

Issues of Scale: Imaging Micro to Oversized Objects

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UNIVERSITY OF WYOMING

University of Wyoming Fossil Vertebrate Collection

- 40,000 specimens
- 2,600 Localities
- 6,000 species represented

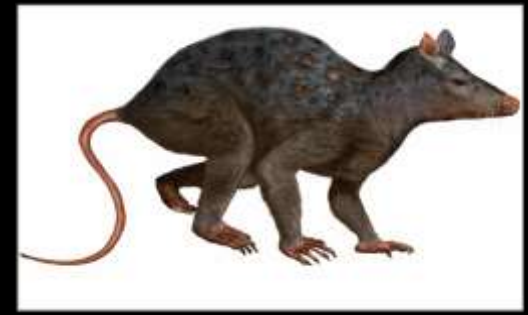
- Only 1 Full-Time (shared) Position
- Very Limited Income



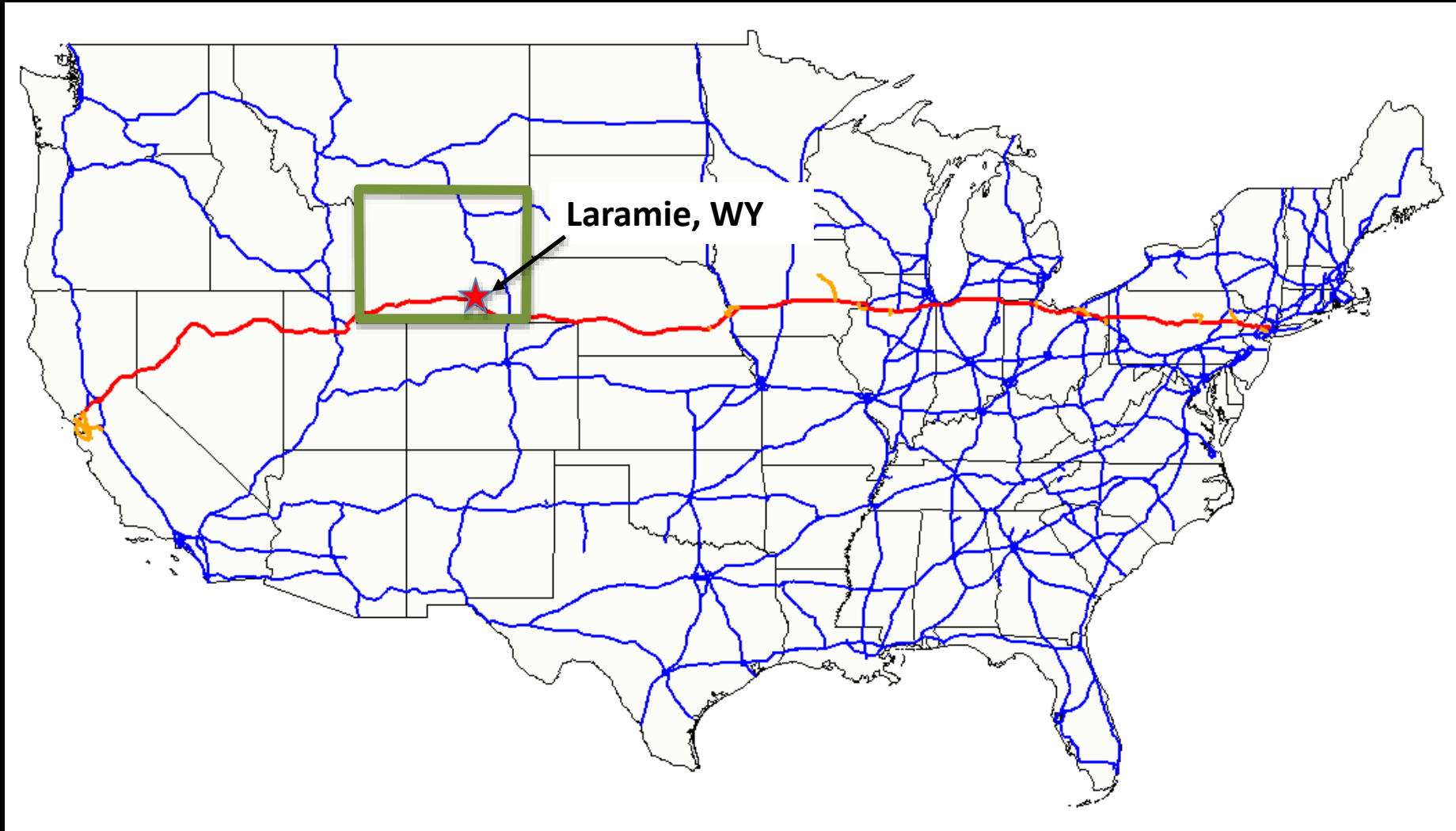
Mesozoic Vertebrates (Dinosaurs and Marine Reptiles)



