

## Doing 3D: Implementation and Best Practices in Applying 3D Technologies Across Higher Education

Sunday, June 24  
10:30 - 11:30 AM  
MCC Rm 392



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# Doing 3D

## Implementation and Best Practices in Applying 3D Technologies Across Higher Education

[tiny.cc/ALA3D](https://tiny.cc/ALA3D)

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# **TECHNOLOGY, WORKFLOWS, AND COSTS**

# The Four main types of 3D Imaging

Structured Light Scanning

Photogrammetry

Laser Scanning

CT Scanning

# Photogrammetry vs Structured Light Scanning

# STRUCTURED LIGHT SCANNING

# ARTEC SPACE SPIDER



# ARTEC EVA





ARTEC LEO



# Structured Light Scanners - Technology

- Most popular of all 3D Imaging Technologies
- Lowest quality of technologies for the moment
- Easiest entry point and very fast in production
- Uses structured light to build density
- Photogrammetry to build texture
- Portable and doesn't require expensive lighting
- Supports all major file formats for output

# Structured Light Scanners - Workflows

- Begin with calibration and registration of scanner
- Perform series of scans of the object in 360°
- Capture different angles and distances with a combination of auto and manual alignment
- Finalize model in proprietary software
- Export model into 3D output and save data
- Occasionally perform measurement checks

# Structured Light Scanners - Costs

- **Higher End**
- Artec Leo \$25k
- Creaform Go!SCAN \$17k
  
- **Lower End**
- Scan in a Box \$3k
- EinScan-SP (Platinum) \$2k

# Structured Light Scanning - Advantages

- Speed
- Simplicity
- Cost
- Portability
- Community Support
- It's newer technology
- Sort of (3D to 3D) vs (3D to 2D to 3D) or Photogrammetry

# PHOTOGRAMMETRY



# Photogrammetry - Technology

- DSLR Camera
- 24mm, 35mm, and 50mm lens
- LED lighting recommended
- Tripod and Monopod
- Computer with robust processing capabilities
- Adobe Photoshop and Agisoft Photoscan Pro
- Supports all major file formats for output

# Photogrammetry - Workflows

- Photograph 360° in 12° increments for objects and spaces while overlapping images in a flat plane
- Process Raw files in Adobe Camera Raw
- Preserve Raws and Uncompressed Tiffs
- Process Tiffs in Agisoft Photoscan Pro
- Align Photos, Build Dense Cloud, Build Mesh, Build texture,
- Output desired 3D file format



# Photogrammetry - Costs

● 50mp DSLR-----	\$3500
● 35mm Lens-----	\$500
● Tripod and Monopod -----	\$300
● LED Lights-----	\$2000
● 3D Targets and Color Charts -----	\$500
● Agisoft Photoscan-----	\$550
● <b>Total</b> -----	<b>\$7350</b>

# Photogrammetry - Advantages

- Highest possible quality for single image capture
- Highest possible quality for texture
- Highest possible accuracy for color management
- Scientific Accuracy with targets and color charts
- We already know how to preserve 2D images
- As technology changes processing will advance
- DSLR is easily used for other types of capture

# LASER SCANNING (Lidar)



ARTEC RAY



LEICA SCAN STATION P40

# Laser Scanners or (Lidar) - Technology

- Lidar is Light Detection and Ranging. (Laser/Radar)
- By far the most accurate technology
- Uses lasers and sensors for measurement
- Mostly used for geographic spaces and mapping
- Builds dense point cloud with lidar technology
- Builds image overlay with an internal camera
- Supports all major 3D file formats for output

# Laser Scanners or (Lidar) - Workflows

- Set up scanner and configure settings first
- Define scan parameters and image options
- Begin scanning and wait for capture to complete
- Transfer data to computer and open scanned information in proprietary software for processing.
- Process data and output desired for 3D file format
- May also implement other software at this point

# Laser Scanners or (Lidar) - Costs

- **Higher End**

- Leica ScanStation P40 3D \$125k

- Artec Ray \$60k

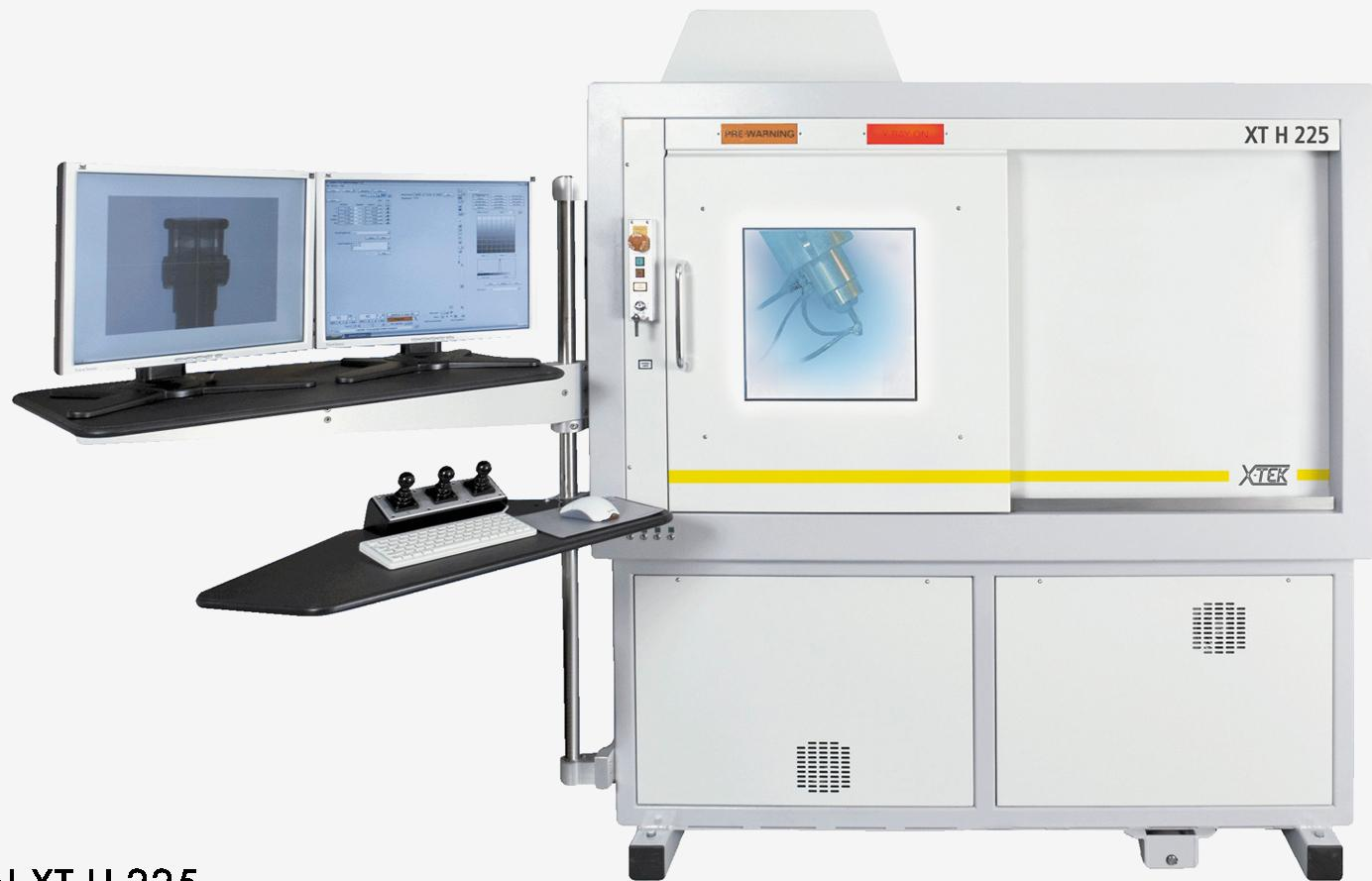
- **Lower End**

- Leica BLK360 \$16k

- Leica 3D Disto \$8k

# CT SCANNING





NIKON XT H 225

# CT Scanners - Technology

- Radiographic or X-Ray technology
- Obtains Interior and Exterior 3D information
- Mostly used for medical and or paleontological specimen
- Best technology for micro or small specimen
- Non-destructive methods
- Supports all major file formats for output

# CT Scanners - Workflows

- Mostly proprietary hardware and software
- Hard to find information about specific workflows since the technology is proprietary and vendor specific
- Only a small number of manufacturers
- Requires trained specialists and technicians
- You can also send specimen to companies for imaging rather than purchasing equipment

# CT Scanners - Costs

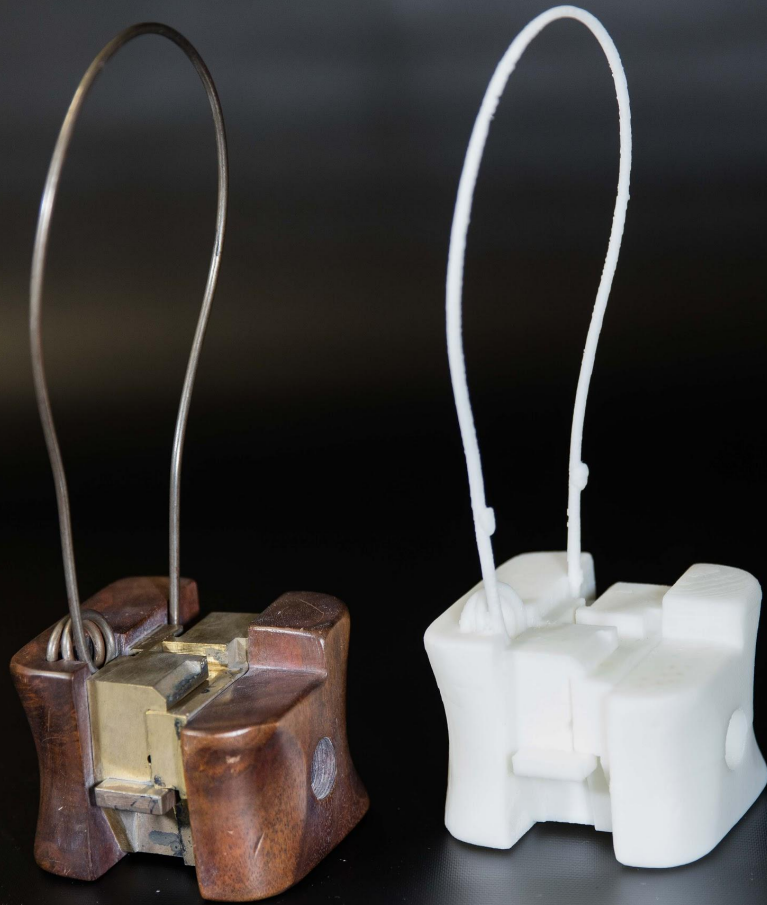
- Prices only provided by request from companies
- All scanners require contracts for setup and maintenance
- Prices range from \$100k to \$1million
- A few common models I was able to find:
- The Nikon XT H 225 at [www.nikonmetrology.com](http://www.nikonmetrology.com)
- The Skyscan 221 available at [www.bruker.com](http://www.bruker.com)

