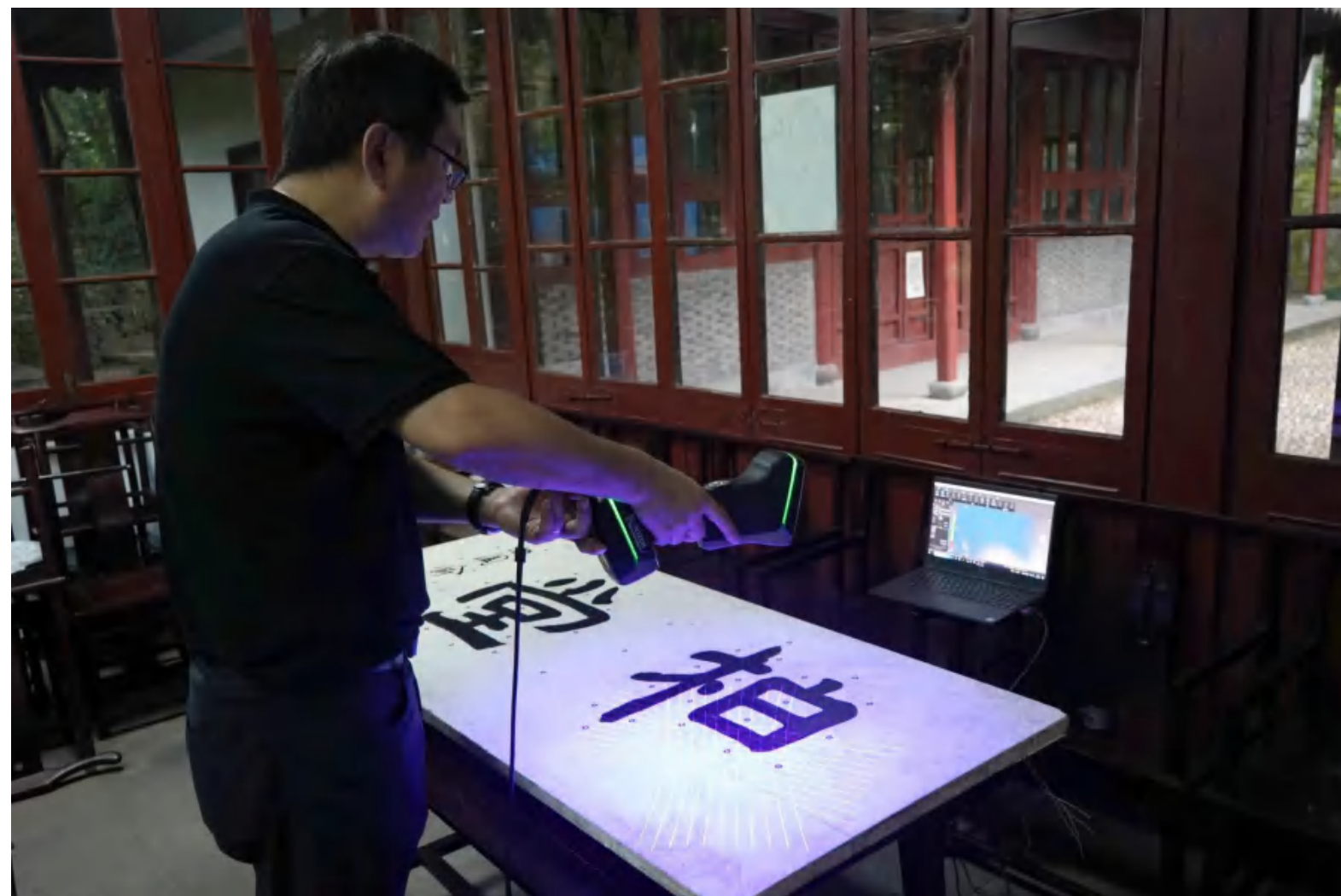
Watch the HD video of this case study:  
<https://www.youtube.com/watch?v=ms8H0qFs0b0>

# 04 Case Study: 3D Digital Monitoring and Protection of Xiling Seal Art Society



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# Case Study: 3D Digital Archiving of an Ancient Plaque





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# Case Study: 3D Digitization of Inscriptions on an Ancient Tower



# True Color 3D Digitization Solution-Handheld Color 3D Scanner

**Process:** 3D scan directly to obtain color 3D data on the surface of the item

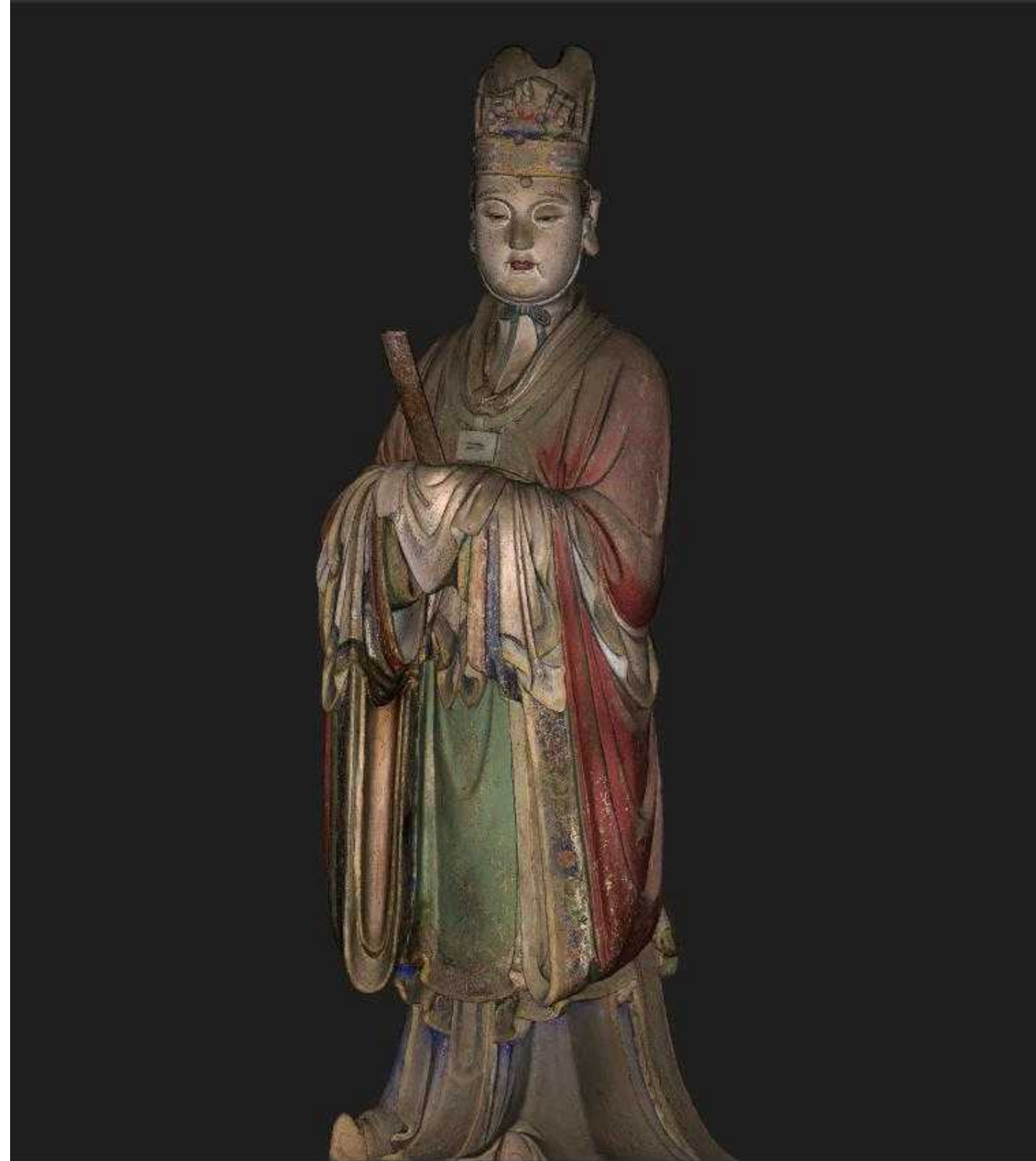
**No post-processing (complete scan data, and low requirements for color restoration):** export obj format, directly used for 3D printing, 3D data analysis/archive/3D display.

**Post-processing is required (the data is incomplete, or the color requirements are a bit high):** the exported obj data is combined with the photos taken by the SLR in a uniform light environment from various angles, and imported into iReal 3D mapping software for smart texture mapping to get a HD color 3D model.

**Main software used for data post-processing:** iReal 3D mapping software, Photoshop

**Other software might be used for data post-processing:** Geomagic Wrap, ZBrush, Marmoset Toolbag

# True Color 3D Digitization Solution-Handheld Color 3D Scanner



## 3D Scanning an Ancient Temple in Shanxi Haizhou

Among the numerous state-protected ancient buildings in Shanxi, the Haizhou Guandi Temple has a unique cultural significance. As the carrier of Guan Gong culture, Haizhou Guandi Temple is the earliest, largest, highest-grade and best-preserved Guandi temple in China, known as "the crown of martial arts temples".

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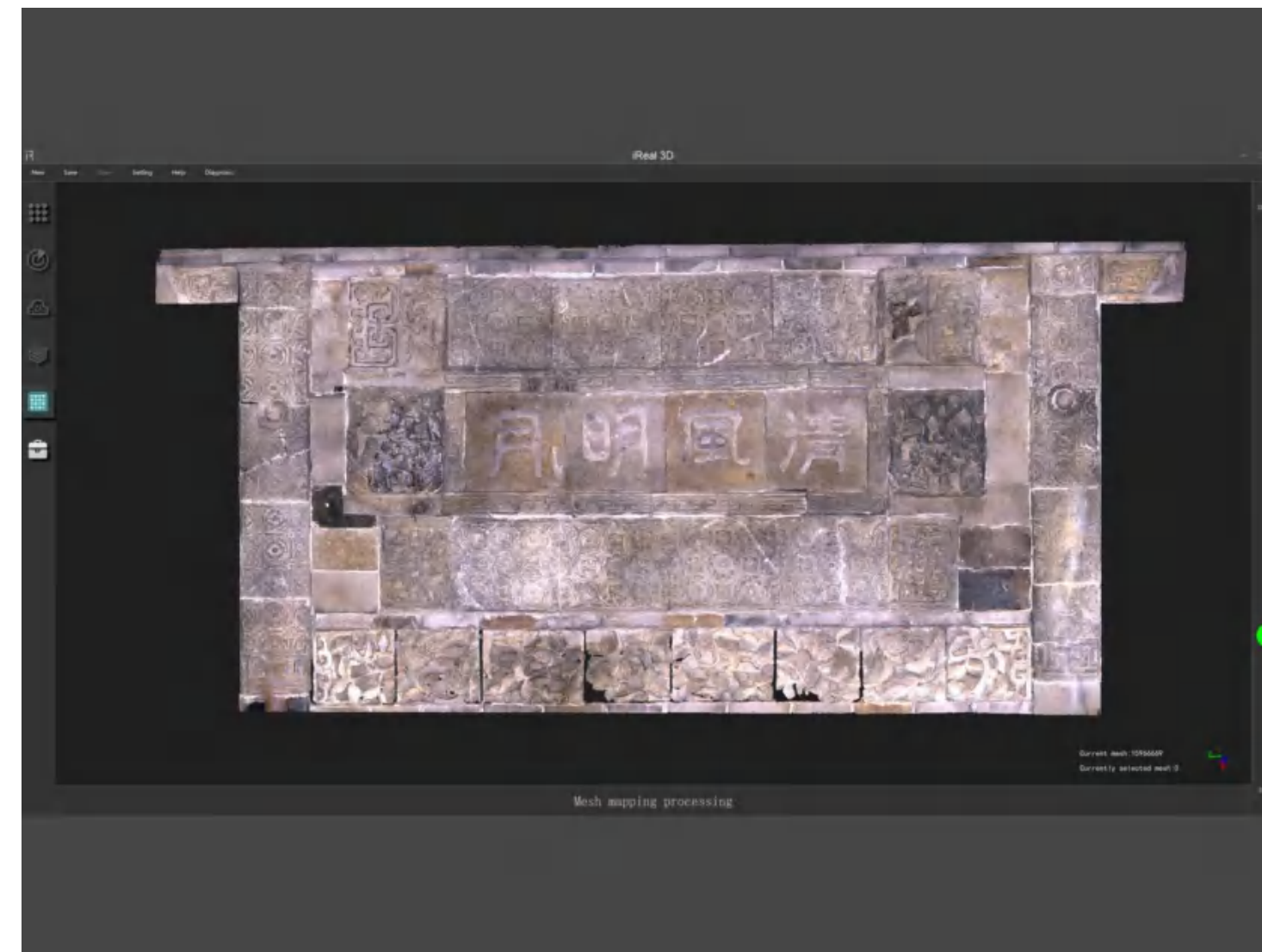
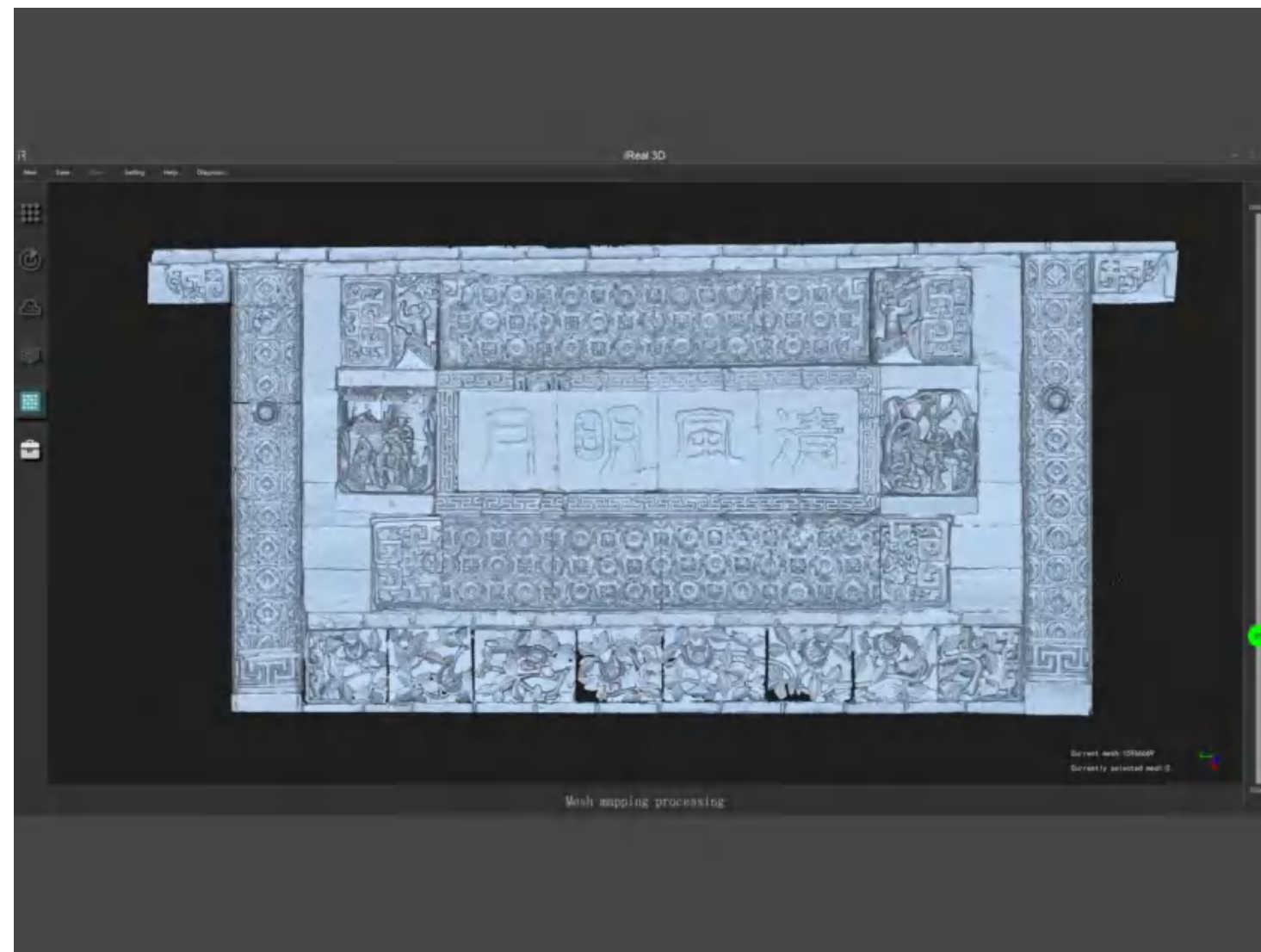
# True Color 3D Digitization Solution-Handheld Color 3D Scanner