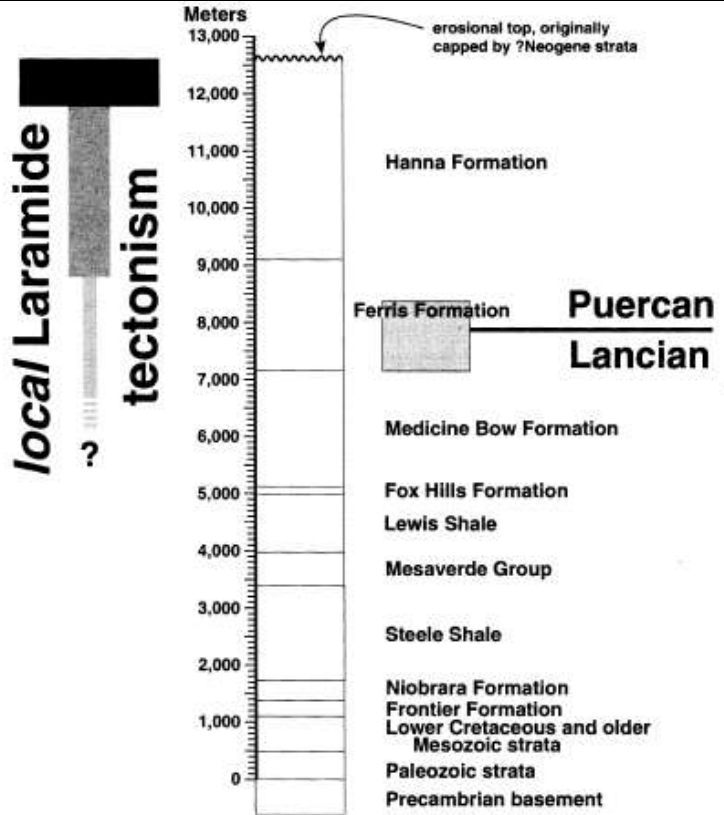
Mesozoic and Paleogene Mammals



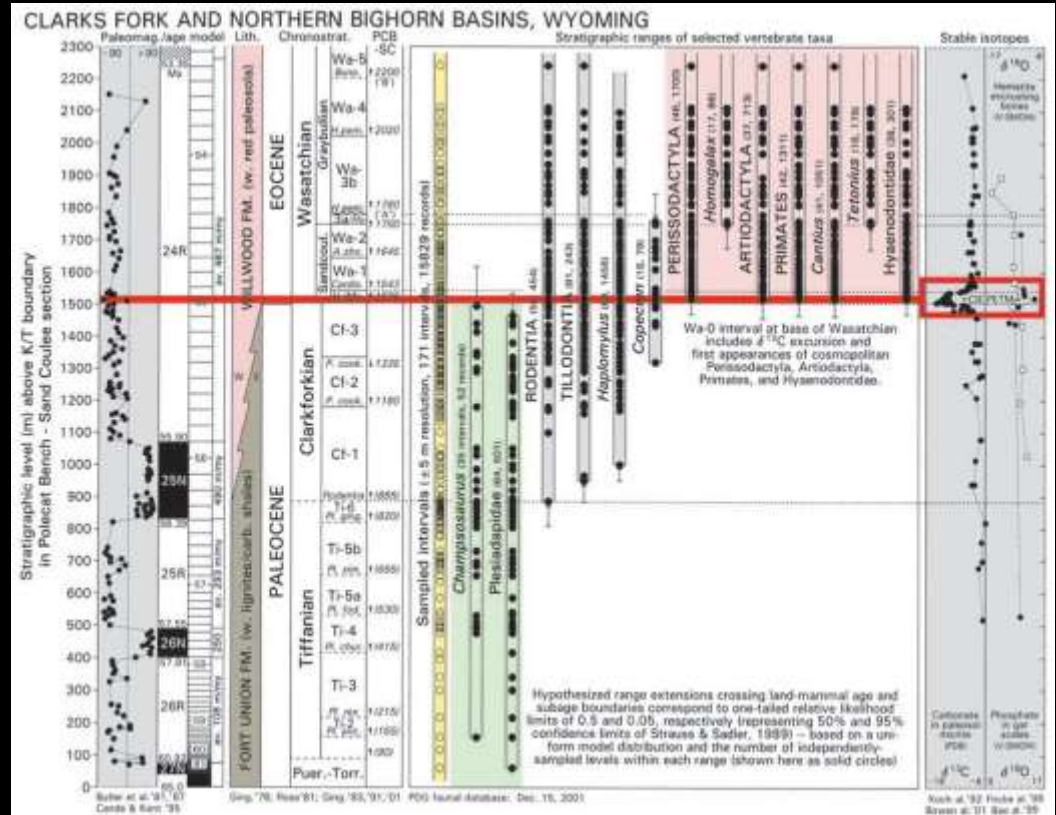
Why Digitize



Research Potential