# Resources and Links

- Virginia Tech Digital Imaging and Preservation Services Wiki [www.webapps.es.vt.edu](http://www.webapps.es.vt.edu)
- Federal Agencies Digital Guidelines Initiative [www.digitizationguidelines.gov](http://www.digitizationguidelines.gov)
- BH Photo Supply [www.bhphotovideo.com](http://www.bhphotovideo.com)
- Artec 3D Scanners [www.artec3d.com](http://www.artec3d.com)
- Nikon Metrology [www.nikonmetrology.com](http://www.nikonmetrology.com)
- Leica Geosystems [www.leica-geosystems.com](http://www.leica-geosystems.com)
- Adobe Creative Cloud [www.adobe.com](http://www.adobe.com)
- Agisoft Photoscan [www.agisoft.com](http://www.agisoft.com)
- Cultural Heritage Imaging [www.culturalheritageimaging.org](http://www.culturalheritageimaging.org)
- Web 3D Consortium [www.web3d.org](http://www.web3d.org)
- SketchFab [www.sketchfab.com](http://www.sketchfab.com)

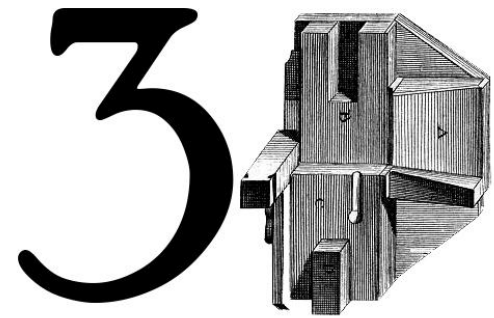
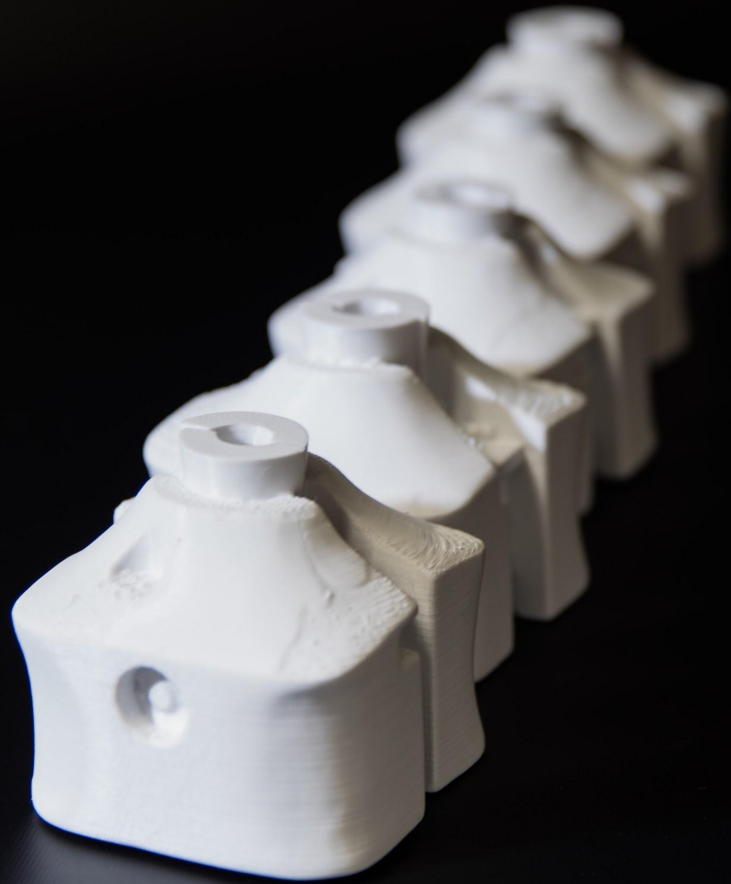
# Technology, Workflows, and Costs - Overview

<b>Method</b>	<b>Structured Light</b>	<b>Photogrammetry</b>	<b>Laser (Lidar)</b>	<b>CT Scanning</b>
<b>Technology</b>	Handheld or mounted scanner and a robust computer with various 3D software.	DSLR camera, tripod, lighting, and a robust computer with Agisoft Photoscan, Photoshop, and various 3D software.	Lidar system, tripod, dedicated hardware, and a robust computer with various 3D software.	CT Scanning system in special designed space.(not portable), dedicated hardware and software and various 3D software.
<b>Labor</b>	Basic Photo Skills recommended per scanner model.	Advanced photo skills recommended. Basic skills required.	Trained specialists and technicians required.	Trained specialists and technicians required.
<b>Outputs</b>	STL-OBJ-PLY-etc.	STL-OBJ-PLY-etc.	STL-OBJ-PLY-etc.	STL-OBJ-PLY-etc.
<b>Cost</b>	\$10k - \$25k	\$5k - \$10k	\$17k - \$125k	\$100k - 1million



# DOING 3D

Building a 3D  
project



# HOTBED

**3D** Printed **H**istory **O**f **T**he **B**ook **E**ducation

Furthering Book History Education  
through Rapid Fabrication



# 3Dhotbed: The Beginning

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Scanned & printed miniatures  
from the University of North  
Texas Special Collections.



Den Geest Des Gebeds Vol Godvrugtige Oeffeningen: Uyt De H.  
Schrifture, Den Missael En Hh. Vaders. Brugge: Corn. de Moor en  
Zoon, 1795

<https://digital.library.unt.edu/ark:/67531/metadc853127/>

# 3DHOTBED TYPECASTING TOOLKIT

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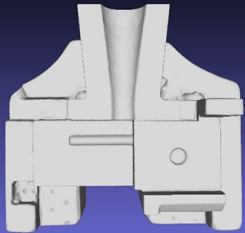
PUNCH



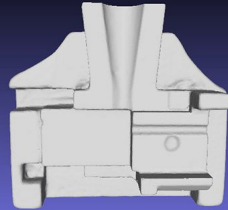
MATRIX



FINISHED TYPE



HAND MOULD SIDE A



HAND MOULD SIDE B



TYPE WITHOUT JET

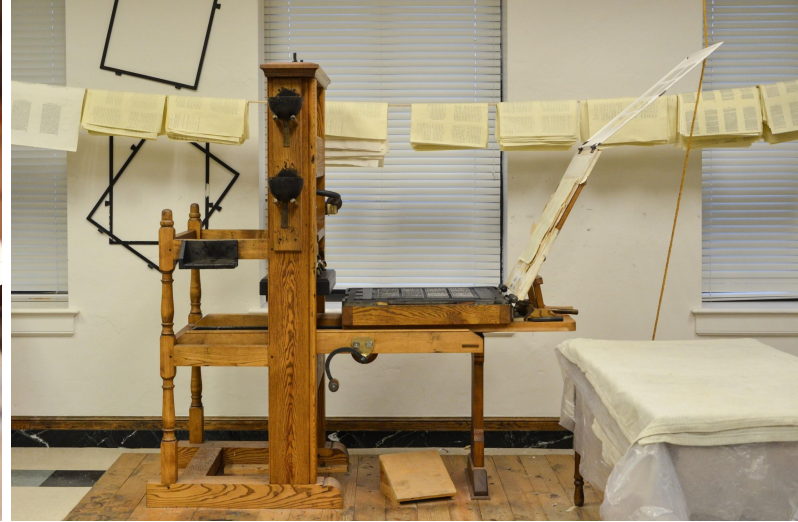


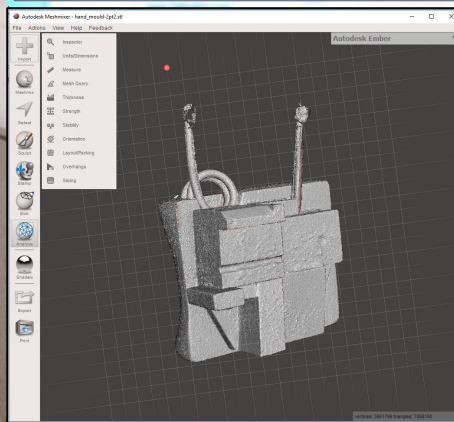
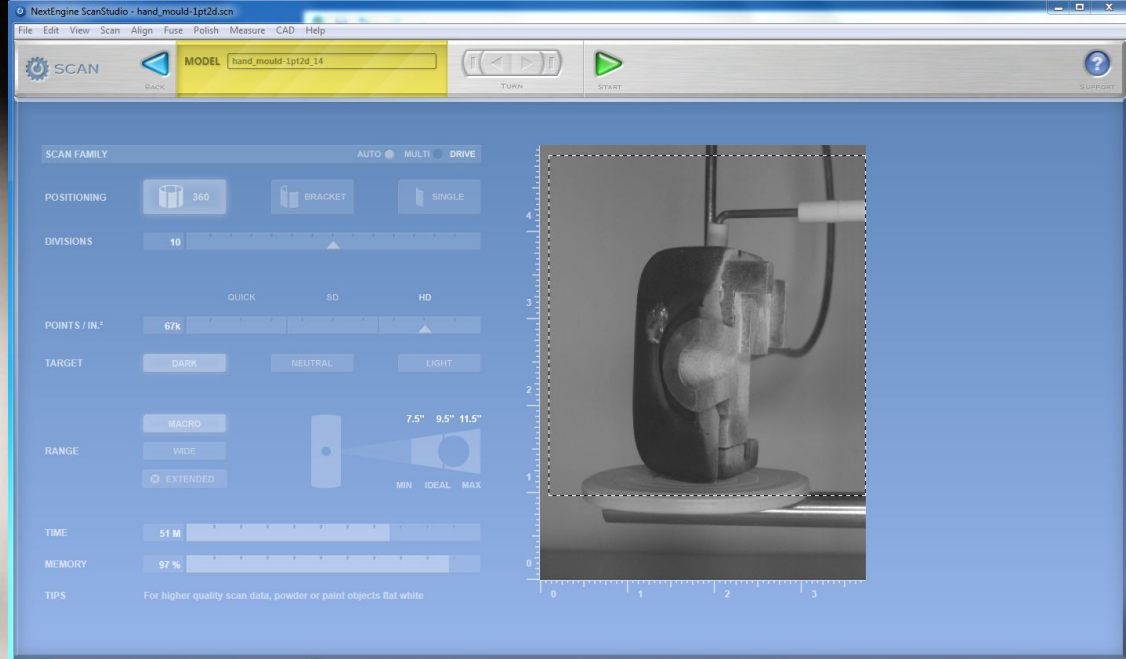
**Custom Built  
~ \$4,000**

# THE BOOK HISTORY WORKSHOP AT TEXAS A&M

Hands-on instruction of  
hand-press printing using  
period-accurate tools and  
techniques.