Chinese National Key Cultural Relics Protection Unit (Three Saints in the West)

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# True Color 3D Digitization Solution-Handheld Color 3D Scanner



3D digital archive of ancient building exterior walls

# True Color 3D Digitization Solution-Handheld Color 3D Scanner

## Process

1. 3D scan to obtain 3D data (monochrome) of the surface of the item, such as stl, obj.
2. Optimize the acquired 3D data through 3D software (filling holes, carving, reducing surfaces, etc.);
3. Obtain pictures from all angles of the item through the SLR in a uniform light environment.
4. High-efficiency texture mapping is achieved through the iReal 3D mapping software.

**Data acquisition hardware equipment:** handheld laser 3D scanner, SLR and shooting kit (fill light, color calibration card, automatic turntable)

**The post-processing software mainly involves:** iReal 3D mapping software, Photoshop

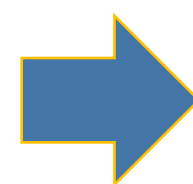
**Other post-processing software:** Geomagic Wrap, ZBrush, Marmoset Toolbag

## 1. DATA COLLECTION

Laser 3D Scanning

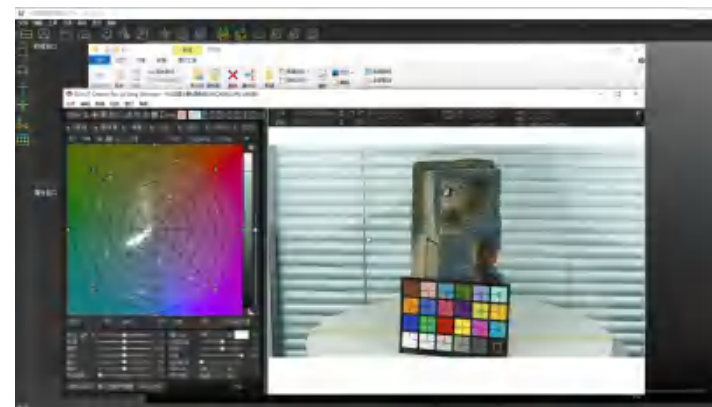


Photos Collecting

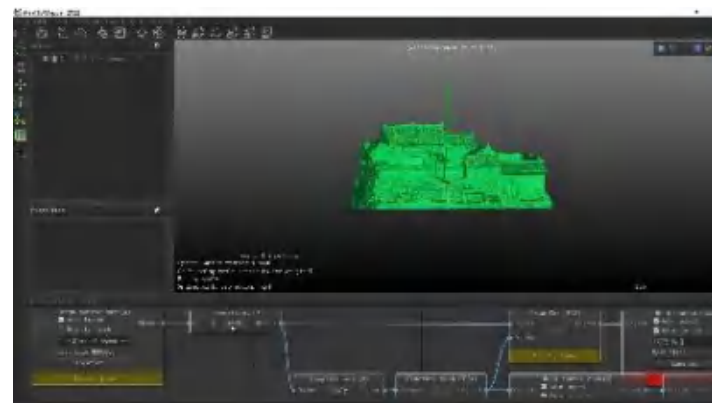


## 2. PRE-PROCESSING OF MODELS AND PHOTOS

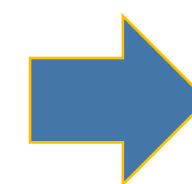
Photos Color Adjustment



Mesh Pre-processing

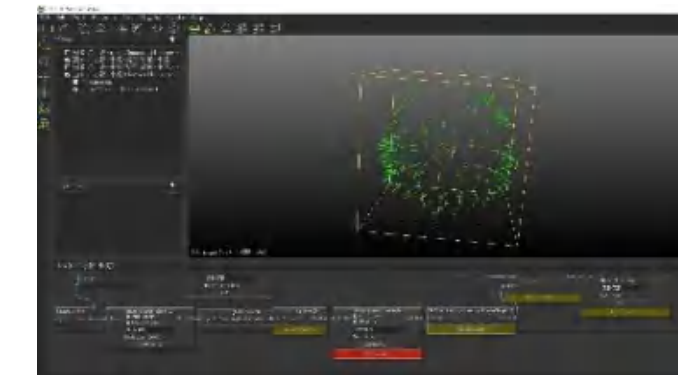


Photos Object Extraction



## 3. FULLY AUTOMATIC MAPPING

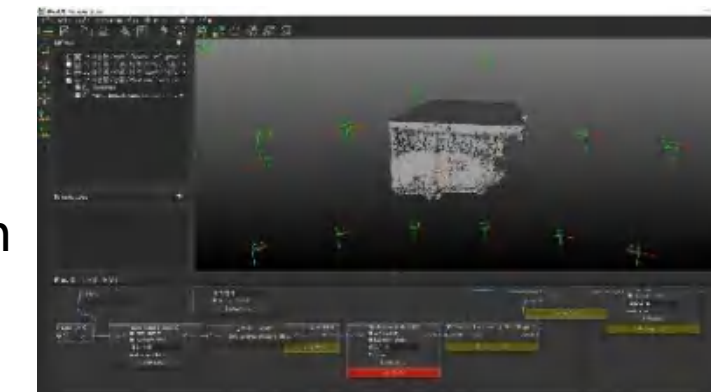
Relative Orientation



Absolute Orientation



Fine Registration



## 4. SMART MAPPING

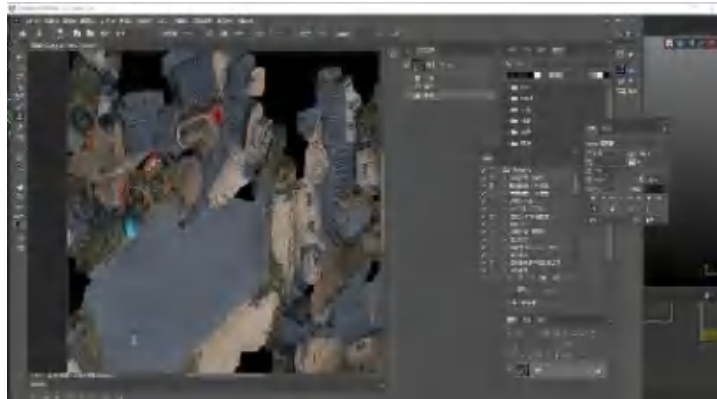
Automatic Mapping



Seam Editing

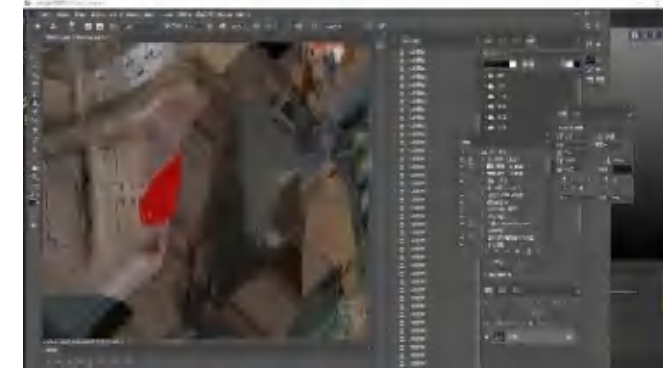


