

3D Modeling of Han  
Dynasty Mirrors  
using application of  
Photogrammetry

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## Photogrammetry: what is it?

- ◆ Photogrammetry is a method of measurement and interpretation in order to derive the shape and location of an object based on a series of photographs of that object
- ◆ Today it is a computerized process that produces spatial accuracy from photographs.
  - ◆ Creates an output: 3D model, mesh, point cloud, map, drawing, measurement, etc.

# 3D Modeling Technologies: Pros and Cons

## Photogrammetry



## Laser Scanning



# Types of Photogrammetry

- ◆ Aerial Photogrammetry

  - ◆ Scale: landscape

- ◆ Field Photogrammetry (Complex subject)

  - ◆ Scale: site specific, i.e. architecture, contexts, in-situ objects

- ◆ Lab Photogrammetry (Simple subject)

  - ◆ Scale: individual objects/artifacts in a controlled setting

# Workflow

## Capture the Subject

- Lab/Object Set-up
- Good Photography
- Good Geometry

## Image Preprocessing

- Color Correction
- Format as JPEG/TIFF
- Remove Camera Settings

## 3D Modeling

- Agisoft  
Photoscan Pro
- Align Photos
- Build Dense  
Cloud
- Build Mesh
- Create Texture

# Han Dynasty Mirrors

Bryn Mawr College

Art and Artifacts Collection: 82.47.a-c



Princeton Art Museum

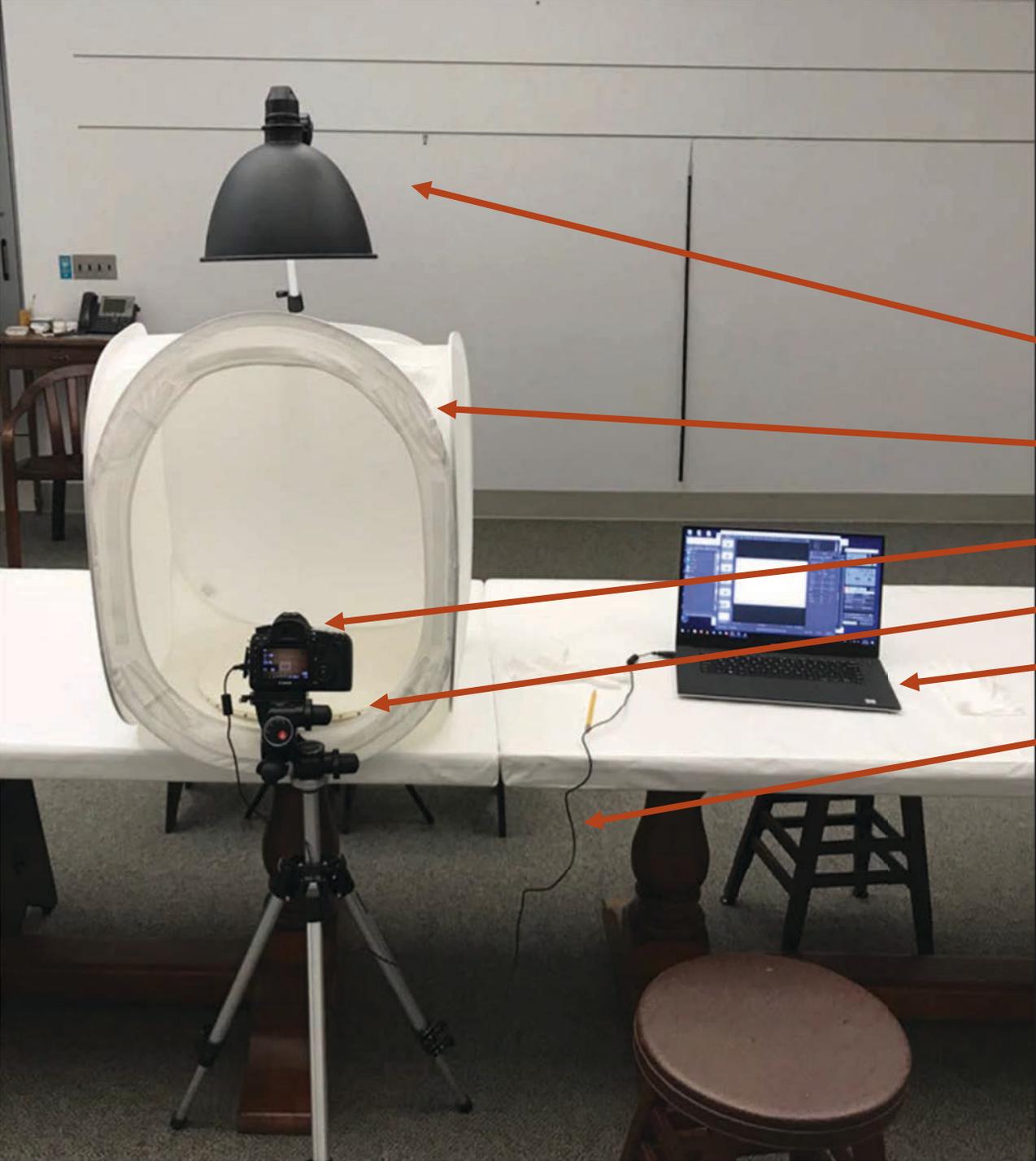
Asian Arts Collection: y1965-49



Smithsonian

Freer Art Gallery: F1911.108





# Shooting the Mirror: Set Up

## ◆ Key Components:

- ◆ Light Source
- ◆ Diffuser Box
- ◆ Camera
- ◆ Turntable
- ◆ Computer
- ◆ Cable for Remote Shooting



F1,4 F2 F2,8 F4 F5,6 F8 F11 F16 F22 F32



1/1000 1/500 1/250 1/125 1/60 1/30 1/15 1/8 1/4 1/2

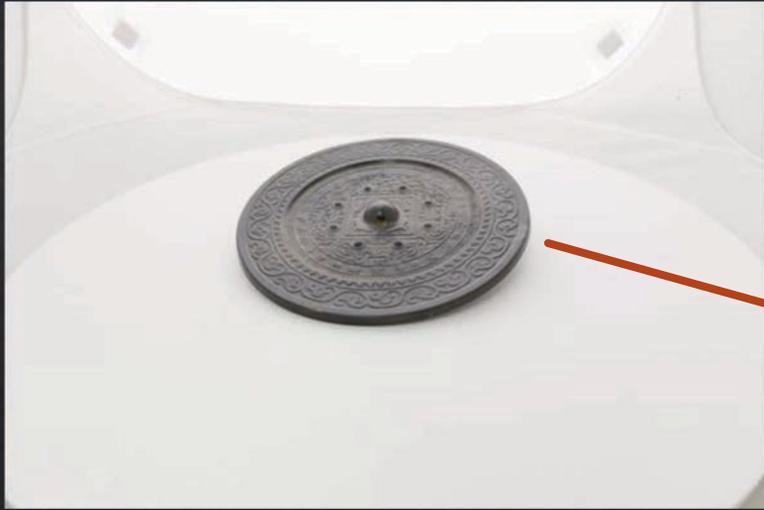


ISO 50 ISO 100 ISO 200 ISO 400 ISO 800 ISO 1600 ISO 3200 ISO 6400 ISO 12800 ISO 25600

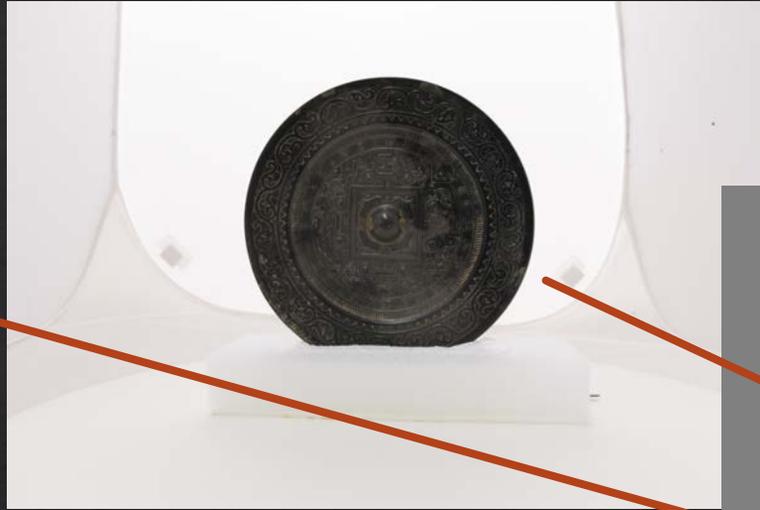
- IDEAL CAMERA SETTINGS:
- Aperture: f/16-f/22
- Shutter: 1/60-1/125
- ISO: 100-200