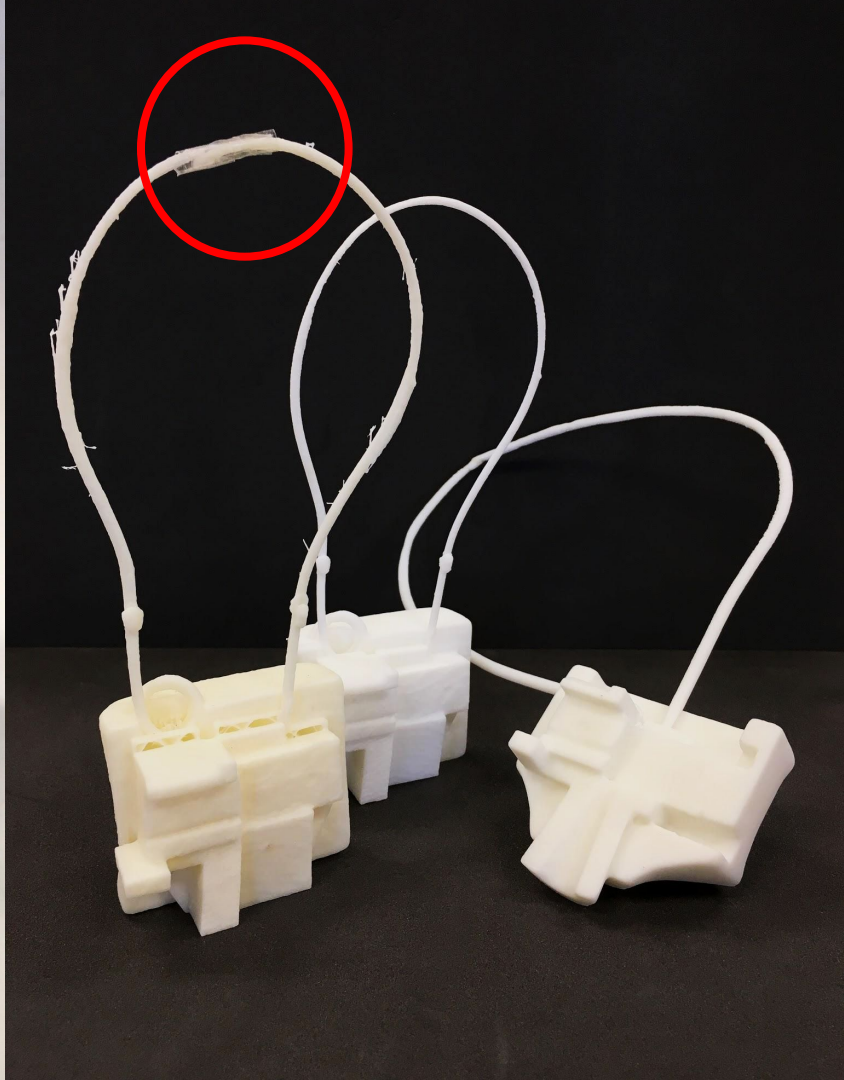
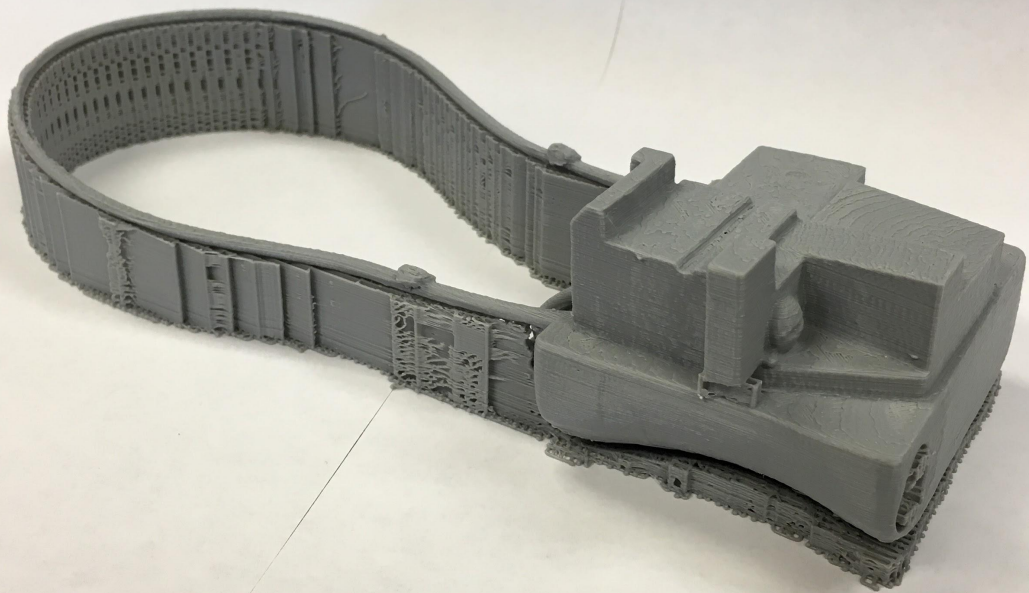
More info: <http://library.tamu.edu/book-history>