Smart UV Generating and Transferring

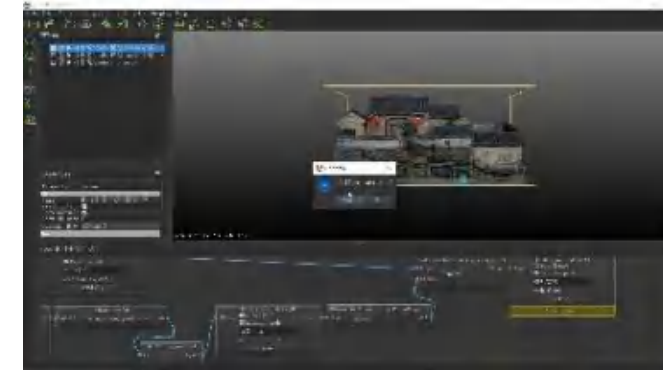


## 5. MAPPING EDITING AND BAKEN

Refine Textures  
Linkage  
Photoshop



Uniform after Refine Textures



Bake Albedo and Normals



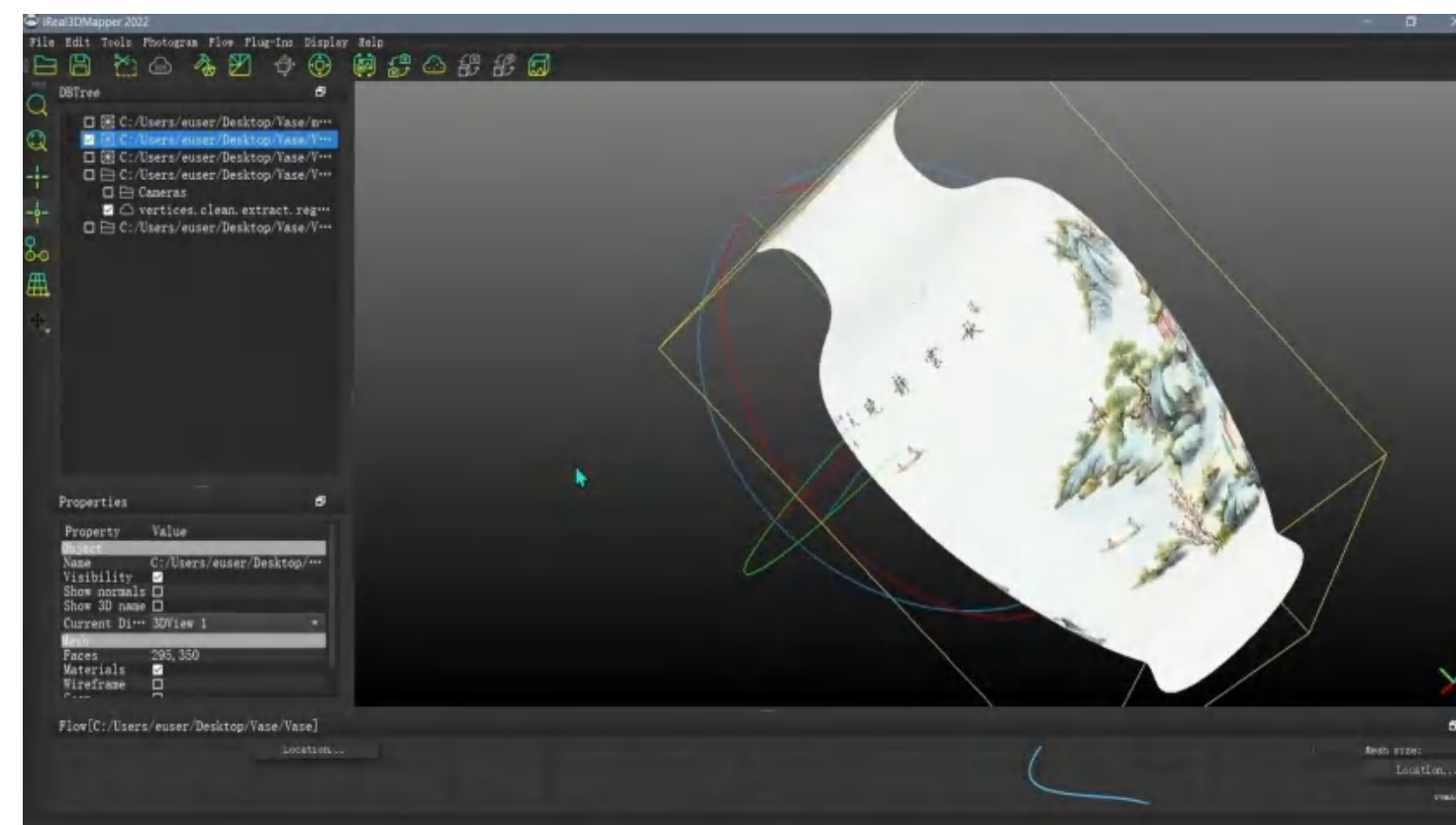
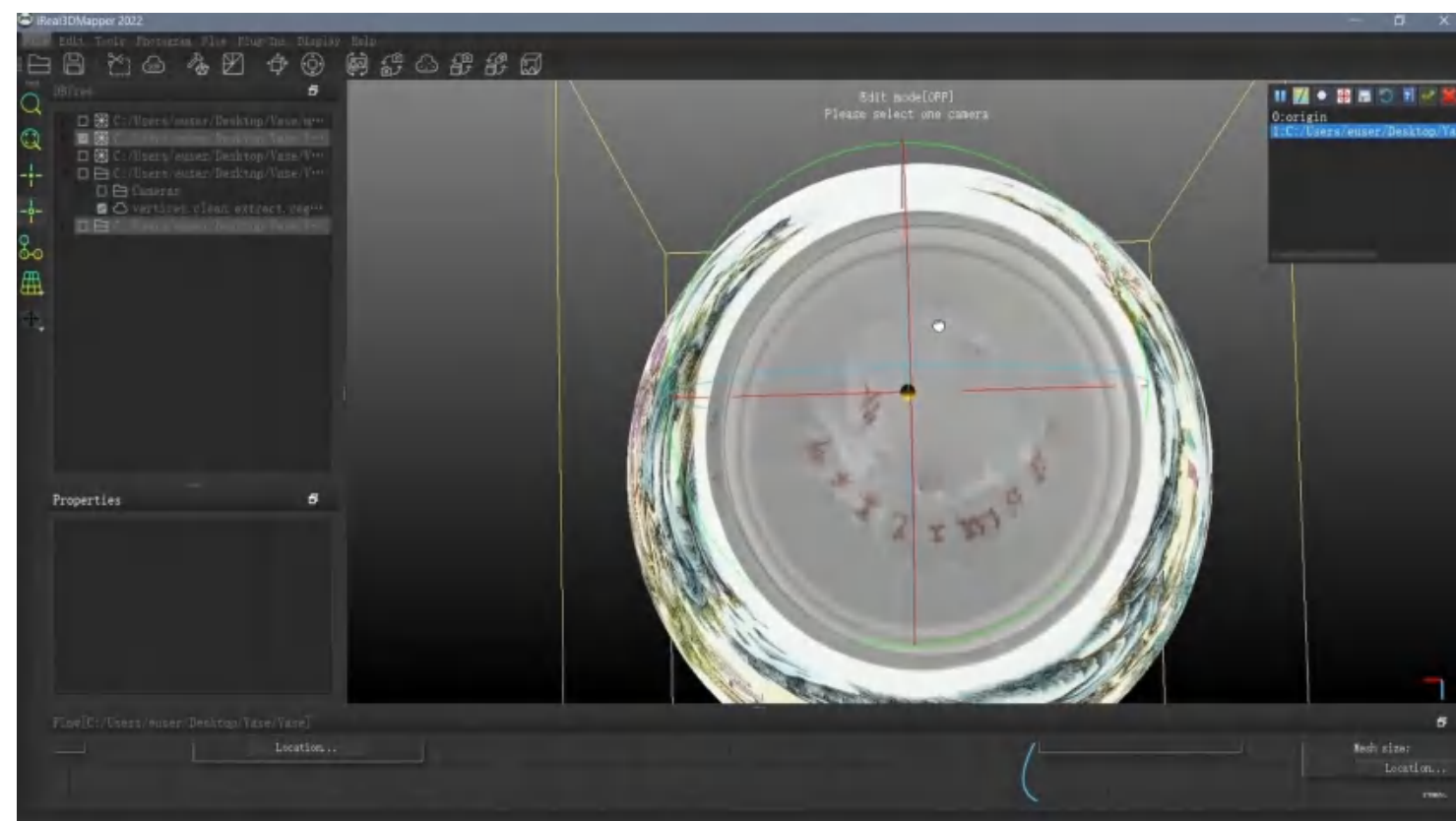
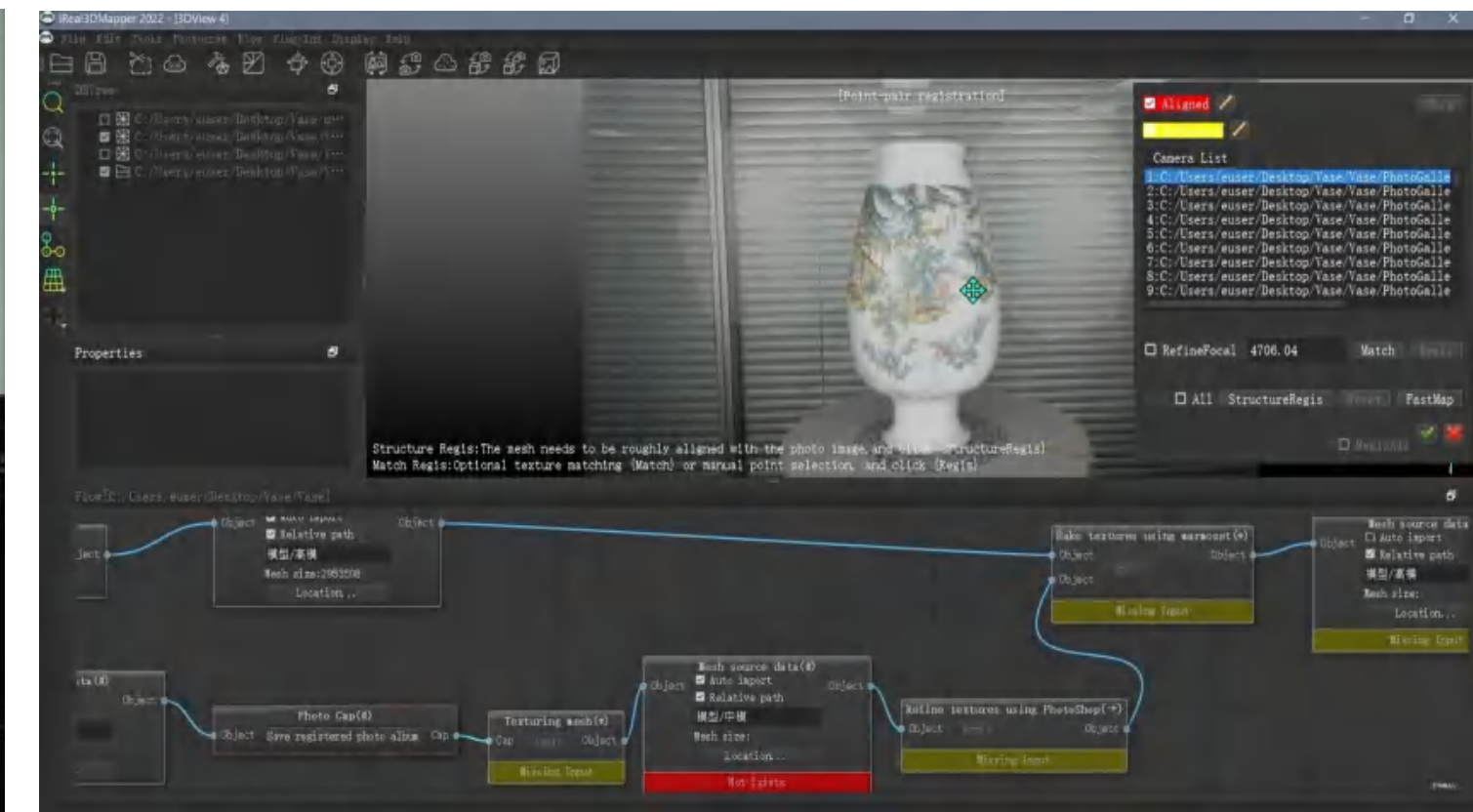
## 720° HIGH-PRECISION MAPPED MODEL





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# Whole Process of Porcelain Texture Mapping (Video Tutorial)



Complete video tutorial:

<https://www.youtube.com/watch?v=2TAbir3aklc&t=7s>



**Necessary skills:** 3D scanning, professional SLR photography, Adobe Photoshop

**Model optimization software:** Geomagic Wrap, ZBrush, 3DS Max, etc.

**Texture mapping software:** iReal 3D mapping software, Adobe Photoshop

### Products, Solutions&Services Available:

1. 3D scanners and iReal 3D mapping software for sale
2. Value-added services for Scantech users: such as data post-processing, texture mapping services, assisting in solving large quantities/difficult parts processing, etc.

### The optimal solution for high-precision 3D digitization of cultural relics:

- Reverse modeling (mainly with handheld 3D laser scanners, supplemented by handheld speckle scanners) + 3D modeling/3D model optimization + SLR + texture mappings.
- If there are many types of materials and sizes to be scanned, it is recommended that various tools (different types of 3D scanners) be flexibly matched to be the best solution.

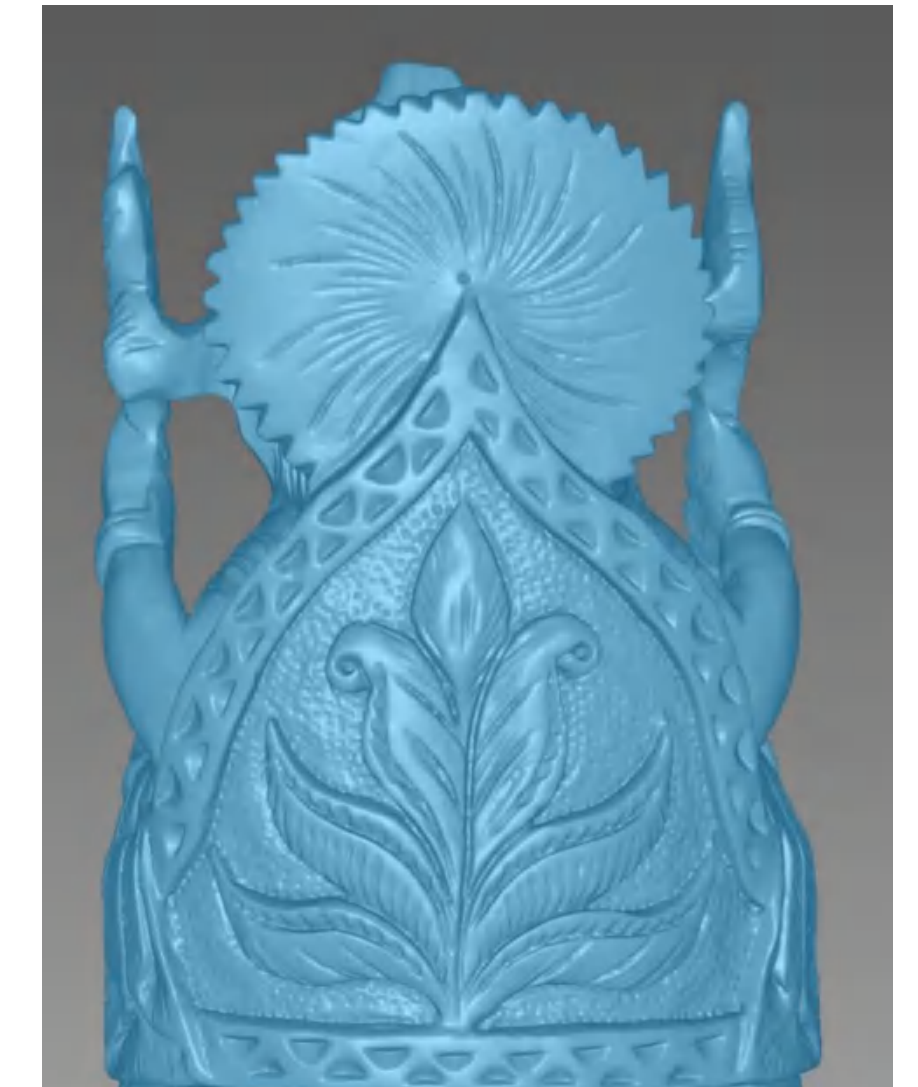
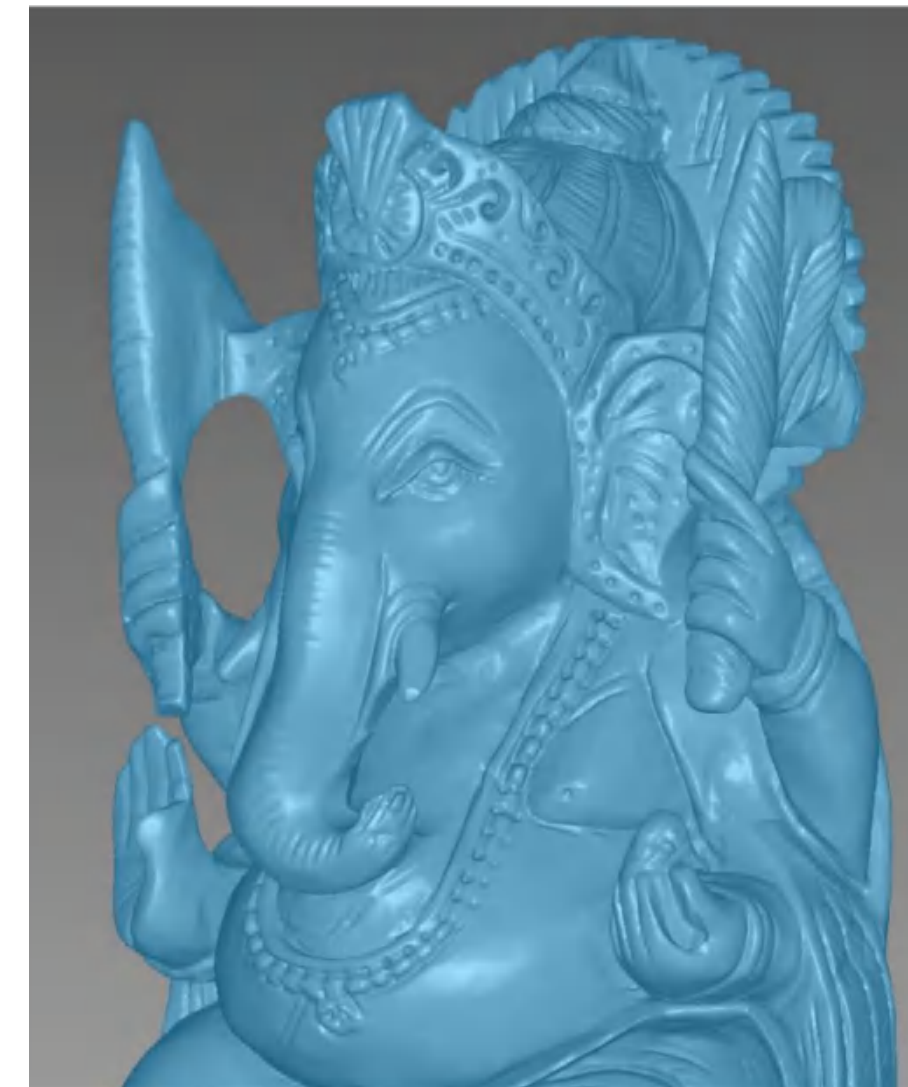
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# Other: High-precision 3D Scanning