## Shooting the Mirror: Good Photography

# Shooting the Mirror: Good Geometry



Circuit 1: Reverse



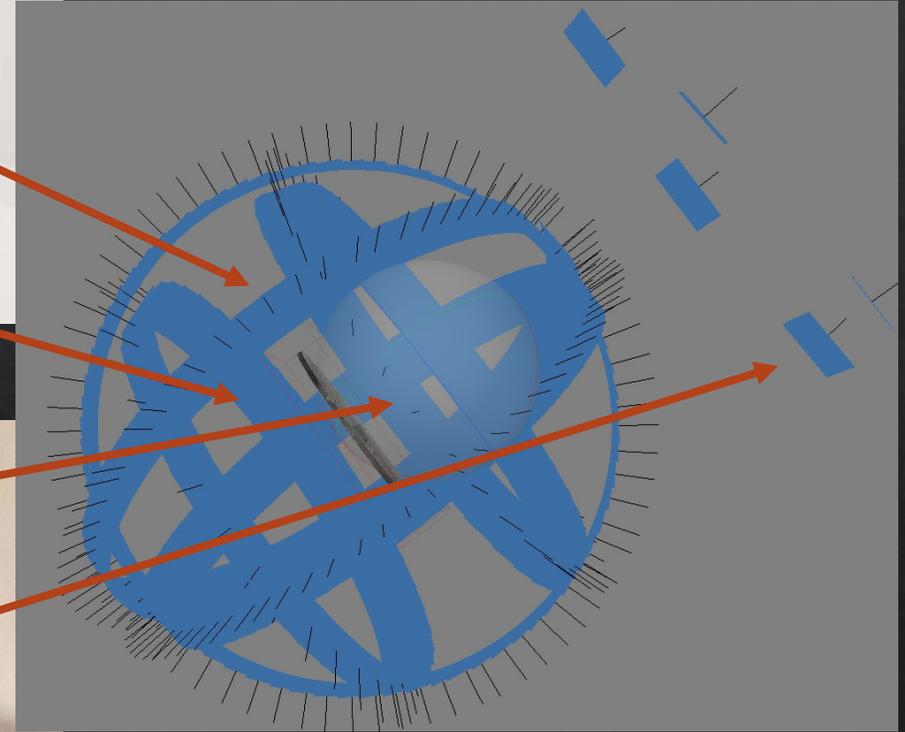
Circuit 3: Standing



Circuit 2: Obverse



Flat Run Bottom

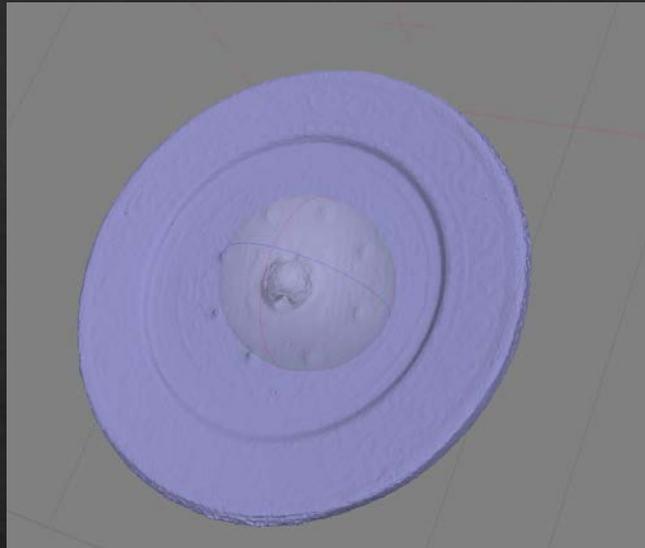


Each blue square represents a photograph taken; diagram demonstrates complete photographic coverage of the object.

# Shooting the Mirror: 3D Modeling



Dense Cloud



Mesh



Textured Model

# Why do we practice photogrammetry?

## Obtain accurate renditions of archaeological features/artifacts

- Take measurements from the models because they remove distortion present in 2D photographs

## Cultural Heritage

- Photogrammetry provides an opportunity to preserve cultural heritage in an electronic format
  - Ex. Assyrian reliefs destroyed by Isis
- Reconstruction of damaged buildings

## Increase public interest

- Photogrammetry provides an opportunity to “democratize” information and make it available to the public
  - Ex. 3D city models