## CHALLENGES SCANNING

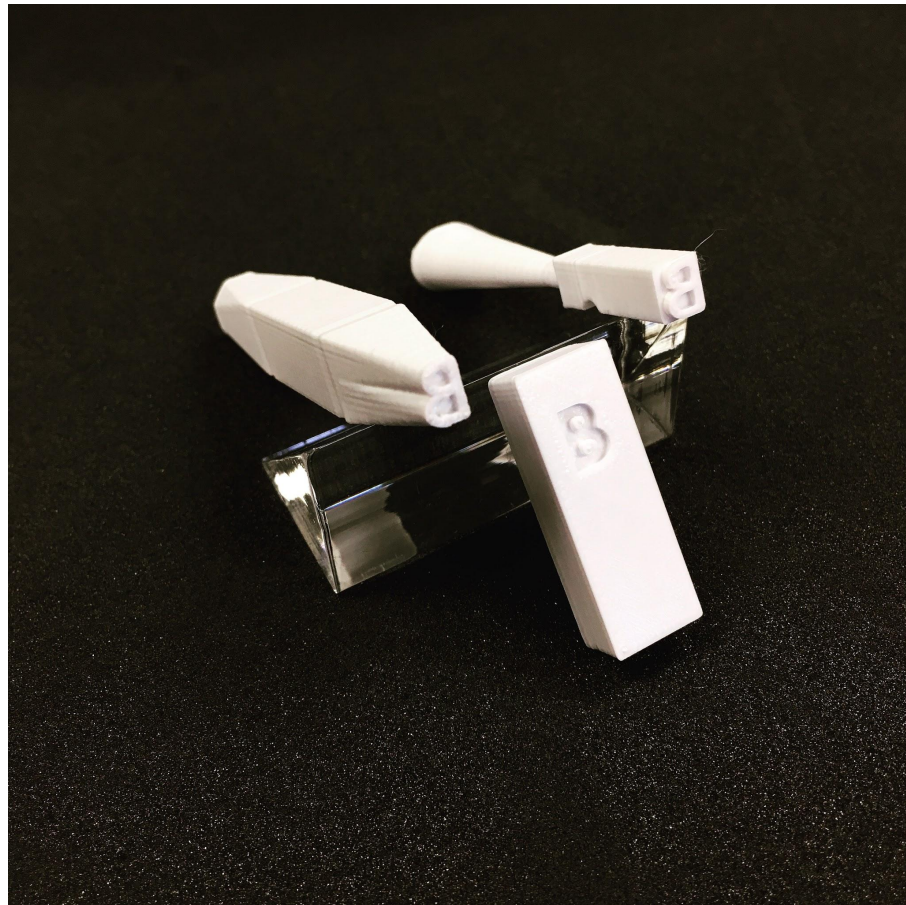
- LARGE OBJECTS
- SHINY OBJECTS



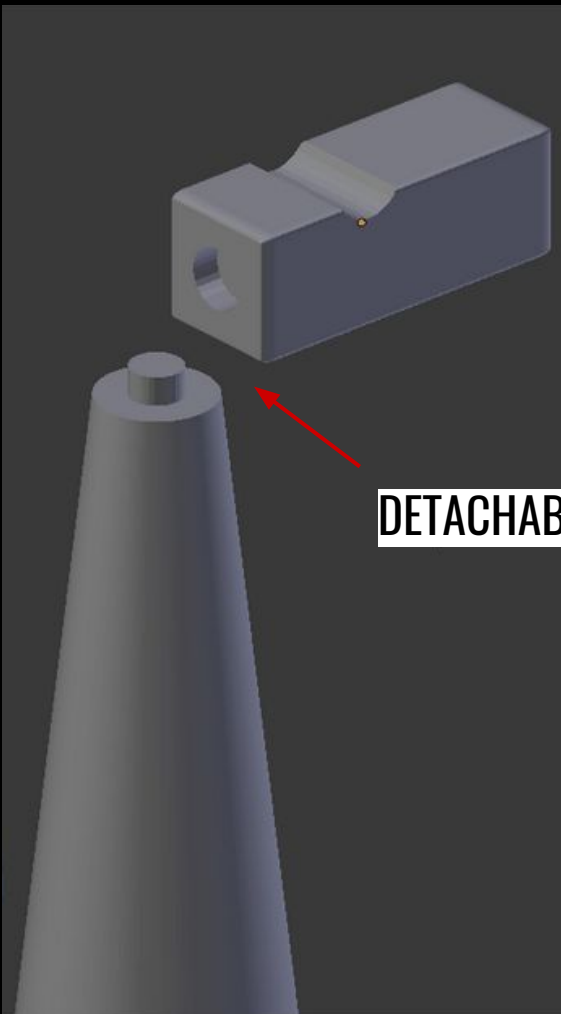


**SCANNED PRINTS**

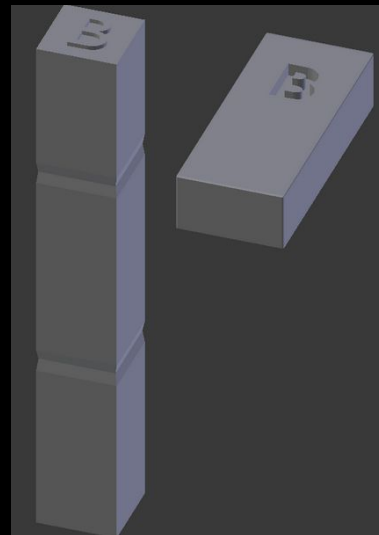
**VS**



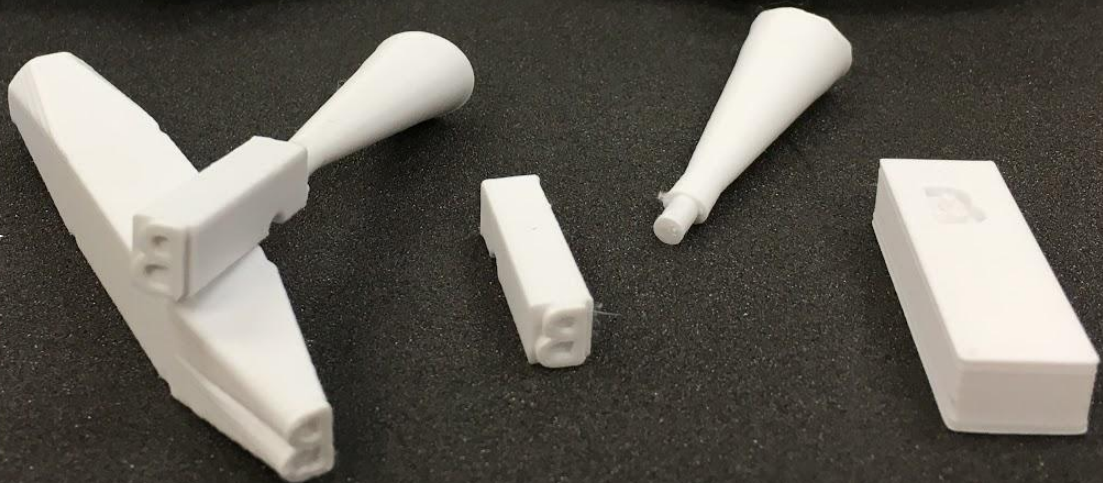
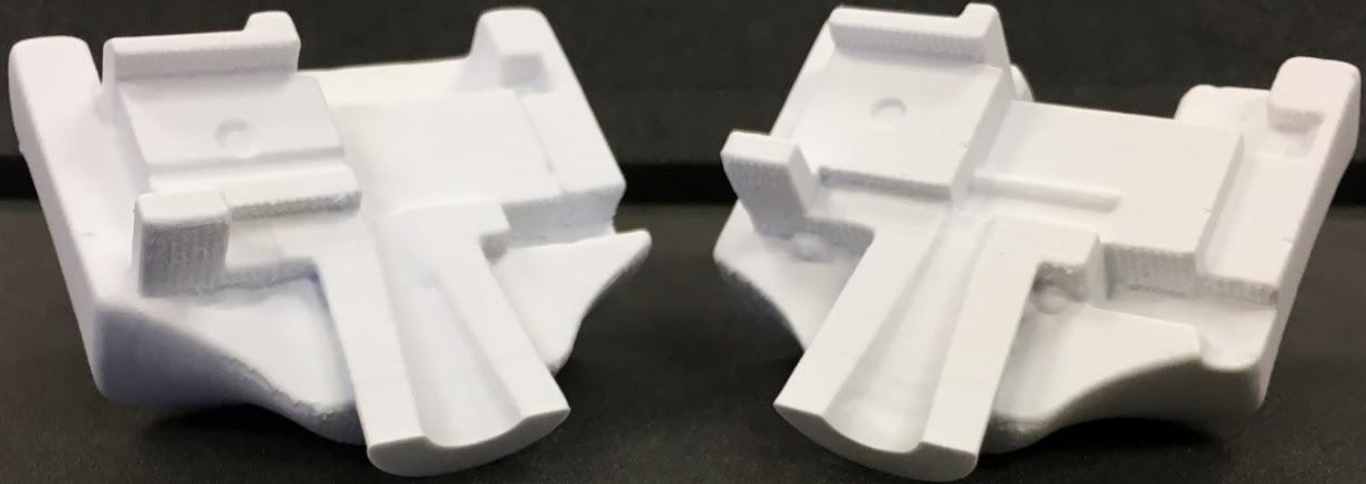
**MODELED PRINTS**



**DETACHABLE JET PIECE**







**JUST \$20  
WOW!!!**



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## 3Dhotbed: 3D Printed History of the Book Teaching Tools



### About the Project

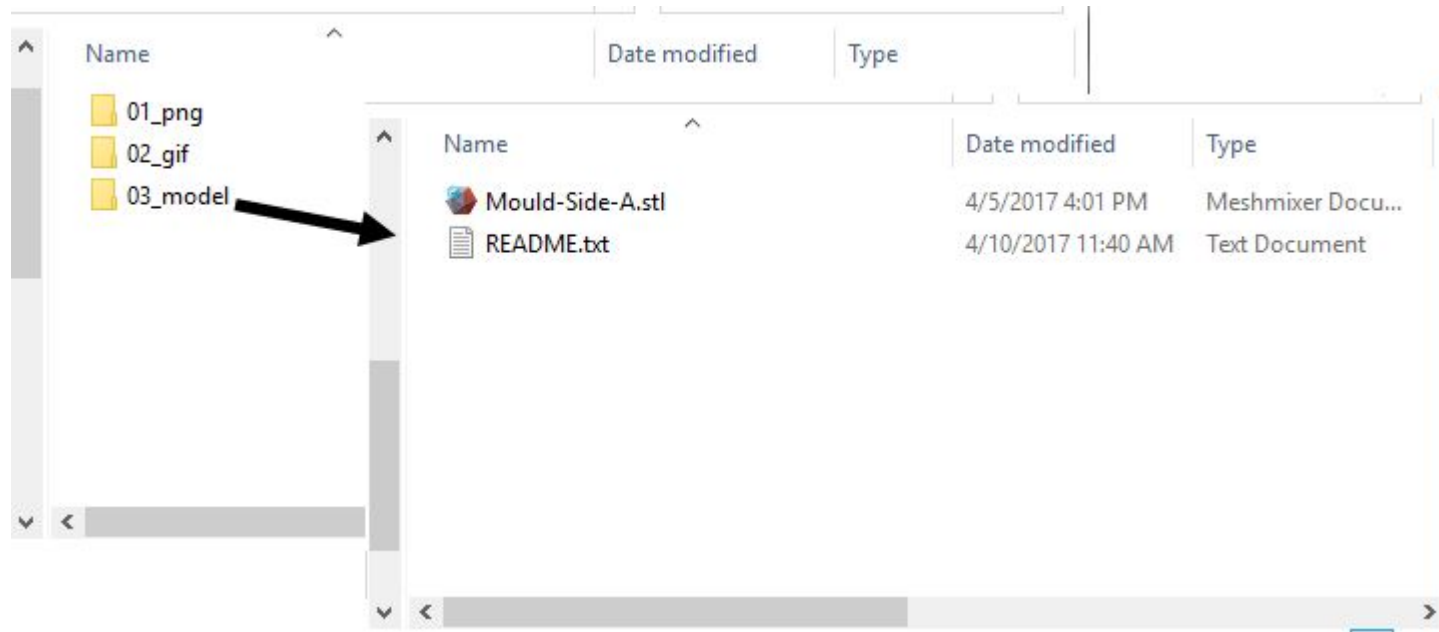
3Dhotbed is a collaborative project that seeks to make historical re-creations of certain tools and implements used in book history instruction more easily accessible for pedagogical purposes. Led by faculty from the University of North Texas and Texas A&M University Libraries, the year-long project sought to create, utilize, and disseminate the data necessary to reproduce teaching models of the tools used to cast moveable type during the hand-press era. Learn more at the [3dhotbed project website](#).

### About the Collection

The collection includes downloadable datasets necessary to 3D print the 3Dhotbed teaching toolkit in individual pieces or as a complete model set. The toolkit includes all the pieces necessary to teach the punch matrix system in a classroom setting: a punch, a matrix, an adjustable hand mould, an individual piece of type with an attached jet, and a piece of type with a removable jet attachment.

# 3D Model Packaging for Upload

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Print & Share



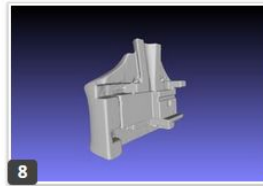
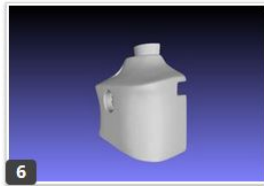
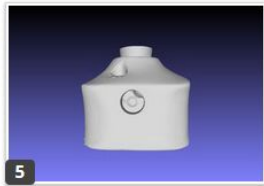
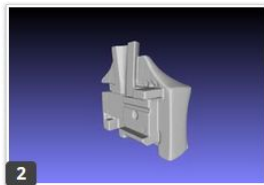
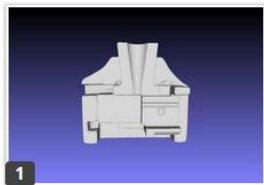
Citations, Rights, Re-Use

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[Dataset: Moveable Type Hand Mould Side B] (Listing Multiple Items).