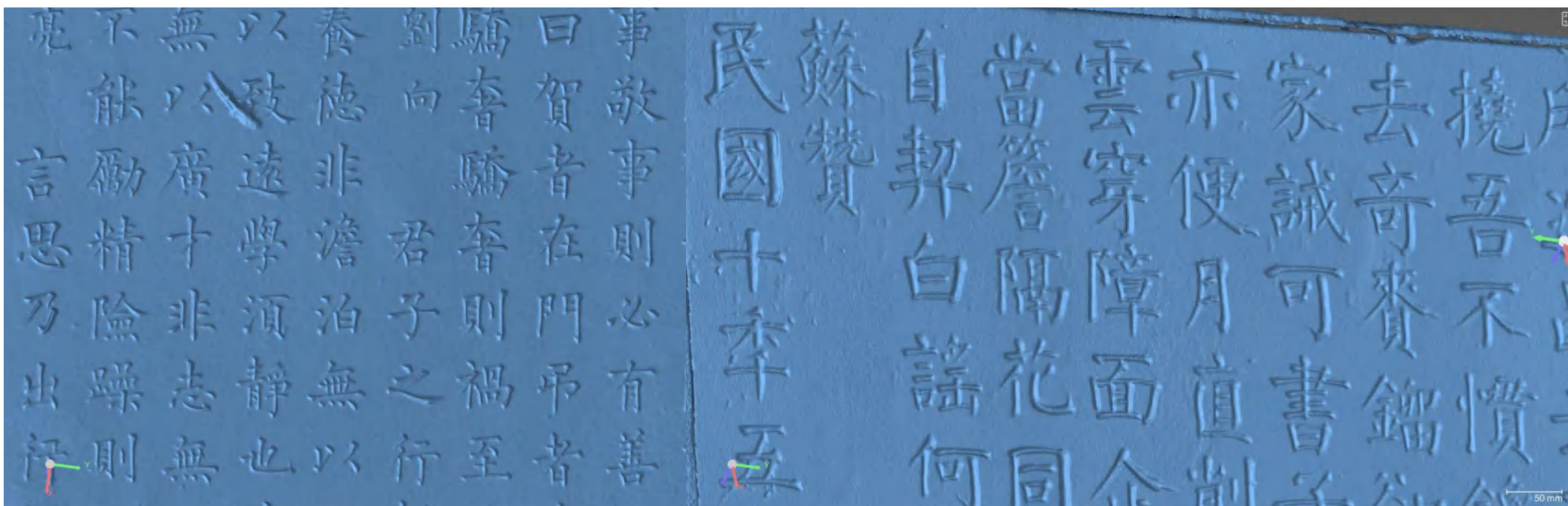
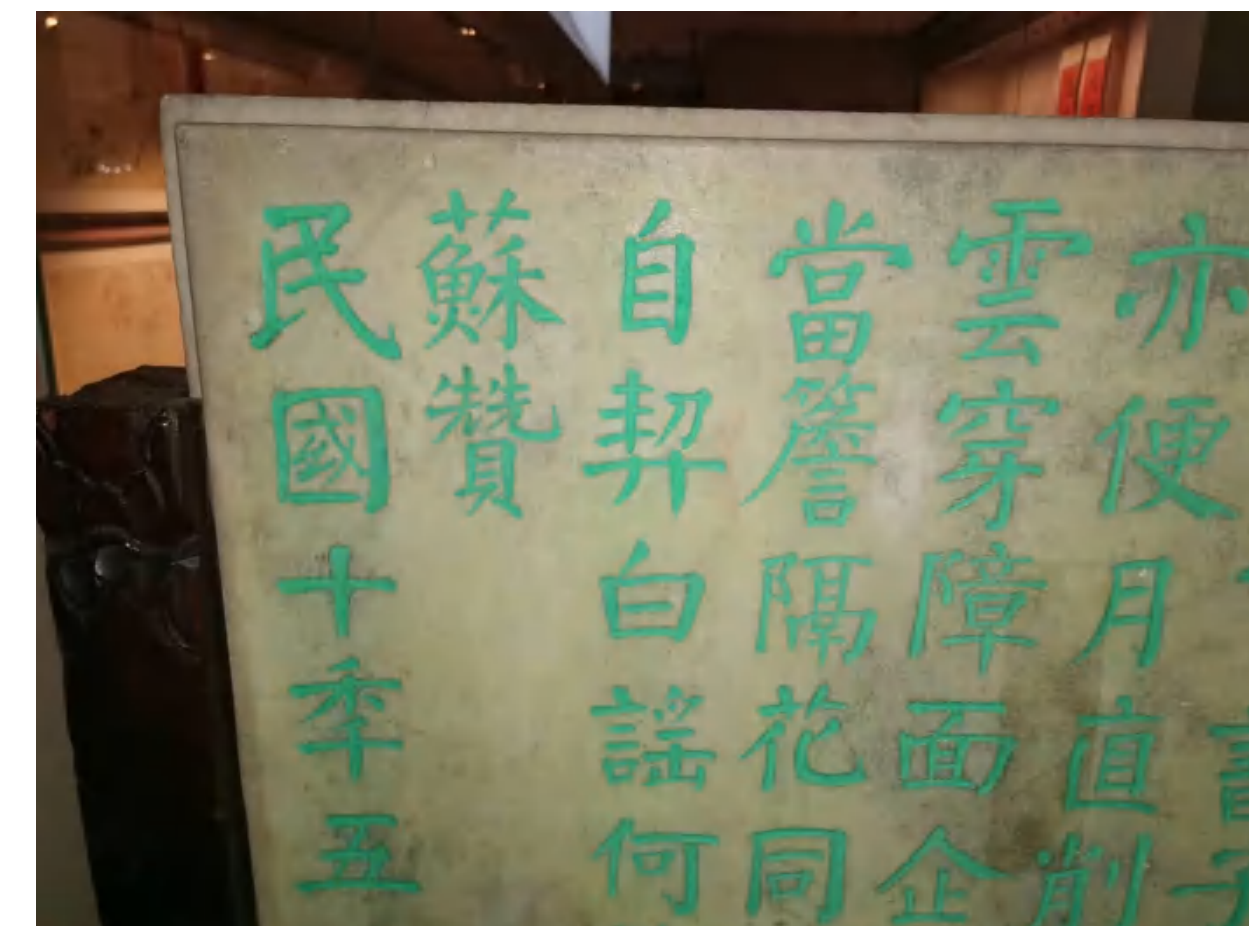
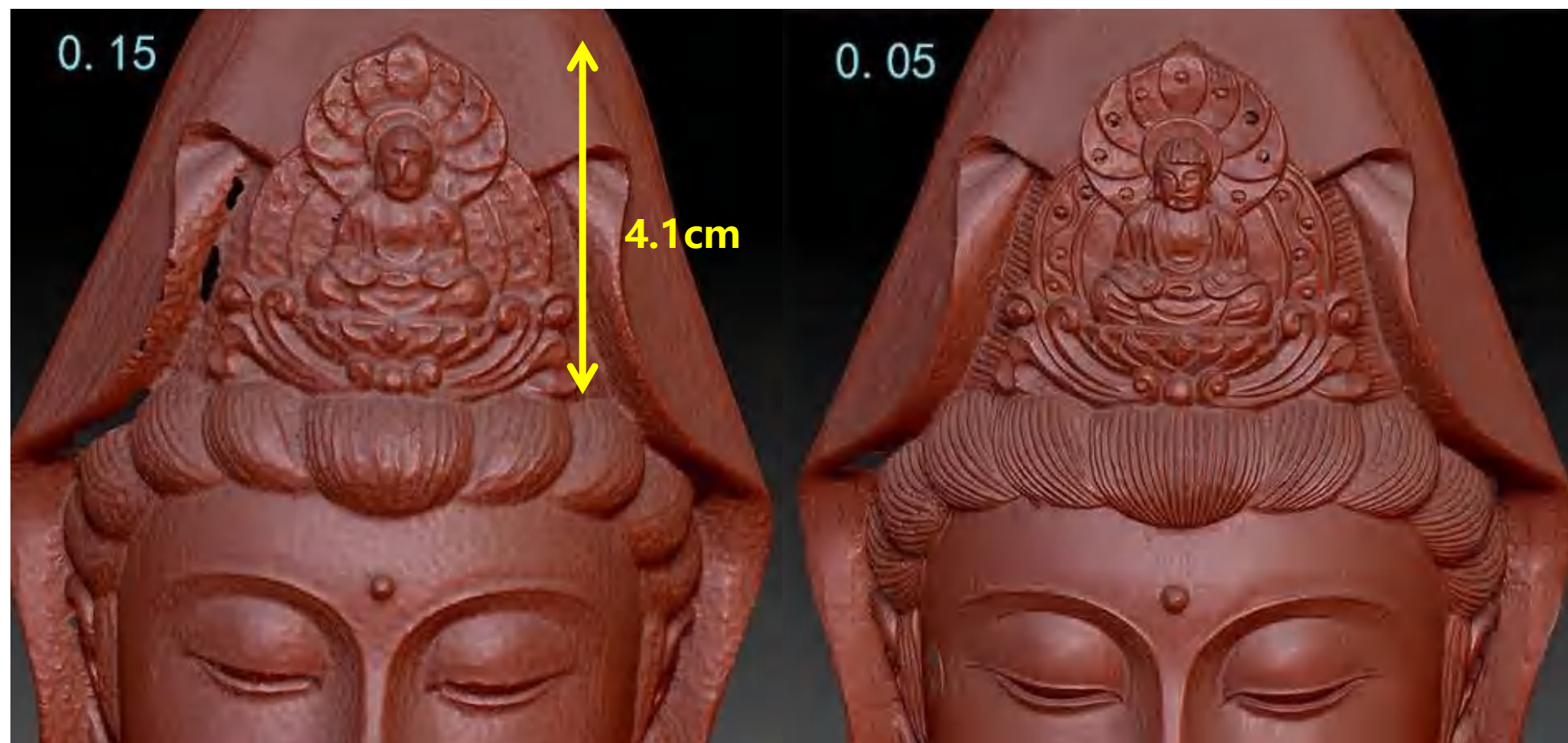


Watch the complete video of this case study:

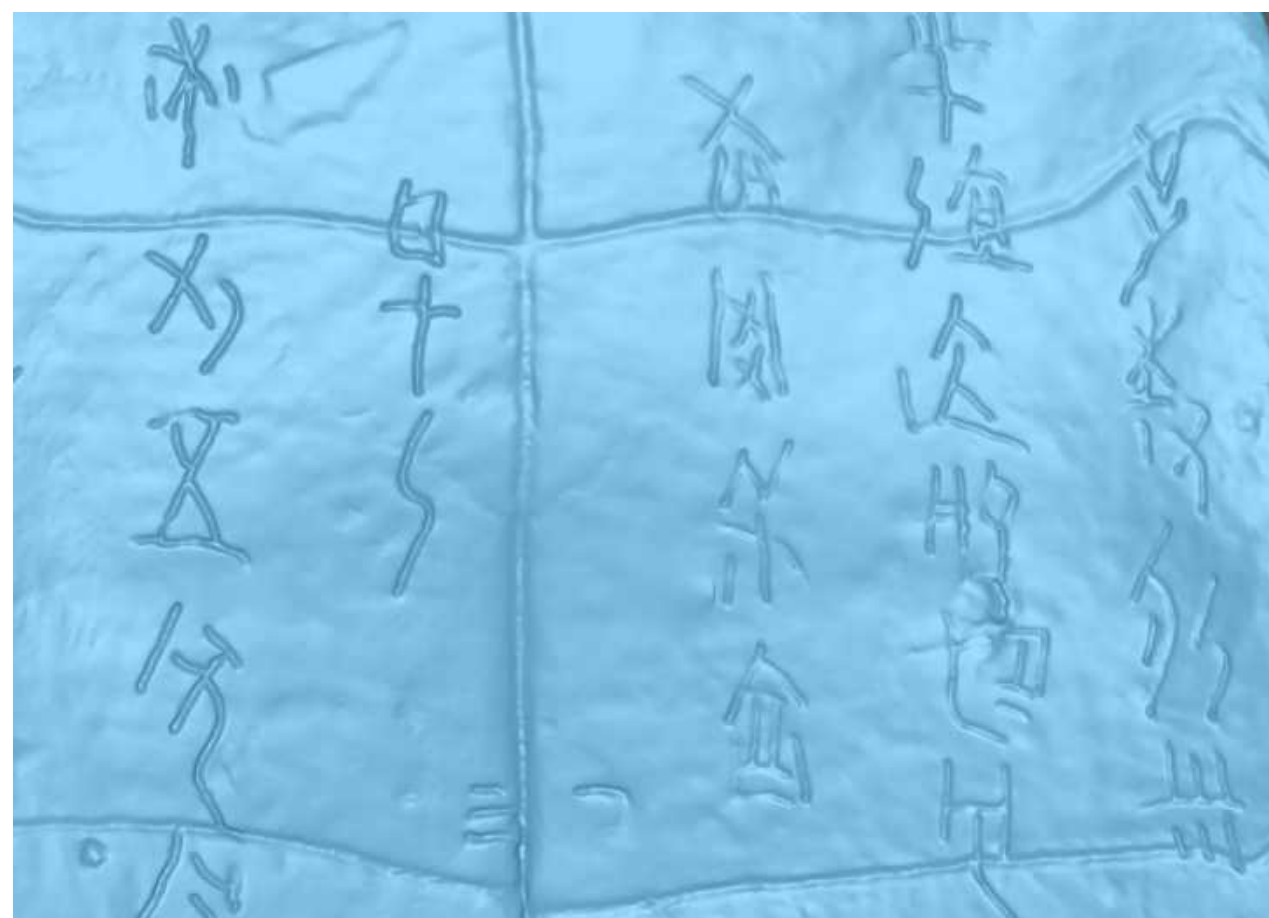
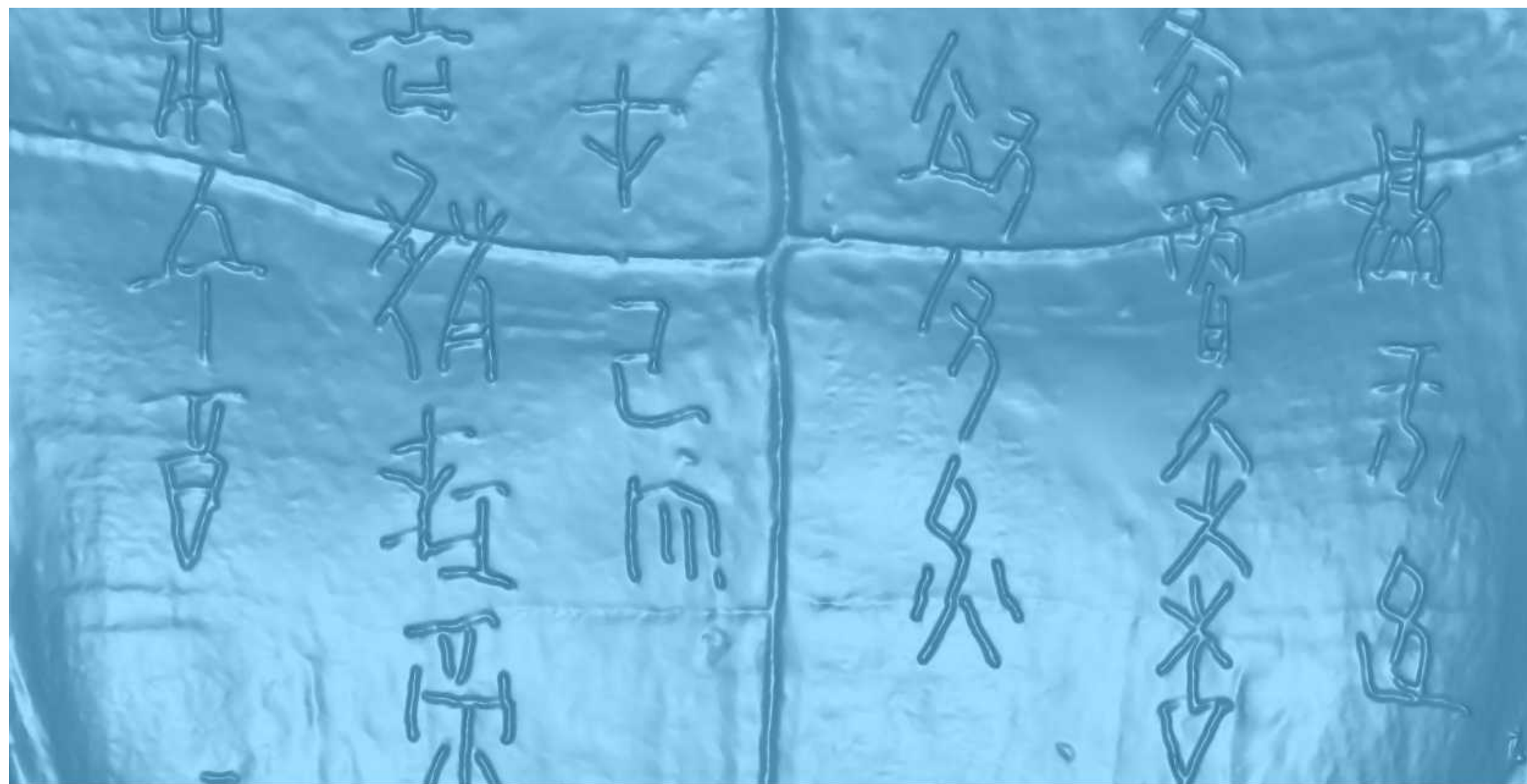
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# Other: High-precision 3D Scanning

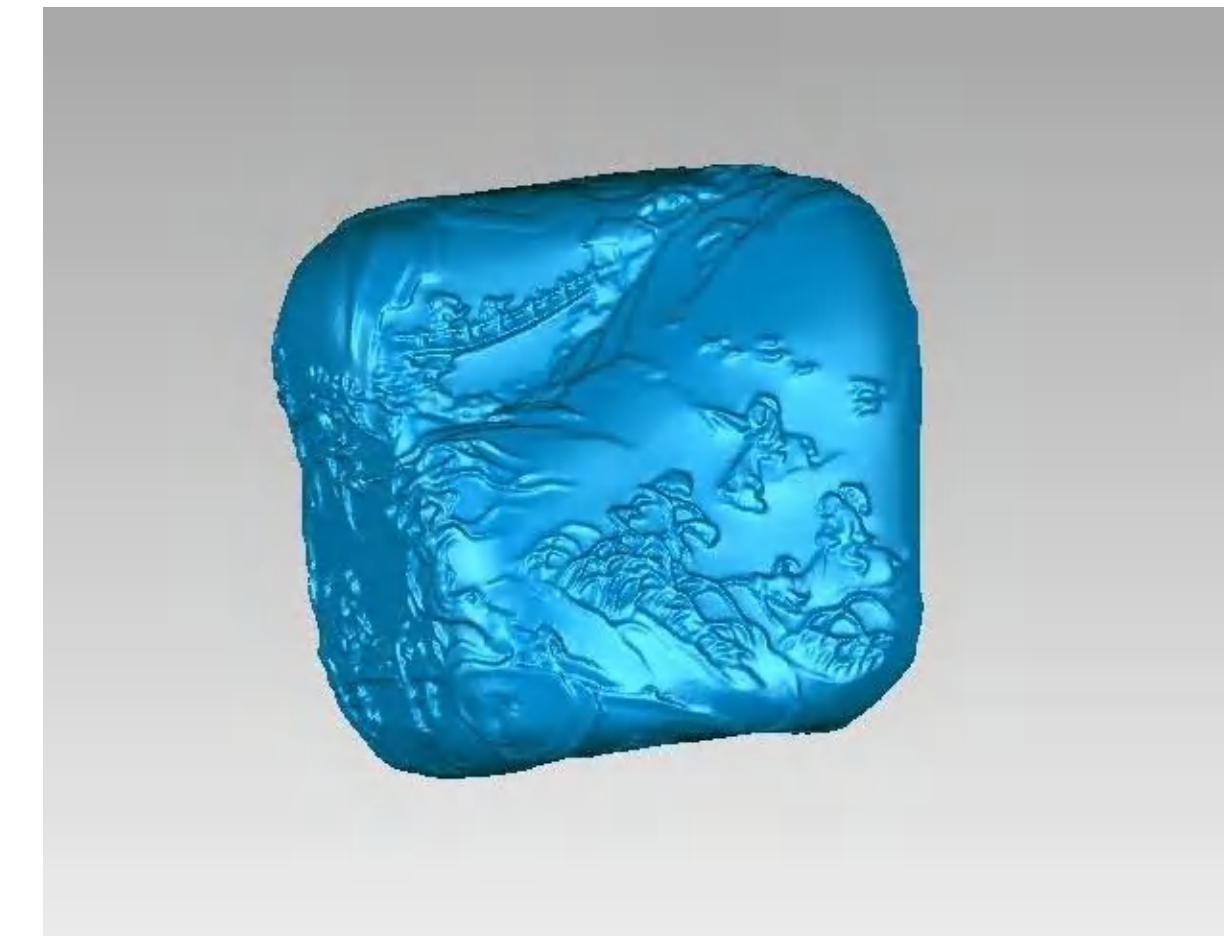
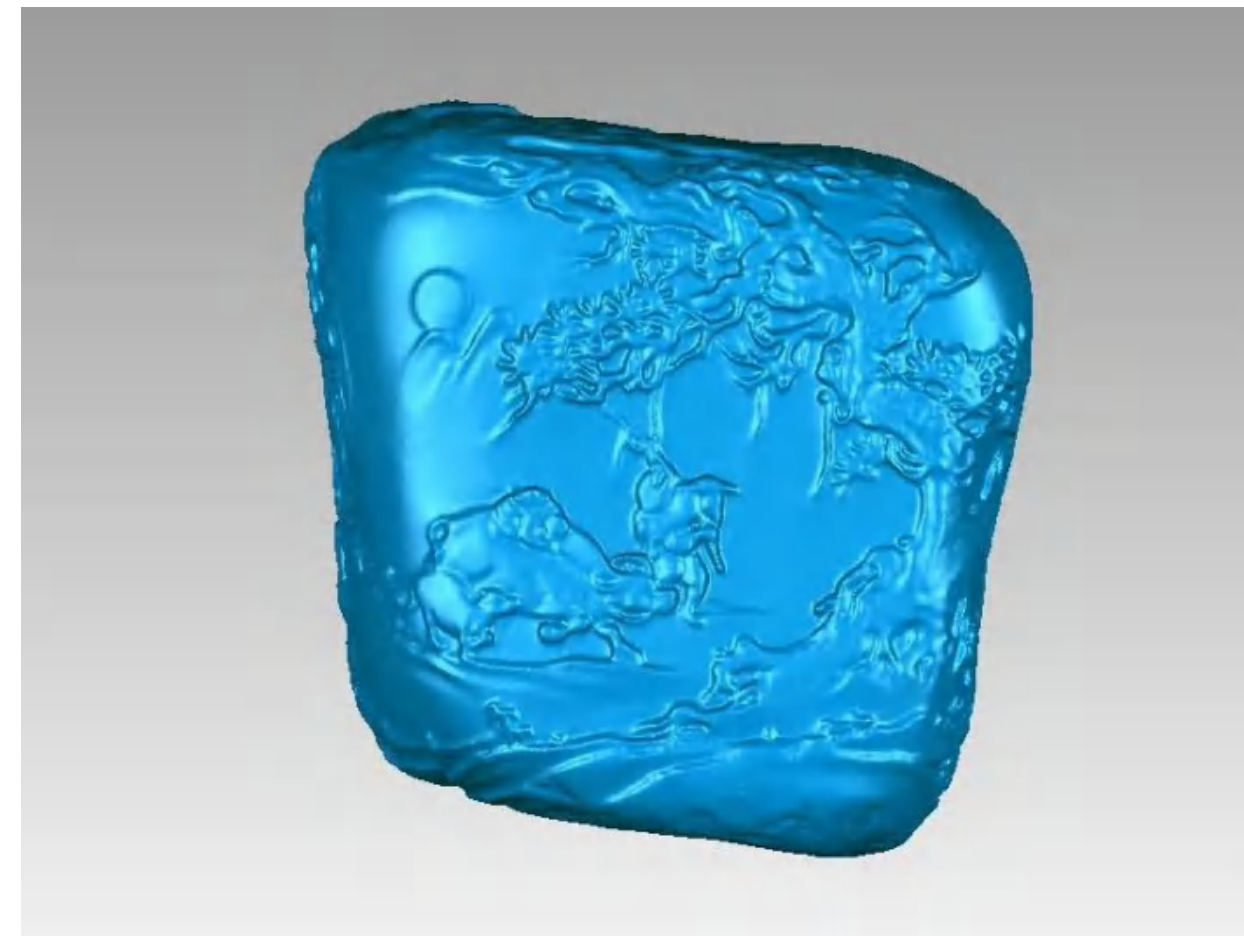
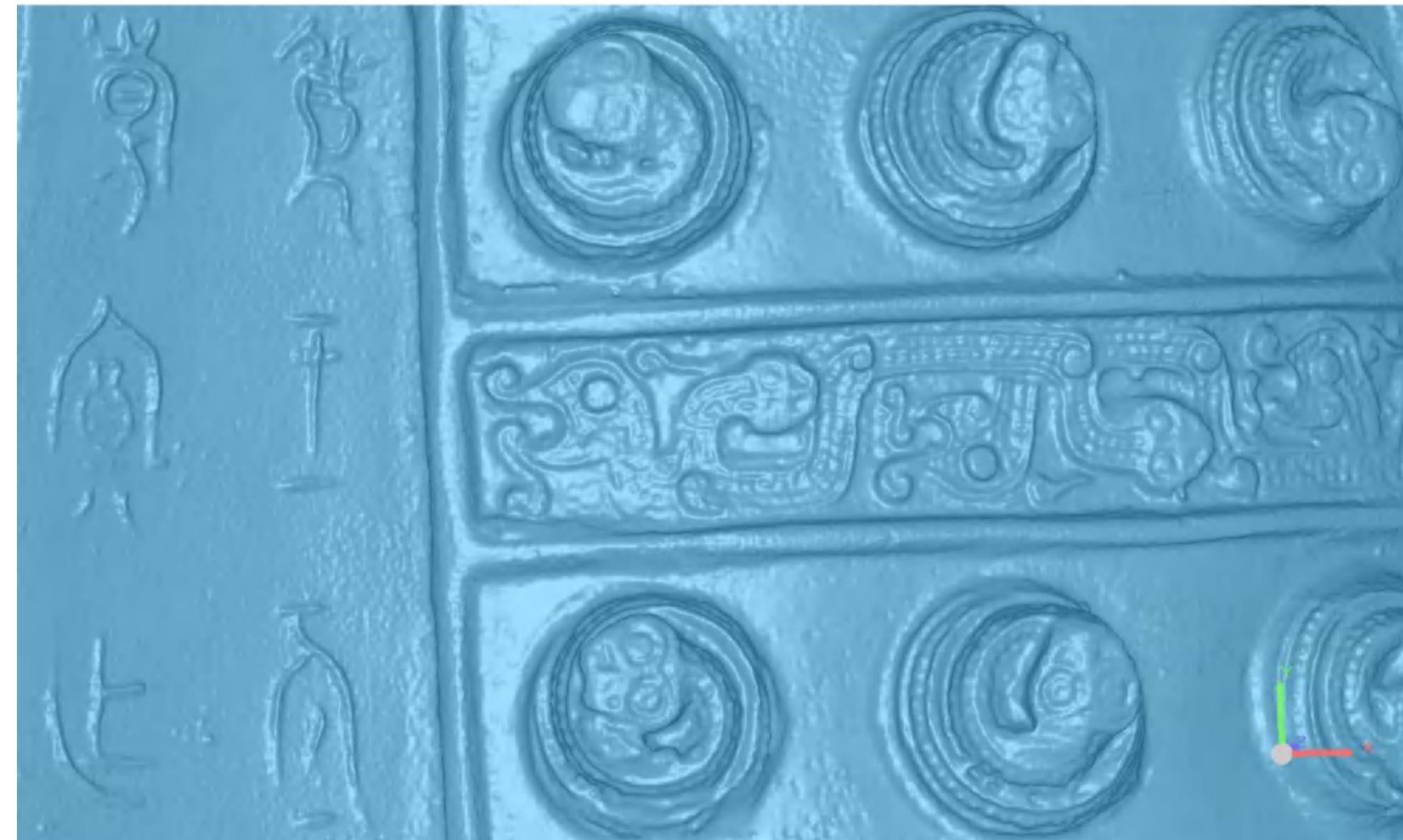
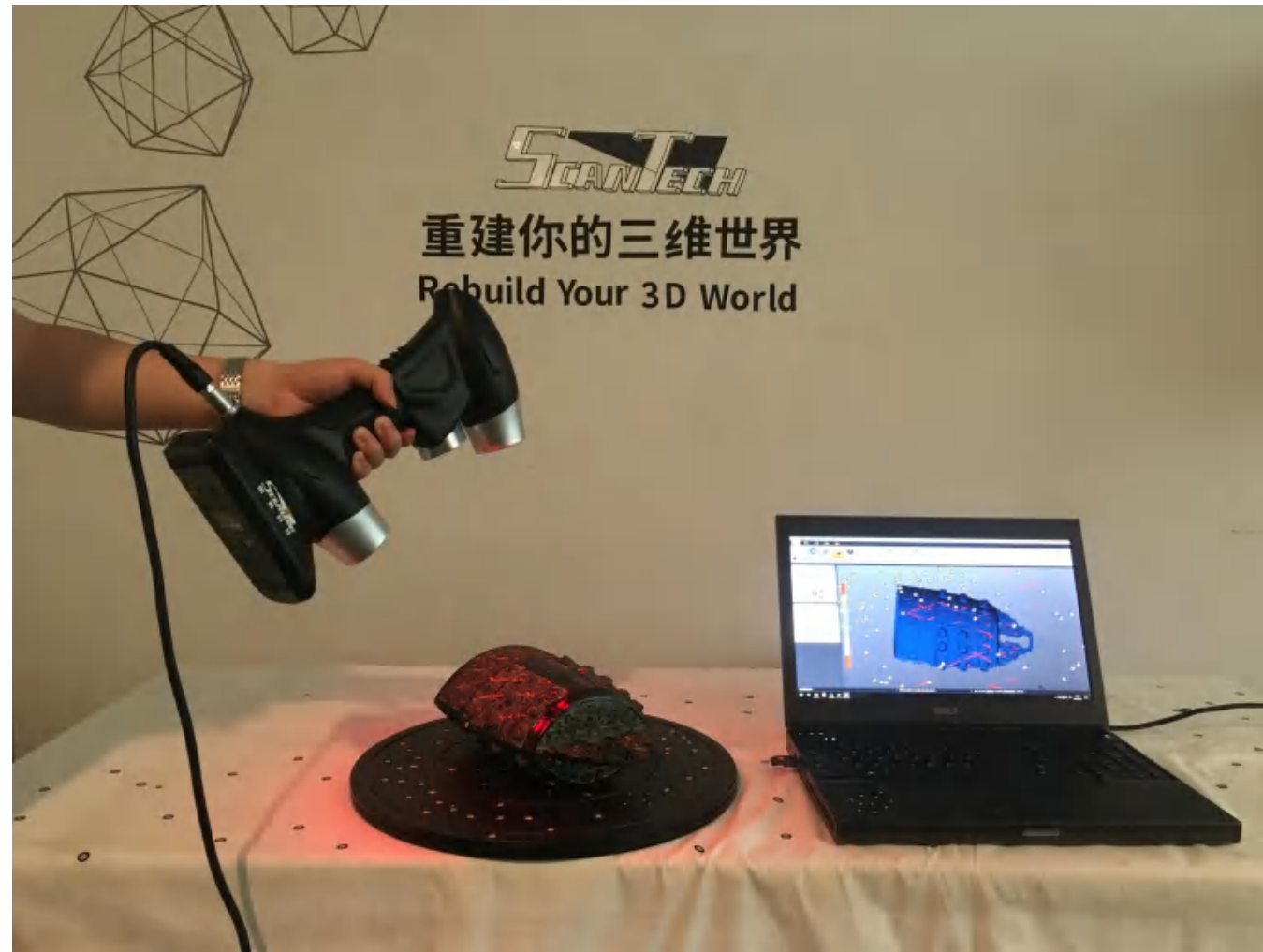