Items

This dataset has 16 items. Select a thumbnail to view a larger version.



```
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  <dc:creator>Jacobs, Courtney E.</dc:creator>
  <dc:creator>McIntosh, Marcia</dc:creator>
  <dc:creator>O'Sullivan, Kevin M.</dc:creator>
  <dc:creator>Strait, Bob</dc:creator>
  <dc:contributor>3Dhotbed</dc:contributor>
  <dc:contributor>Texas A & M University</dc:contributor>
  <dc:date>2017-04-01</dc:date>
  <dc:language>English</dc:language>
- <dc:description>
  3D dataset model of one side of a moveable hand mould. The resulting 3D printed model will replicate the historical artifact used to cast type
  during the hand press period. This 3D dataset is in two parts. Each part is a separate piece of the two-sided mould. You will need to print both files
  to have a complete model for a hand mould. For printing ease, the spring (used by typesetters to hold the matrix into place on the mould) has been
  excised. These models are for teaching purposes only and cannot be used to cast type using molten type metal, nor can they be used for printing.
  This dataset is an individual file and is part of a complete set of teaching tools.
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```

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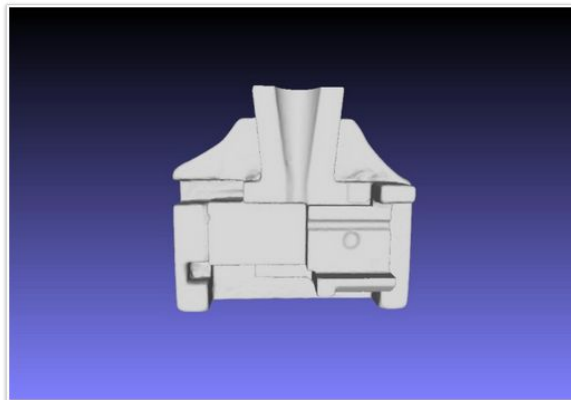


## Citations, Rights, Re-Use

Citing This Dataset

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## [Dataset: Moveable Type Hand Mould Side B]



Showing 1-4 of 16 items in this dataset.

## Description

3D dataset model of one side of a moveable hand mould. The resulting 3D printed model will replicate the historical artifact used to cast type during the hand press period. This 3D dataset is in two parts. Each part is a separate piece of the two-sided mould. You will need to print both files to have a complete model for a hand mould. For printing ease, the spring (used by typesetters to hold the matrix into place on the mould) has been excised. These models are for teaching purposes only and cannot be used to cast type using molten type ... [continued below](#)

## Creation Information

Jacobs, Courtney E.; McIntosh, Marcia; O'Sullivan, Kevin M. & Strait, Bob April 1, 2017.

## Context

This **dataset** is part of the collection entitled: [3Dhotbed: 3D Printed History of the Book Teaching Tools](#) and was provided by [UNT Libraries](#) to [Digital Library](#), a digital repository hosted by the [UNT Libraries](#). It has been viewed 86 times . [More](#)



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[Dataset: Moveable Type Hand Mould Side B] (Listing Multiple Items).

Filename	Size	Format	Download
Mould-Side-B.stl	18.6 MB	application/octet-stream	<a href="#">Download</a>
README.txt	1.3 KB	text/plain	<a href="#">Download</a>
Side-B-Without-Bump-gif.gif	258.1 KB	image/gif	<a href="#">Download</a>

# FULL DETAILS

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## Making Book History: Engaging Maker Culture and 3D Technologies to Extend Bibliographical Pedagogy

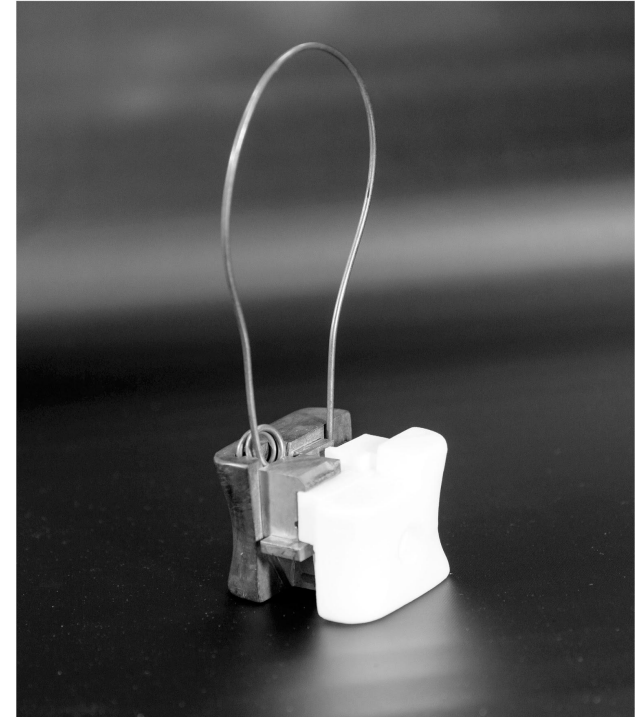
2018, *RBM: A Journal of Rare Books, Manuscripts, and Cultural Heritage*

Link: <https://doi.org/10.5860/rbm.19.1.59>

**RBM:**

*A Journal of Rare Books, Manuscripts, and Cultural Heritage*

Volume Nineteen, Number 1, Spring 2018





# BOOK HISTORY MAKER FAIR

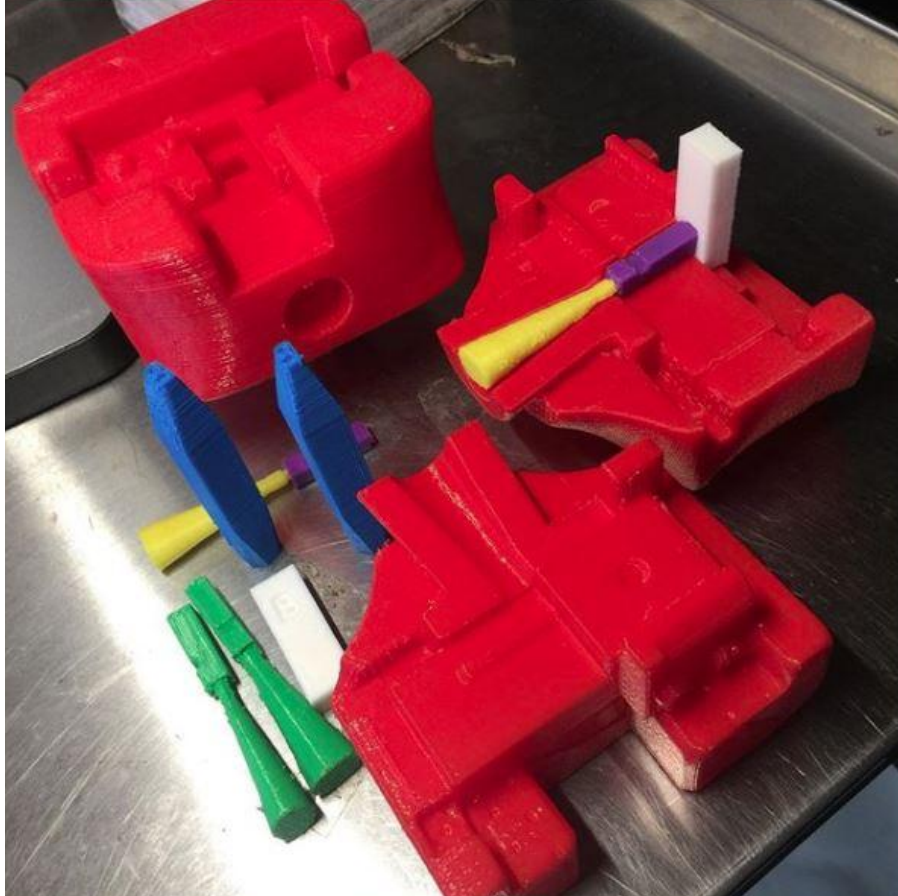
---



TYPE DESIGN  
TYPE CASTING  
SETTING TYPE  
IMPOSITION  
PRINTING  
FORMAT  
BINDING



# IN-CLASSROOM USE: NORTHEASTERN UNIVERSITY



ryancordell • [Follow](#)  
Northeastern University

ryancordell Book historians & bibliographers, my 3D printed punches, matrices, moulds, and type are here! Thanks to @3dhotbed for making it all possible!

generaldevelopment Awesome profile  
ncbenedict29 AMAZING.



17 likes

JANUARY 23

Log in to like or comment.



# DIY 3D FROM THE GROUND UP

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- 3D printers are no longer the hurdle
- If no funding for 3D printing... start with modeling?
  - Blender
  - Meshlab
  - Tinker
  - Meshmixer
- Research/practice with youtube videos



# Thank You!

**UNT Libraries Green Light To Greatness  
UNT Libraries Digital Humanities and Collaborative Programs Unit in the Public Services Division  
Bob's Hub from 3D Hubs  
Marker Tree3D  
UNT Libraries Makerspace "The Factory"  
UNT College of Arts and Visual Design Fab Lab**

This presentation is also available at [tiny.cc/3DhotbedALA](http://tiny.cc/3DhotbedALA)  
Prints can be acquired: <http://bs3dprinting.com/>

# MorphoSource: 3D data repository



Doug M. Boyer / MorphoSource Director, Associate Prof.  
(Duke) Julie M. Winchester / Product Manager & Developer  
(Duke)

Tim McGeary / Associate University Librarian (Duke)  
Tim Ryan / Associate Prof. (PSU)



DUKE UNIVERSITY  
LIBRARIES



PennState



# MORPHO SOURCE

*at a glance*

- Founded 2013
- Place for 3D data on vouchered specimens



# MORPHO SOURCE

*3D data*

## **Volume**

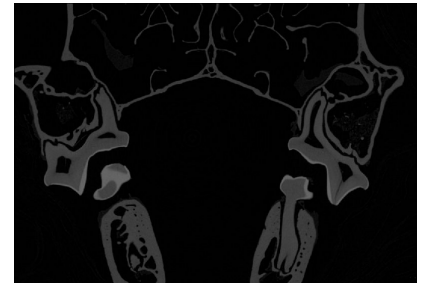
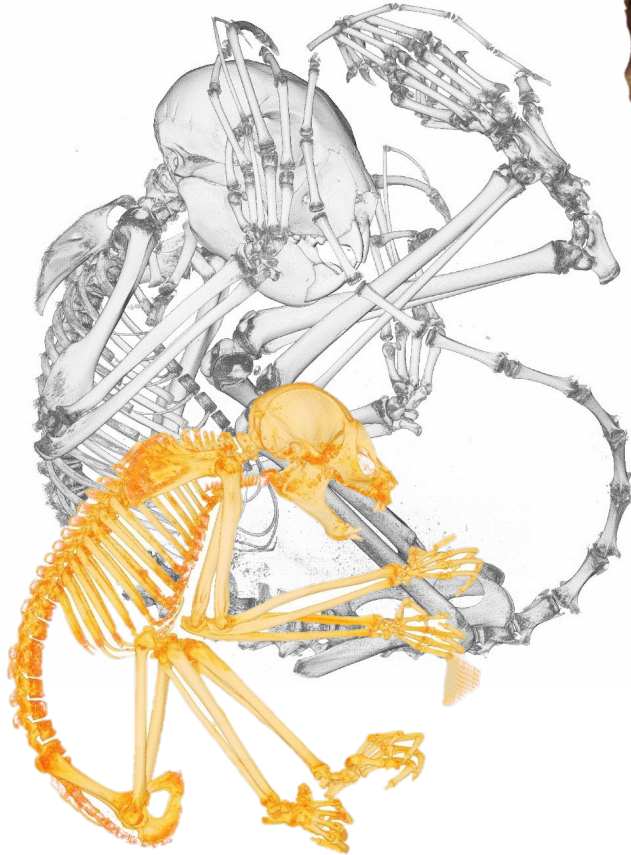
Modality – Medical/microCT, MRI

Formats – tiff, dicom, jpeg, bmp

## **Surface**

Modality – Laser, structured light,  
photogrammetry

Formats – ply, stl, obj



# MORPHO SOURCE

*at a glance*

- Founded 2013
- Place for 3D data on vouchered specimens
- Integrating with Duke Library Digital Repository via support by NSF



NSF DBI-1661386  
NSF DBI-1661132



NSF DBI-1701714



## Using MorphoSource, users can...

- Browse by taxonomy, institution, bibliography, project; search keywords

The screenshot shows the MorphoSource website interface. At the top left is the logo "MORPHO SOURCE BY DUKE UNIVERSITY" with a grid of colored dots. To the right is a navigation bar with "ABOUT", "BROWSE", and "DASHBOARD" links, a search bar, and "MEDIA CART" and "STATS" icons. Below the navigation bar is a "Getting Started" section with a "Find & Download Datasets" box containing a "BROWSE" button and a search input field, and a "Useful Info" list with links for "Information for Users", "Information for Contributors", "Terms", and "User Guide". To the right of this section is a 3D model of a primate foot with a caption: "foot of Daubentonia madagascariensis scanned at 38micron resolution at Duke Evolutionary Anthropology department's new high resolution microCT facility. Click here if you are interested in details on the facility". Below this is a "Recently Published" section with a link to "Australopithecus sediba from the site of Malapa, South Africa" and a "BECOME A CONTRIBUTOR" button.