# Other: High-precision 3D Scanning



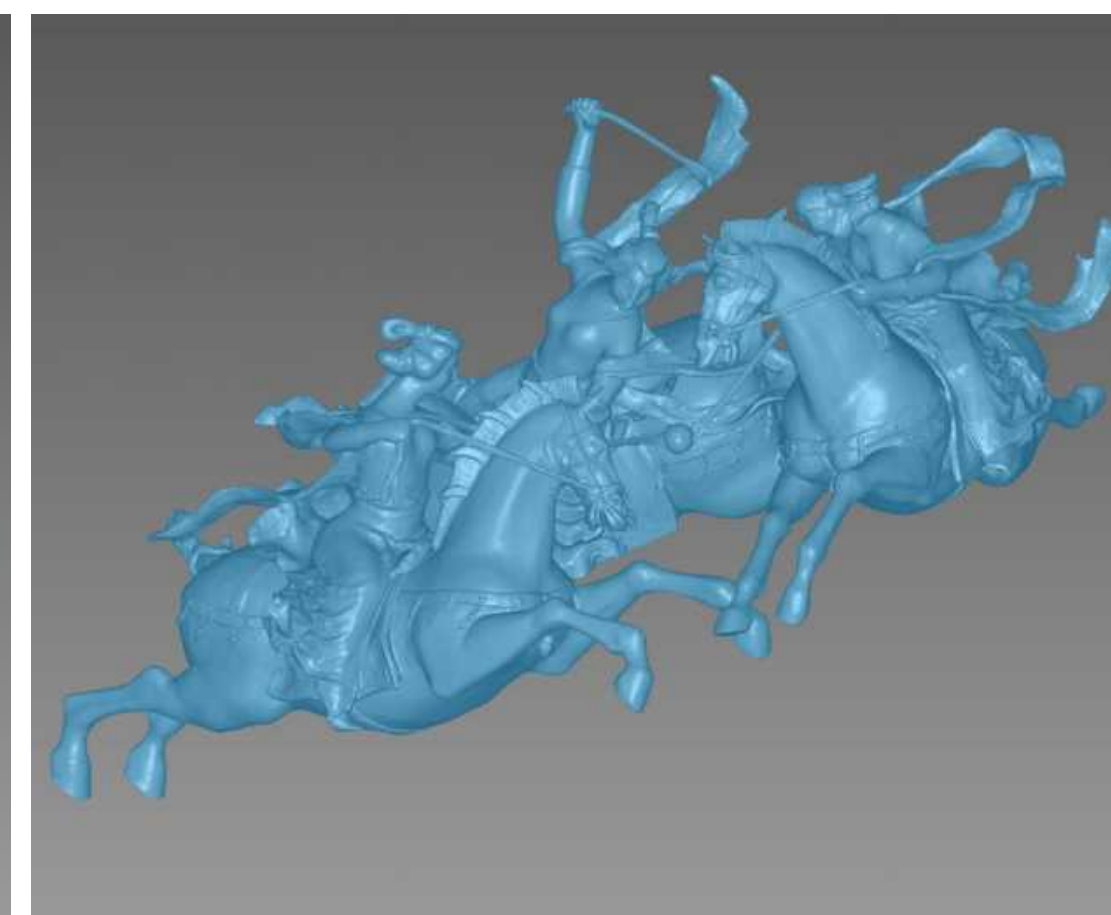
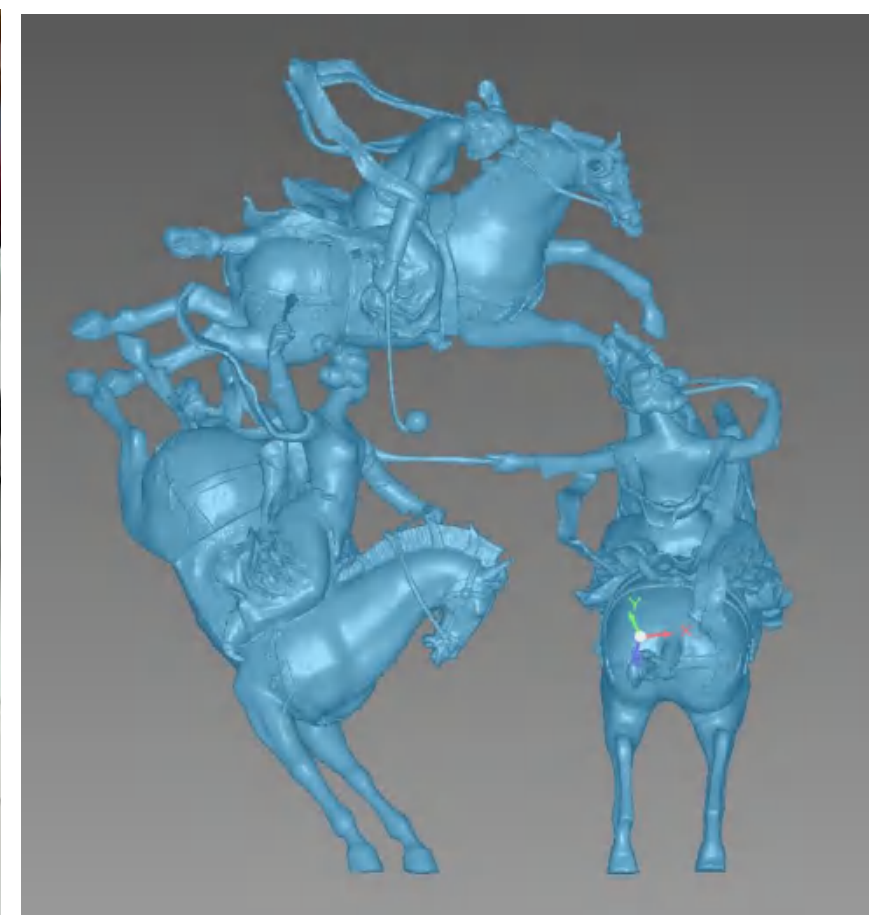
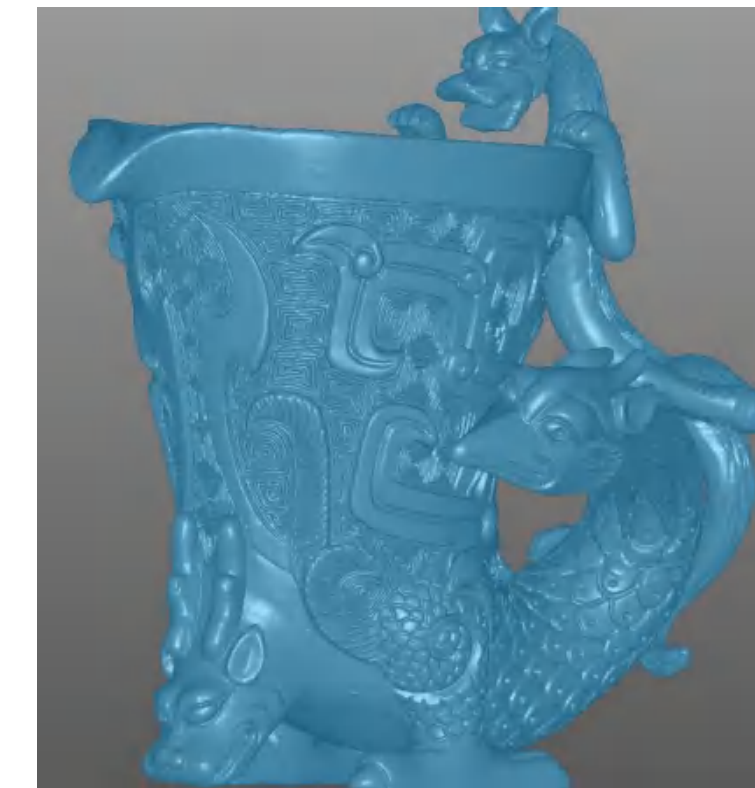
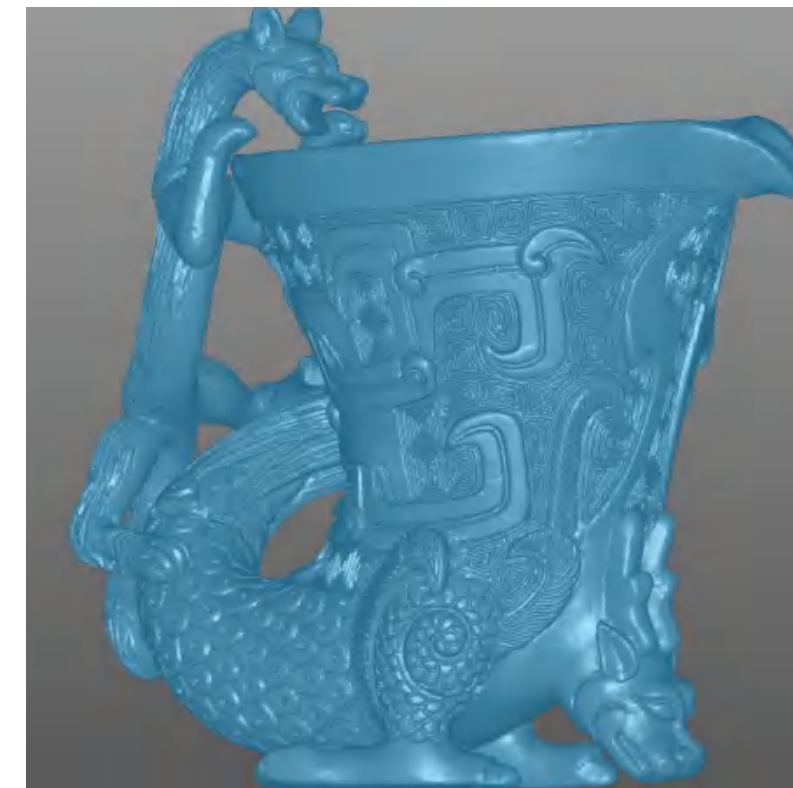
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# Other: High-precision 3D Scanning