MORPHO SOURCE  
BY DUKE UNIVERSITY

ABOUT BROWSE DASHBOARD

MEDIA CART | STATS

### Getting Started

Find & Download Datasets

BROWSE or

enter search terms

Useful Info

- [Information for Users](#)
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- [Terms](#)
- [User Guide](#)

foot of *Daubentonia madagascariensis* scanned at 38micron resolution at Duke Evolutionary Anthropology department's new high resolution microCT facility. [Click here if you are interested in details on the facility](#)

### Recently Published

Australopithecus sediba from the site of Malapa, South Africa  
→ [See all project specimen](#)  
→ [See all project specimen](#)

Interested in creating a MorphoSource project?

BECOME A CONTRIBUTOR


## Using MorphoSource, users can...

- Browse by taxonomy, institution, bibliography, project; search keywords


### Media results

Jump to page:  GO 17 results « Previous page 1/3 Next »

OPTIONS




ADD




M6508  
USNM-481103  
[Ptilocercus lowii](#)  
CT Volume Data  
1 file

ADD



M6509  
USNM-481103  
[Ptilocercus lowii](#)  
CT Volume Data  
2 files

ADD



M6516  
USNM-481103  
[Ptilocercus lowii](#)  
Reference photos  
5 files

ADD

### Specimen results

3 results

- [USNM-481103, \*Ptilocercus lowii\*](#)
- [USNM-481107, \*Ptilocercus lowii\*](#)
- [USNM-488052, \*Ptilocercus lowii\*](#)

### Using MorphoSource, users can...

- Browse by taxonomy, institution, bibliography, project; search keywords
- Upload, archive, and share 3D media from a research project or collection

Project: AMNH Mammal Collection

BACK

55 Project Specimens

Group by: [Specimen Number](#) | [Genus](#) | [Species](#)

NEW SPECIMEN



[AMNH-M-174380](#), *Microcebus rufus*  
iDigBio [↗](#)



[AMNH-M-183285](#), *Callimico goetlii*  
iDigBio [↗](#)



[AMNH-M-183291](#), *Callimico goetlii*  
iDigBio [↗](#)



[AMNH-M-185280](#), *Callimico goetlii*  
iDigBio [↗](#)



[AMNH-M-185640](#), *Daubentonia madagascariensis*  
iDigBio [↗](#)



[AMNH-M-185643](#), *Daubentonia madagascariensis*  
iDigBio [↗](#)



[AMNH-M-187861](#), *Cynocephalus volans*  
iDigBio [↗](#)



[AMNH-M-188009](#), *Alouatta seniculus*



*at a glance*

### Using MorphoSource, users can...

- Browse by taxonomy, institution, bibliography, project; search keywords
- Upload, archive, and share 3D media from a research project or collection
- Robustly control access to media with strong privacy and sharing tools

Specimen: DPC-0139. *Otolemur crassicaudatus*

Specimen taxonomy: *Otolemur crassicaudatus*

#### REQUEST DOWNLOAD OF MEDIA

The author will provide this media only upon request. Please explain how you plan to use this media below. The author will review your request and reply shortly.

#### Description of planned usage

Dear Sir/Madam:  
I would like to use this file in a lesson plan.

**Send** **Cancel**



*at a glance*

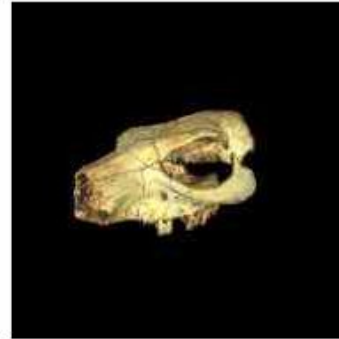
### **Using MorphoSource, users can...**

- Browse by taxonomy, institution, bibliography, project; search keywords
- Upload, archive, and share 3D media from a research project or collection
- Robustly control access to media with strong privacy and sharing tools
- Track downloads/views and assign DOIs to media, enabling citation of media in publications

## Using MorphoSource, users can...

- Browse by taxonomy, institution, bibliography, project; search keywords
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- Track downloads/views and assign DOIs to media, enabling citation of media in publications

## DNMNH-G-22149, *Procavia sp.*



M6014-5467

3D Mesh (Polygon File Format), 92.61 MB

[Citation Elements](#)

[ADD](#)

### Views/Downloads:

Research: 201/24

Education: 133/02

Total: 334/26

## Using MorphoSource, users can...

- Browse by taxonomy, institution, bibliography, project; search keywords
- Upload, archive, and share 3D media from a research project or collection
- Robustly control access to media with strong privacy and sharing tools
- Track downloads/views and assign DOIs to media, enabling citation of media in publications

DNMNH-G-22149, *Procvia* sp.



M6014-5467

3D Mesh (Polygon File Format), 92.61 MB

### Citation Elements

Media number: M6014-5467

DOI: doi:10.17602/M2/M5467 |

ark:/67602/m2/m5467

URL:

<http://www.morphosource.org/Detail/>

ADD 

### Views/Downloads:

Research: 201/24

Education: 133/02

Total: 334/26

In 2012...

- 1) No other similar open use data archive in existence
- 2) Hindering modernization and impact of museum specimen-based research





## *Goals*

- 1) Facilitate specimen-based research
- 2) Broaden the community who can benefit from museum collections



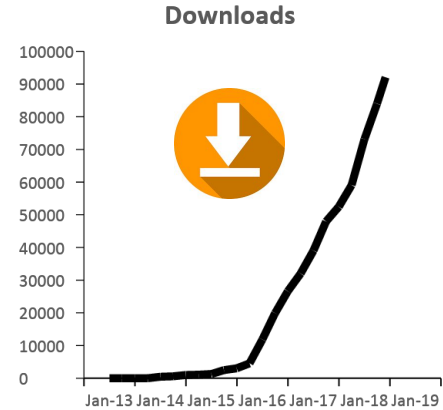
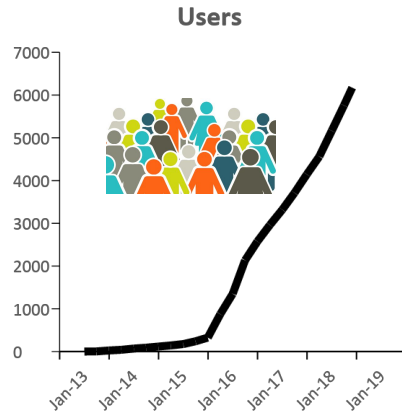
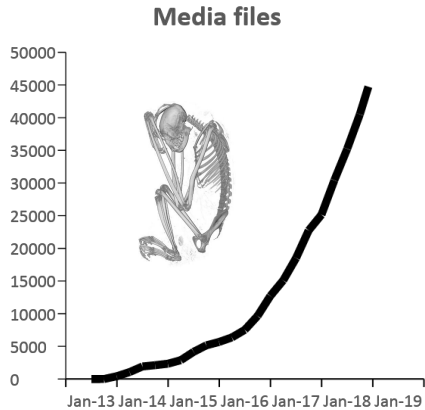
## *Goals*

- 1) Facilitate specimen-based research
  - a. Access to higher fidelity data on specimens
    - i. 3D data (no museum trip, computer vision)
  - b. Access to more specimens
    - i. Normalize/encourage deposition/sharing
    - ii. Account for complex ownership in system
    - iii. Architecture that supports large file formats



## *Goals*

- 1) Facilitate specimen-based research
- 2) Broaden the community who can benefit from museum collections
  - a. See #1
  - b. Metadata and tools for discoverability and downloading



- Approximately 100% growth in data size over previous year
- Increases load on infrastructure and has unique pressures on system (user interface, etc.) design

### Current Holdings

6,248 Users  
93,590 downloads  
1,286,138 views

45,754 3D media files  
12,254 Specimens