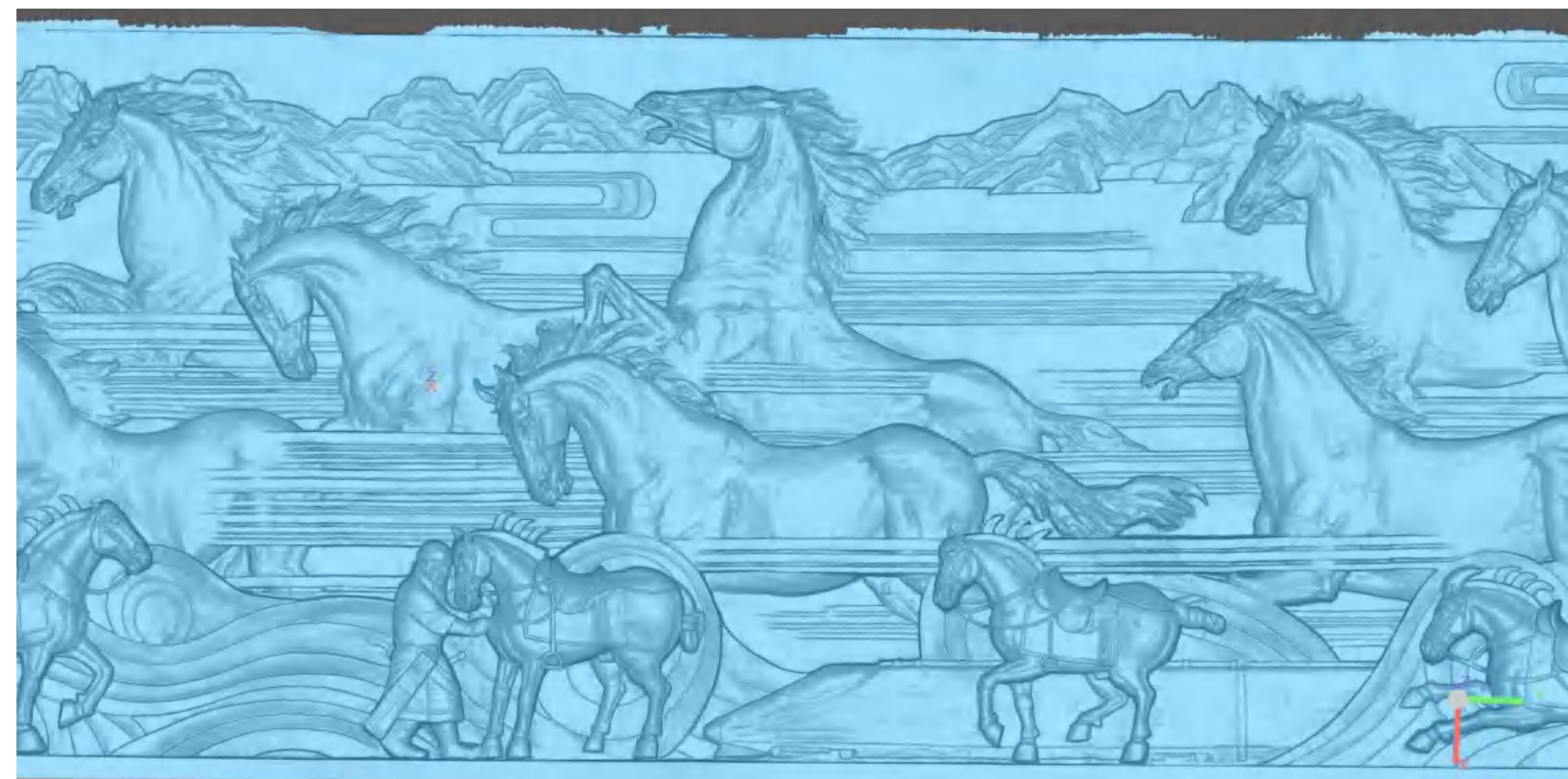
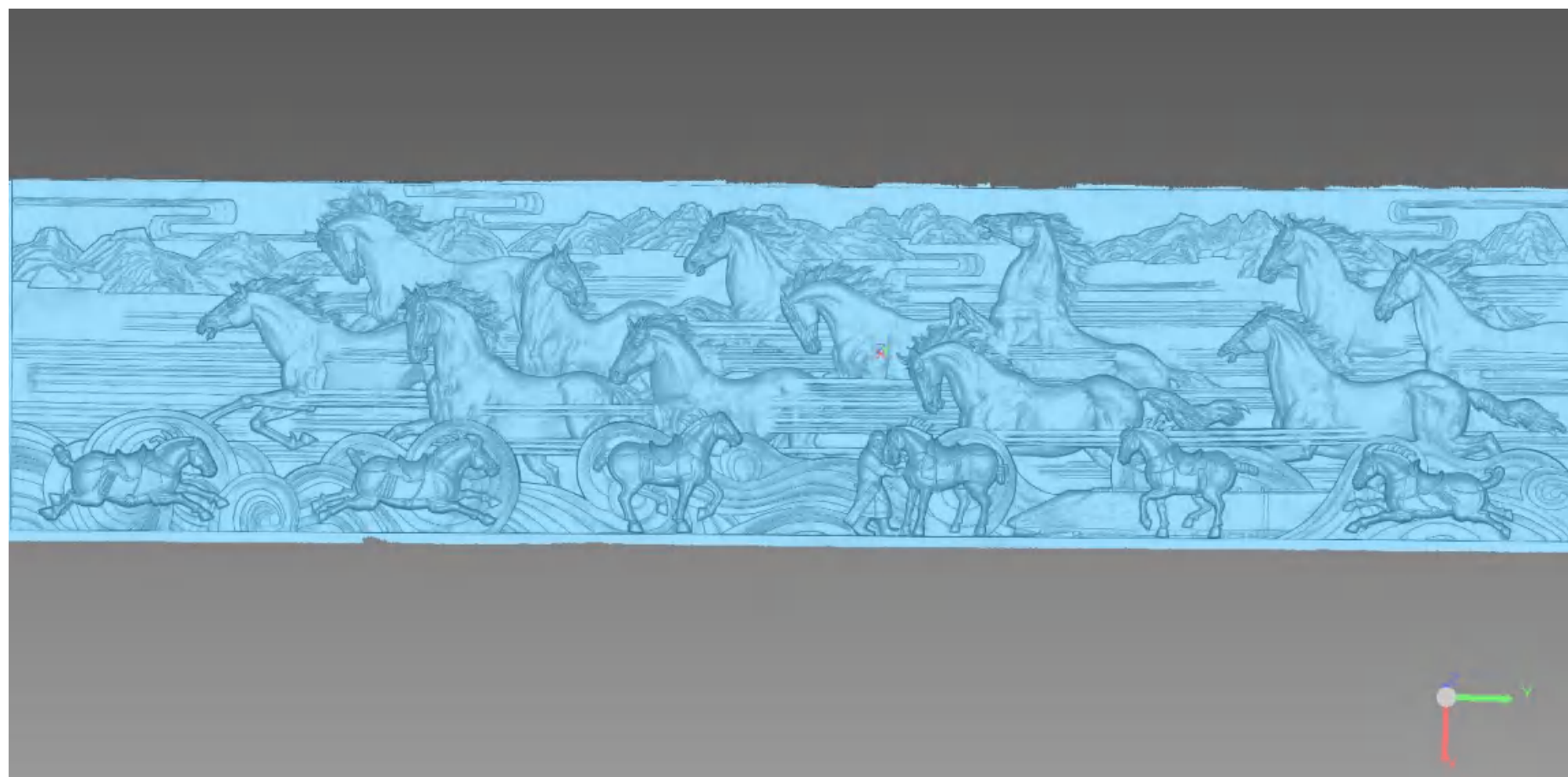
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# Other: High-precision 3D Scanning