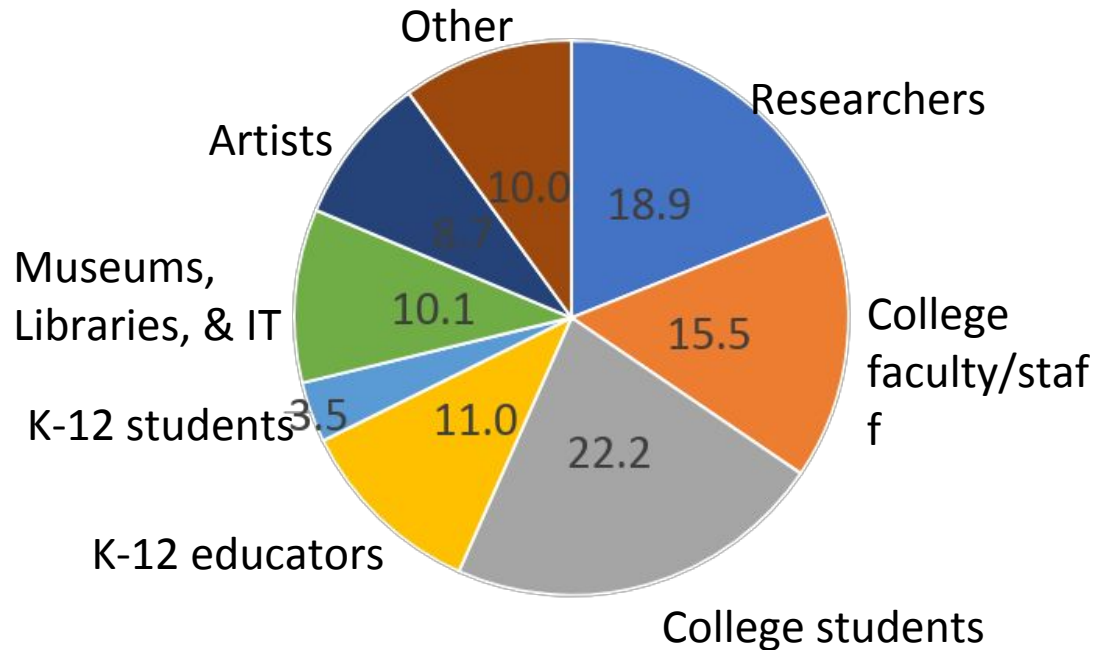


## *Response*

### **Our community**

- 6,248 users
- 84 countries
- 256 institutions
- 92 imaging facilities

### **Users**



# Outline

- I. Community support**
- II. Staffing and governance
- III. Design: data models, software platforms, storage architecture

# Community support

## a. Researchers

- Rights/access management



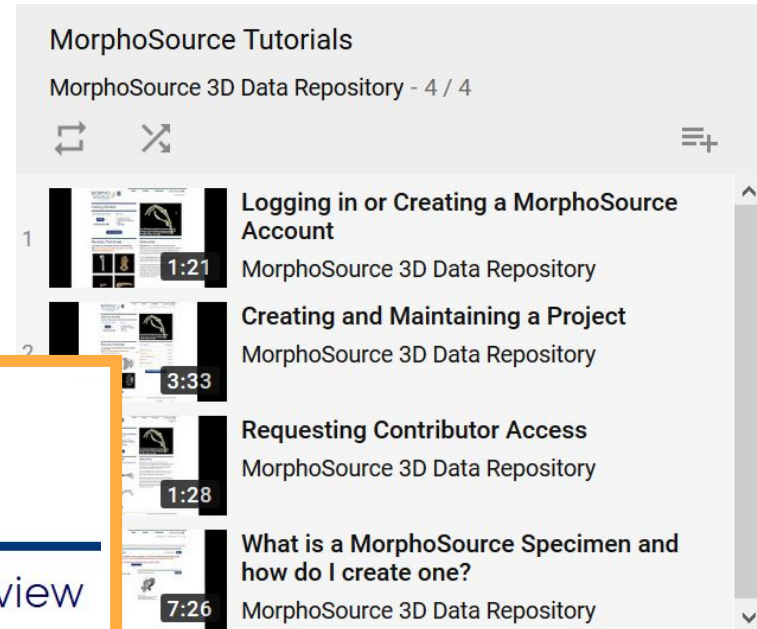
REQUEST DOWNLOAD OF MEDIA



# Community support

## a. Researchers

- Rights/access management
- Deposition, content management



Media groups ▾

NEW MEDIA GROUP

BATCH EDIT

ADD ALL MEDIA TO CART

# Community support

## a. Researchers

- Rights/access management
- Deposition, content management
- Promotion of data

## Recently Published

Frogs in amber from the Cretaceous of Myanmar

[See all project specimens](#)

[Read the published article](#)



**twitter**  
**@MorphoSource**

# Community support

## a. Researchers

- Rights/access management
- Deposition, content management
- Promotion of data
- Organization, discover-ability, readability

---

Media Cart

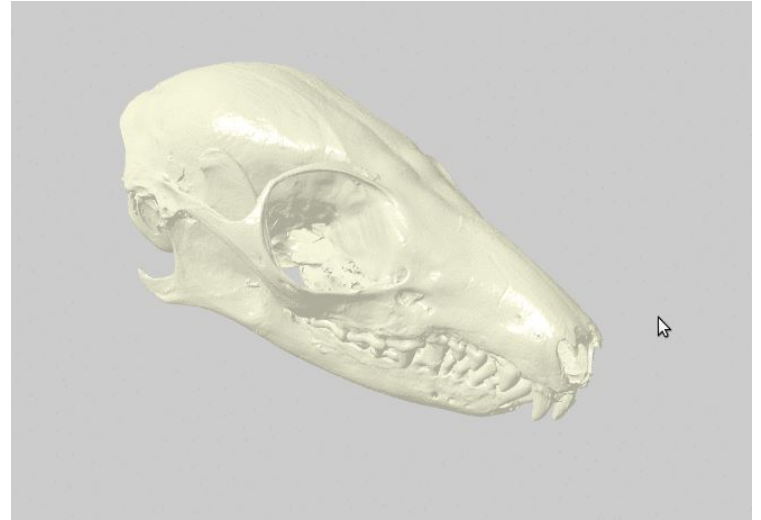
CLEAR CART

DOWNLOAD ALL FILES & METADATA

DOWNLOAD ONLY METADATA

in browser viewing

---



# Community support

## a. Researchers

## b. Museums

- Rights/Access management
- Record management
- Use tracking/data reporting



## Data reporting for MorphoSource media

IPT - Hosted by VertNet (842a2bb5-d705-4d6c-8401-abf3ca28c05d)

Recordset	Media	Downloads	Download Requests	Pub Date
<a href="#">AMNH Herpetology Collections (70a9b7d0-a8da-4528-bbe3-2c4f40779ca9)</a>	CSV EML	CSV EML	CSV EML	Thu, 24 May 2018 12:33:01 -0400
<a href="#">AMNH Mammal Collections (cb790bee-26da-40ec-94e0-c1179618f9bd4)</a>	CSV EML	CSV EML	CSV EML	Thu, 24 May 2018 12:06:01 -0400
<a href="#">AJUM Fish Collection (cab6d230-499b-4a21-9cc2-2750e14e9228)</a>	CSV EML	CSV EML	CSV EML	Thu, 24 May 2018 12:33:37 -0400
<a href="#">Biodiversity Research and Teaching Collections - TCWC Vertebrates (79dfdec9-9e24-489c-a7ce-85dccc52bc9f9)</a>	CSV EML	CSV EML	CSV EML	Thu, 24 May 2018 12:32:30 -0400
<a href="#">BYU Herpetology Collection (3872f27e-cf4e-40bd-b91b-ba7b723a88e5)</a>	CSV EML	CSV EML	CSV EML	Thu, 24 May 2018 12:31:07 -0400
<a href="#">CM Herps Collection (045aa861-1985-4203-80ff-98daaf9f377)</a>	CSV EML	CSV EML	CSV EML	Thu, 24 May 2018 12:30:50 -0400
<a href="#">CM Vertebrate Paleontology Collection (71bbffab-444e-43f9-9a9c-5c42b0eaa5eb)</a>	CSV EML	CSV EML	CSV EML	Thu, 24 May 2018 12:34:52 -0400
<a href="#">CUMV Fish Collection (Arctos) (4fecd59-9f59-44eb-ab6f-4a50b4ed85cd)</a>	CSV EML	CSV EML	CSV EML	Thu, 24 May 2018 12:33:24 -0400
<a href="#">ISM Ornithology Collection (6e8bec70-a148-49c8-9f97-e64e42f9a5b7)</a>	CSV EML	CSV EML	CSV EML	Thu, 24 May 2018 12:30:58 -0400
<a href="#">LACM Vertebrate Collection (2d853af6d-50ec-4931-8e91-481c2491fdee)</a>	CSV EML	CSV EML	CSV EML	Thu, 24 May 2018 12:30:49 -0400
<a href="#">LSUMZ (LSU MNS) Fishes Collection (609d4f55-4cb4-4c8f-acc7-b465eb9f703c)</a>	CSV EML	CSV EML	CSV EML	Thu, 24 May 2018 12:33:01 -0400
<a href="#">MVZ Herp Collection (Arctos) (b3978394-a174-4c6b-8d84-3a435d66bde6)</a>	CSV EML	CSV EML	CSV EML	Thu, 24 May 2018 12:32:58 -0400
<a href="#">MVZ Mammal Collection (Arctos) (fcbcb214-cd82-4453-af56-b4b49161a261)</a>	CSV EML	CSV EML	CSV EML	Thu, 24 May 2018 12:31:42 -0400

# Community support

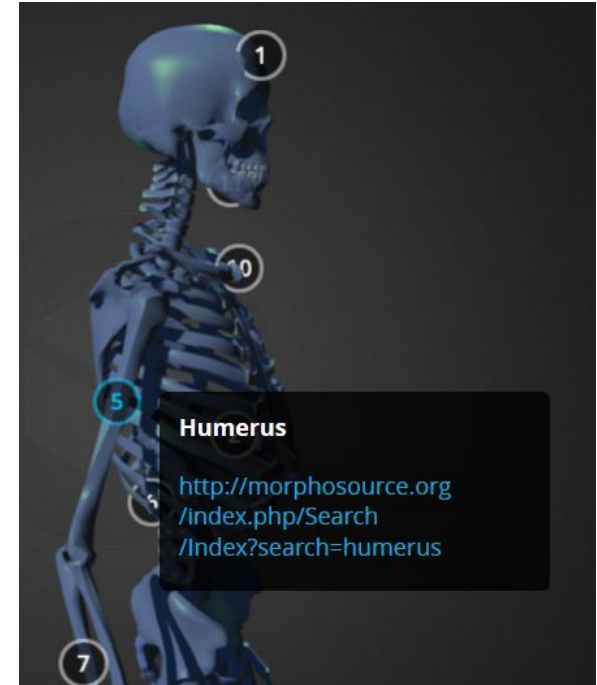
Squirrel = “*Sciurus*”

a. Researchers

b. Museums

c. Educators

- Organization, discoverability, readability



# Outline

- I. Community support
- II. Staffing and governance**
- III. Design: data models, software platforms, storage architecture

# Staffing and Governance

- a. Institutional directorship**
- b. Development team
- c. Infrastructural support
- d. Advisory boards
- e. Working groups

# Staffing and Governance

## a. Institutional directorship

- Library & college authority





# Staffing and Governance

## a. Institutional directorship

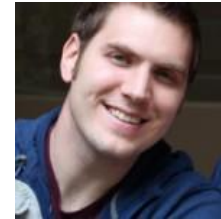
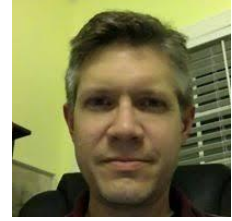
## b. Development team

- Three full time
- Development workflow (Jira, user stories, sprints, code review, testing, etc.)
- Also responsible for supporting user issues



# Staffing and Governance

- a. Institutional directorship**
- b. Development team**
- c. Infrastructural support**
  - Duke library digital repository development team
  - Central IT services
  - University, preservation architecture & policies



# Staffing and Governance

- a. Institutional directorship**
- b. Development team**
- c. Infrastructural support**
- d. Advisory board**
  - Group of with various kinds of relevant expertise
  - Report, present, solicit feedback

People	Institution/Position
S. Anton	NYU, Prof. of Anthropology
D. Blackburn	FLMNH, Curator of Herpetology
G. Nelson	FSU, Inst. for Digital Info.
J. Maisano	UT Austin UTCT/Resrch Assoc.
J. Richtsmeier	PSU, Prof. Anthropology
L. Witmer	OSU, Prof. of Biomedical Sci.
R. Snyder	NMNH, Digital Media Specialist
C. Ross	U. Chicago, Prof. Organismal Bio.
C. Grant	FLMNH, PhD in Educ. Science

# Staffing and Governance

- a. **Institutional directorship**
- b. **Development team**
- c. **Infrastructural support**
- d. **Advisory boards**
- e. **Working groups**
  - Broader range of stakeholders
  - More globally useful solutions

Biodiversity  
Information  
Standards  
T D W G



community standards  
for **3D data** preservation



International  
Image  
Interoperability  
Framework

# Outline

- I. Responding to community needs
- II. Staffing and governance
- III. Design: data models, software platforms, storage architecture**

# Design

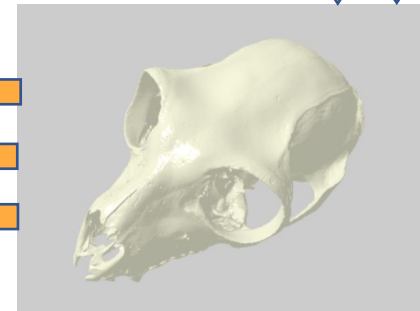
- a. Records and relationships**
- b. Ownership/editing
- c. Data/metadata preservation
- d. Best software for requirements

# Design

## a. Records and relationships (what is a record v. metadata?)

- Users/contributors
- Media (source/derivative)
- Physical object records
- Object/image origin

*Geographic location*  
*Collection institution*  
*Imaging facility*