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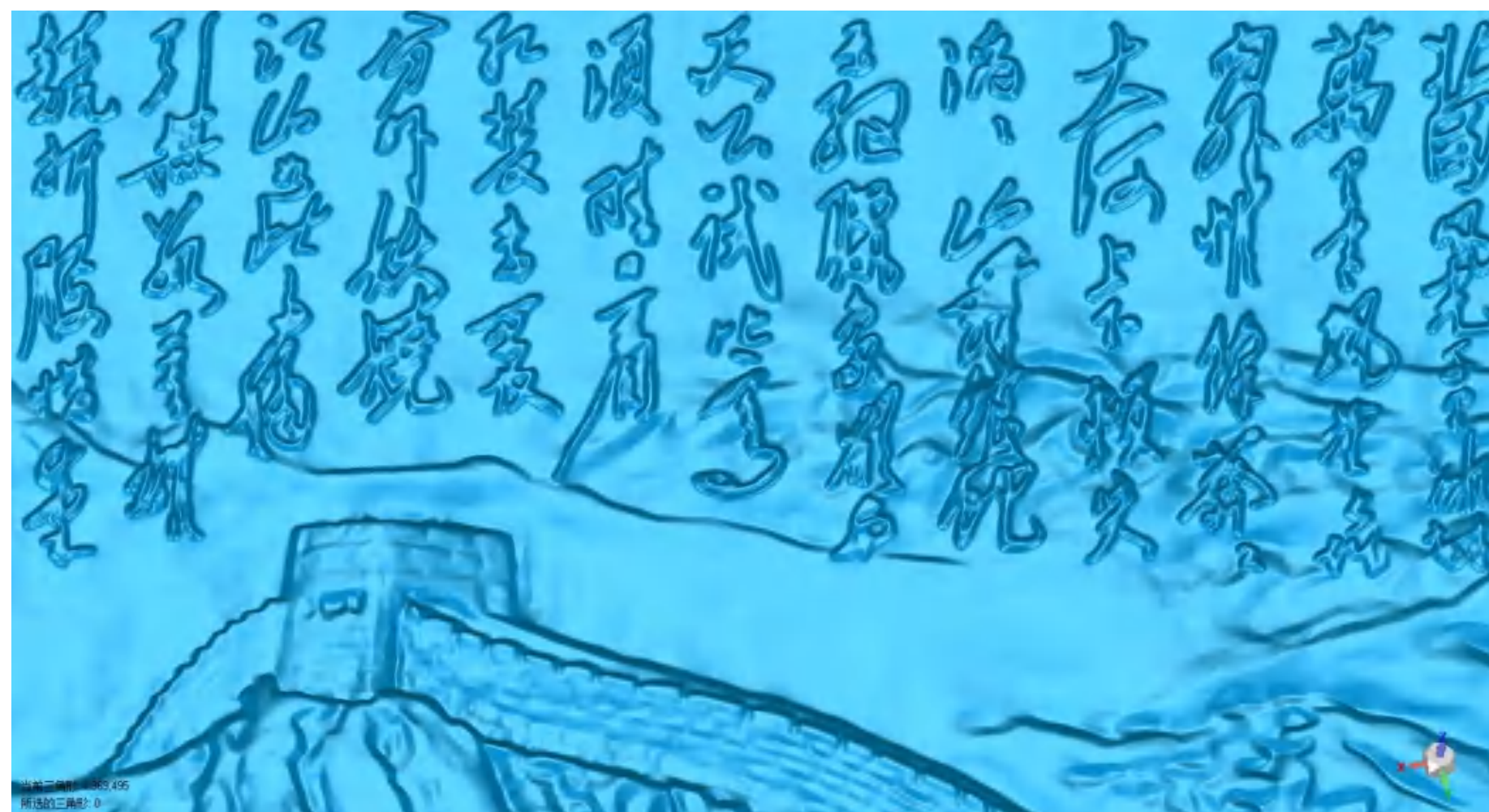
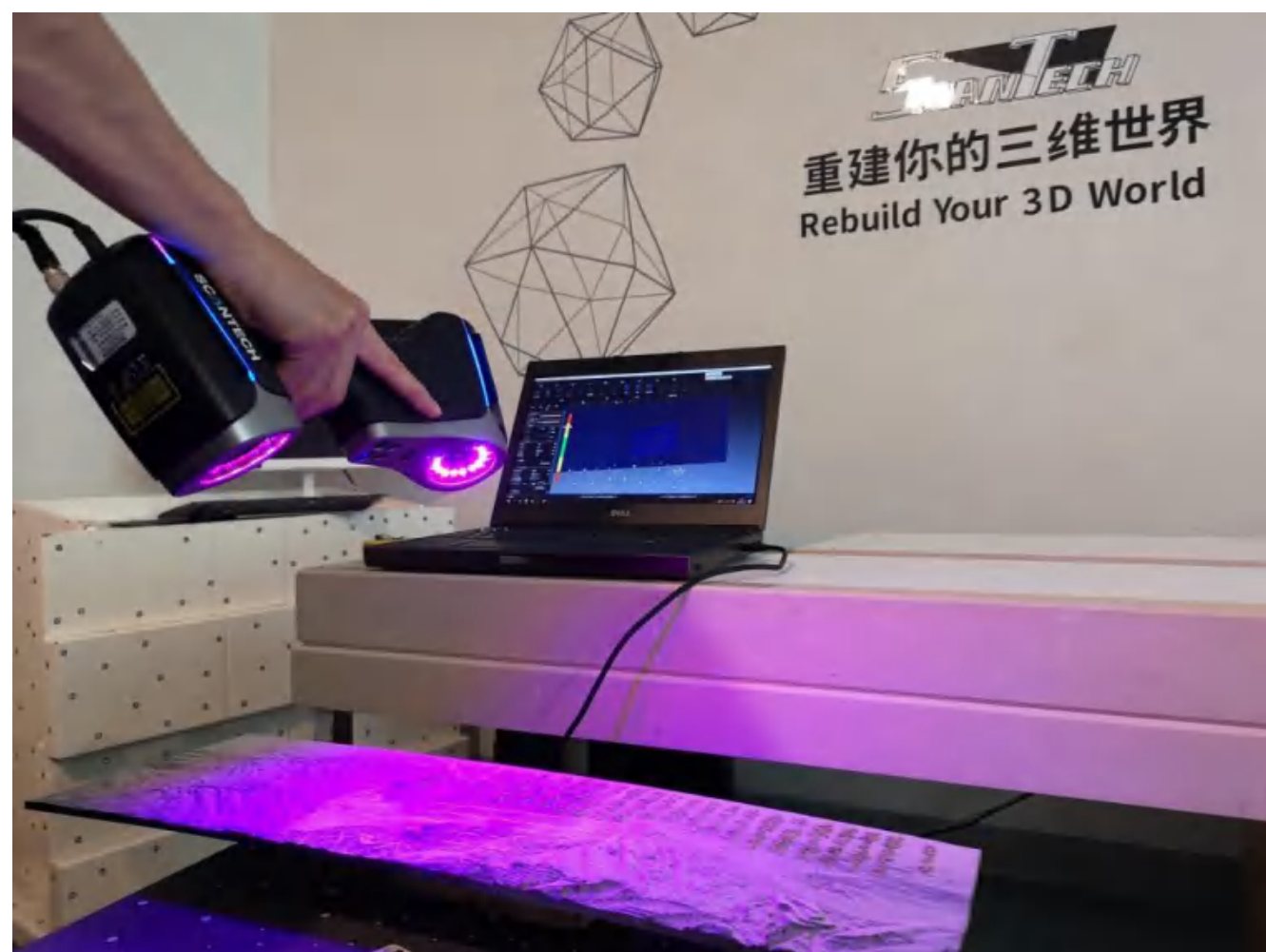
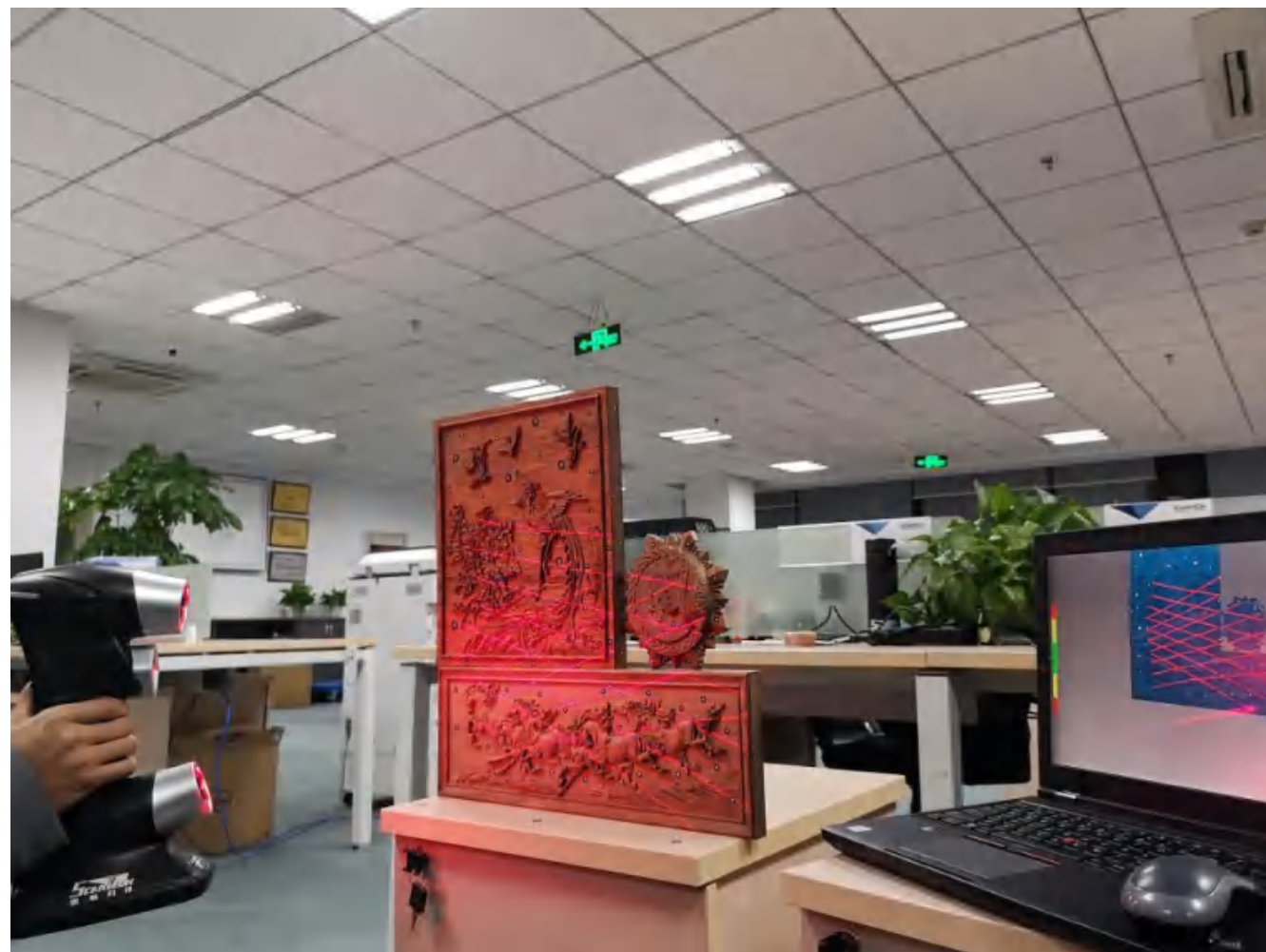


Huge relief: 14\*3 m



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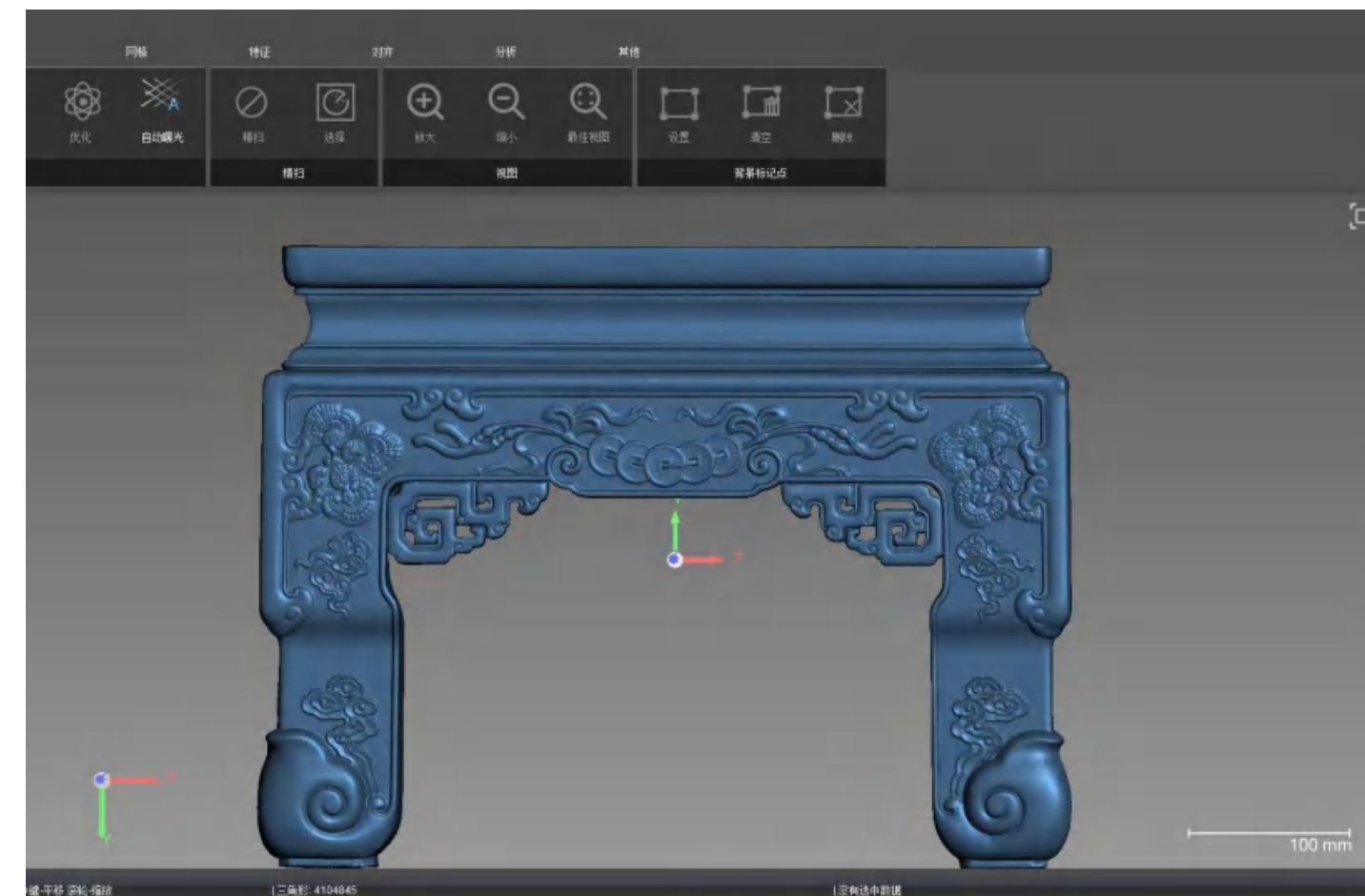
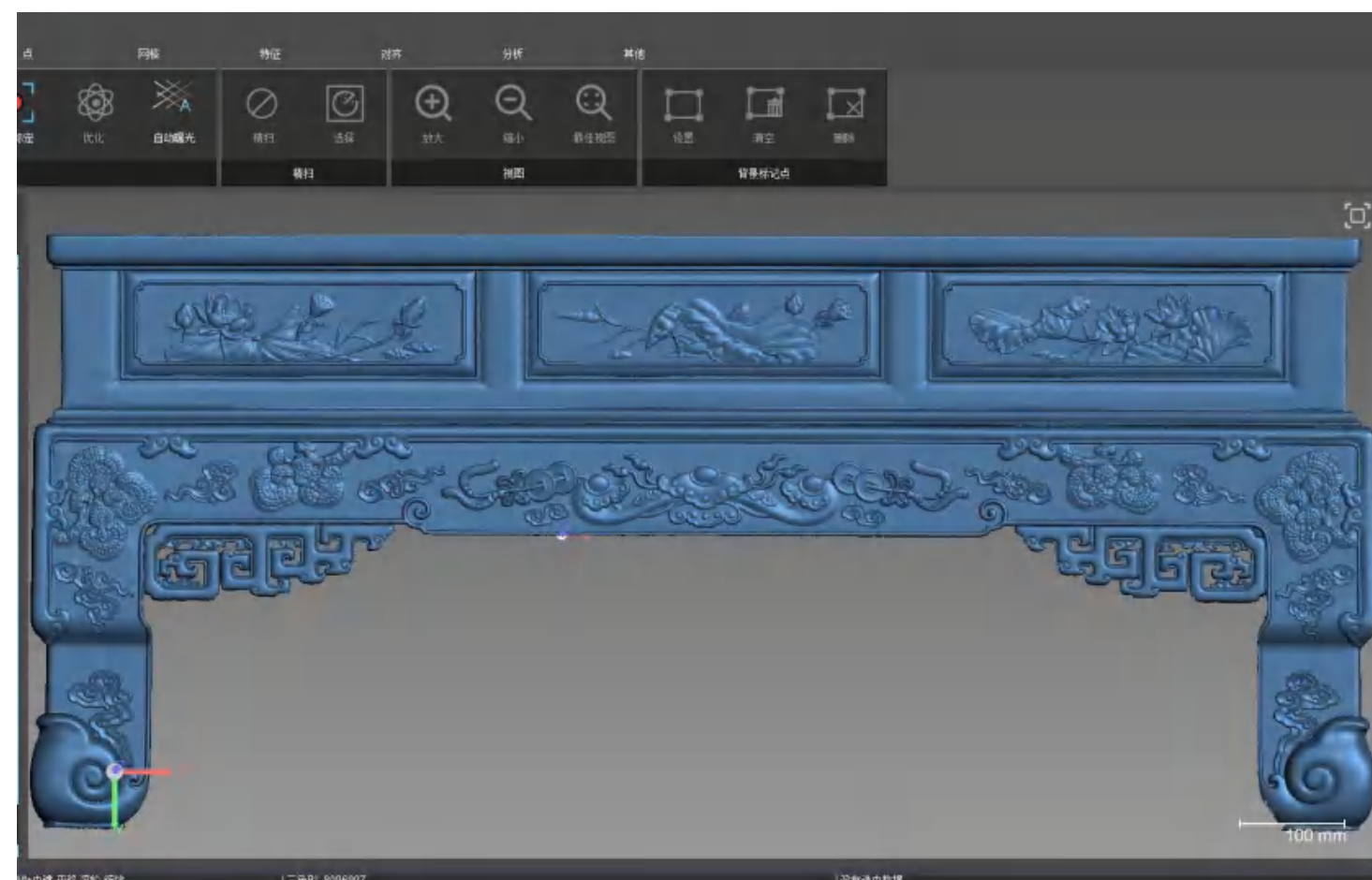
# Other: High-precision 3D Scanning



Wood carving artwork with rich details - plane carving

07

# Other: High-precision 3D Scanning



THANK YOU