# Design

- a. **Records and relationships**
- b. **Ownership/editing (complex for natural history data)**
  - Creator(s)
  - Owner(s)
  - Editor(s)
  - Decider(s)





# Design

- a. **Records and relationships**
- b. **Ownership/editing**
- c. **Data/metadata preservation**
  - Supported formats (open)
  - Access v. preservation copies
  - Managing bit rot (filetracker)
  - Protecting against catastrophic data loss
  - Metadata backups



# Design

- a. **Records and relationships**
- b. **Ownership/editing**
- c. **Data/metadata preservation**
- d. **Best software for requirements**
  - Allow complex owner/access relationships
  - Integrate with preservation software
  - Reflect widely adopted community standard
  - Support latest web technology (responsive IU, etc.)





# Conclusions (3D data) requirements

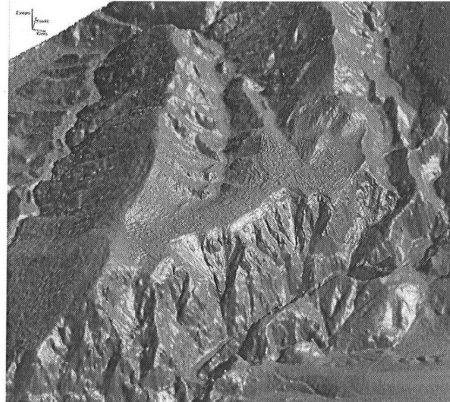
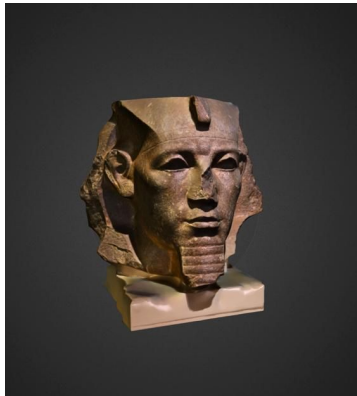
- Need metadata that allows unambiguous linkages to physical objects they usually represent
- Have complex ownership and reuse provisions
- Have complex creation descriptions; how they are related to other data (e.g., derived from) is a fundamental part
- Effective visualization is a key part of discoverability metadata
- Large file sizes means architecture for upload/download, as well as consideration of storage sustainability, are important.



# Conclusions (3D) requirements

## Discovery is critical

- Easy for museum specimens representing animals
- More difficult specimens representing cultural heritage
- Most challenging for non-museum items



# Acknowledgments

Kevin O'Sullivan & Courtney Jacobs for invitation and coordination



## ***For support & funding***

- NSF DBI-1661386 (MorphoSource) and NSF DBI-1701714 (oVert)
- Duke University Trinity College of Arts & Sciences
- Duke Shared Materials Instrumentation Facility
- Duke Biology IT Center
- Duke Libraries

## ***For discussion leading to development of concepts***

- J. Jernvall, A. Evans, G. Evans, D. Blackburn, J. Blundell, G. Motz, H. Little, R. Snyder, E. Stanley, J. Thostenson, J. Sessa, M. O'Leary, M. Uhen, G. Yapuncich, J. Maisano, E. Stanley, R. O'Leary, S. Grant, K. Webbink, L. Witmer, T. Ryan, C. Grant, C. Ross, J. Richtsmeier, G. Nelson
- CS3DP (J. Moore, H. Scates-Kettler, A. Rountrey), LIB3DVR (N. Hall, R. MacDonald)
- iiiF (S. Snyderman)

## ***For work developing and populating MorphoSource***

- Seth Kaufman, Maria Passarotti (Whirl-i-gig, Inc.)
- Alex Thompson, Kevin Love, Dan Stoner (iDigBio)
- Technicians & students: Mackenzie Shepard, Darbi Griffith, Ana Galvez, Miles Schaeffer, Mercedes Zapata-Garcia, Shane Daly, Jong Gwan Lee, Sunghoon Liu, Ksenia Sokolova, Anne Driscoll, Kevin Vo, Annie Lott, Callie Crawford, Barbara Zhao, and many, many more

**COMMUNITY STANDARDS FOR 3D DATA  
PRESERVATION (CS<sub>3</sub>DP) PROJECT**  
**CS<sub>3</sub>DP.ORG**

---

Hannah Scates Kettler

@hskettler

# El Proyecto | The Project : CS<sub>3</sub>DP

IMLS National Leadership Grant

Objetivo | Goals :

- Para crear comunidad | To create community
- Evaluar las normas | To outline and evaluate current best practices and standards
- Desarrollar normas **como comunidad** | Develop new standards as needed as a community



CS<sub>3</sub>DP Investigadores Principales

# La Necesidad | The Need

- IMLS Investigadores Principales trabajaran en núcleo y no estaban solos
- 2017 encuesta sobre la preservación prácticas
  - Muchas perspectivas representadas (>100 respuestas)
  - 72% no usaron los estándares
  - 69% no conocen los estándares
  - 85% querían desarrollar en colaboración normas como una comunidad
- Principal Investigators of IMLS project were working in a silo (they weren't alone)
- 2017 survey on 3D preservation best practices
  - Many perspectives represented (>100 responses)
  - 72% did not use best practices/standards
  - 69% unaware of standards
  - 85% wanted to collaboratively develop standards as a community

Created by Till Teenck  
from Noun Project



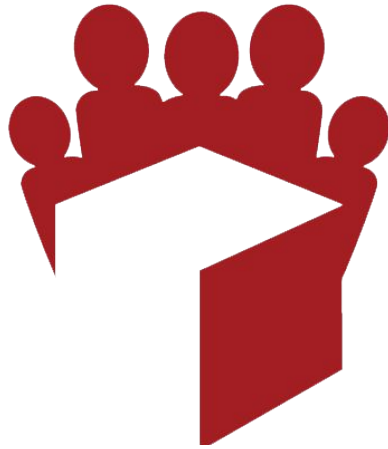
# Implementación | Implementation

- 2 foros nacionales en Febrero y Agosto 2018
  - Foro 1 estableció focos para la preservación de datos en 3D (summary report: [ir.uiowa.edu/cs3dp](http://ir.uiowa.edu/cs3dp))
    - Lo que ya existe
    - Lo que las personas están usando
    - Deficiencias
  - Abrir reunión virtual y trabajo durante el Verano ([cs3dp.org](http://cs3dp.org))
    - Temas
      - Mejores practicas
      - Metadata
      - Acceso y Descubrimiento
      - Derechos de Autor
      - Gestión & Almacenamiento
- 
- 2 National Fora in February and August 2018
  - Forum 1 establishing foci for 3D Data Preservation (summary report: [ir.uiowa.edu/cs3dp](http://ir.uiowa.edu/cs3dp))
    - What is already out there
    - What people are using
    - Shortcomings
  - Open Virtual meetings and work during the Summer ([cs3dp.org](http://cs3dp.org))
    - Topics:
      - Best Practices
      - Metadata
      - Access and Discovery
      - Copyright
      - Management & Storage

Created by Linda  
from Noun Project

# Forum 1 Participant(e)s





community standards  
for **3D data** preservation

**FORUM 2 : AUGUST 13 – 15, 2018**  
**ANN ARBOR, MICHIGAN, USA**

# Resultados | Outcomes



- Comunidad de datos 3D establecida
  - Google Group “Community Standards for 3D Data” ~135+ personas
  - Esfuerzos colaborativos: Building for Tomorrow, LIB3DVR, IIF 3D Community, varios proyectos / plataformas
- Un volumen editado por la comunidad sobre el estado de conservación de datos y recomendaciones 3D
- Establecer direcciones futuras para la preservación de datos 3D
- Established 3D data community
  - Community Standards for 3D Data Google Group ~135+ people
  - Collaborative Efforts: Building for Tomorrow, LIB3DVR, IIF 3D Community, various projects/platforms
- Edited Volume by community on state of 3D data preservation and recommendations
- Establishing Future Directions for 3D Data Preservation

GRACIAS | THANK YOU

Cs3dp.org

@hskettler

# Thank you!

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