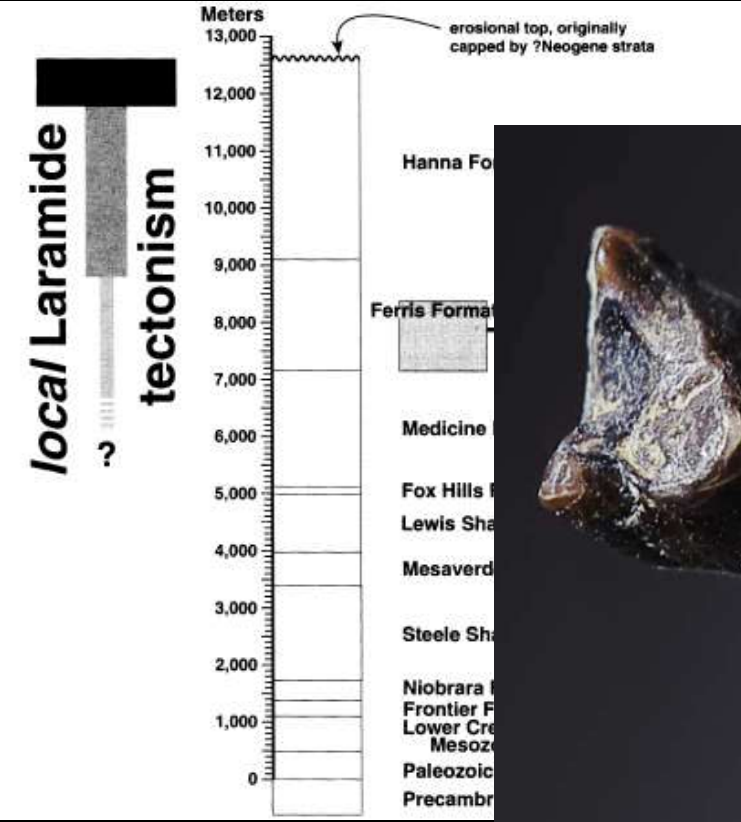


Lillegraven & Eberle., 1979

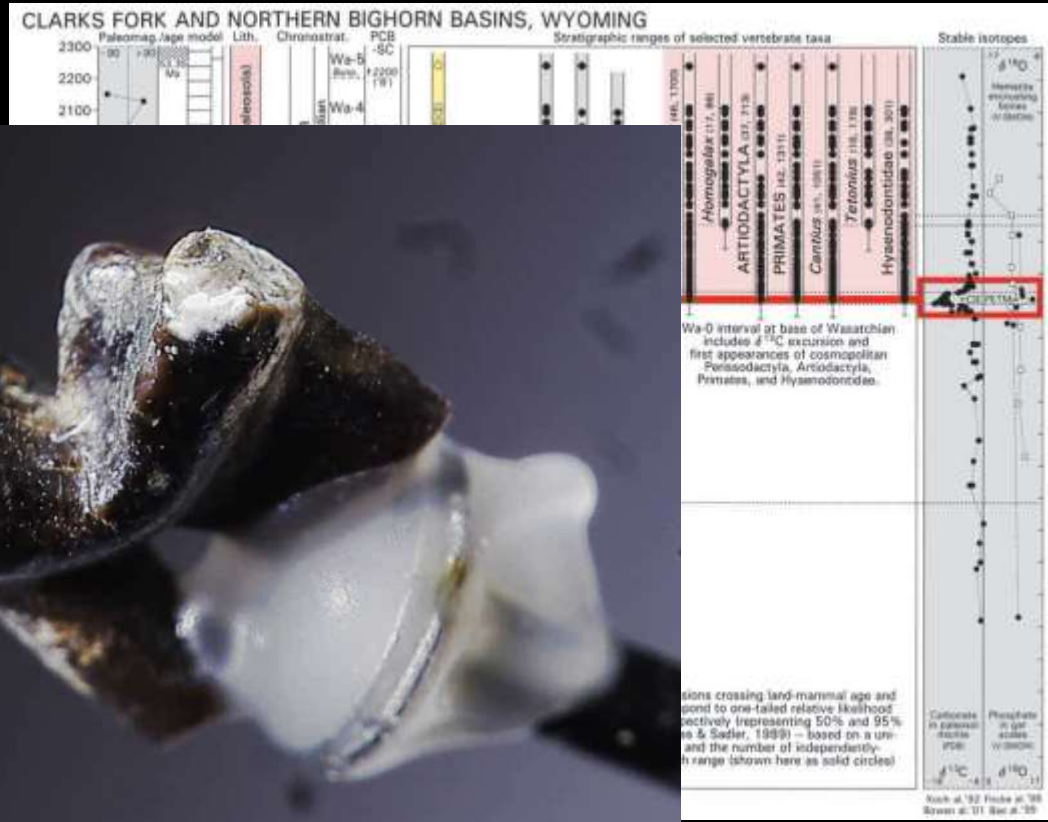


Gingerich (2006)

Research Potential

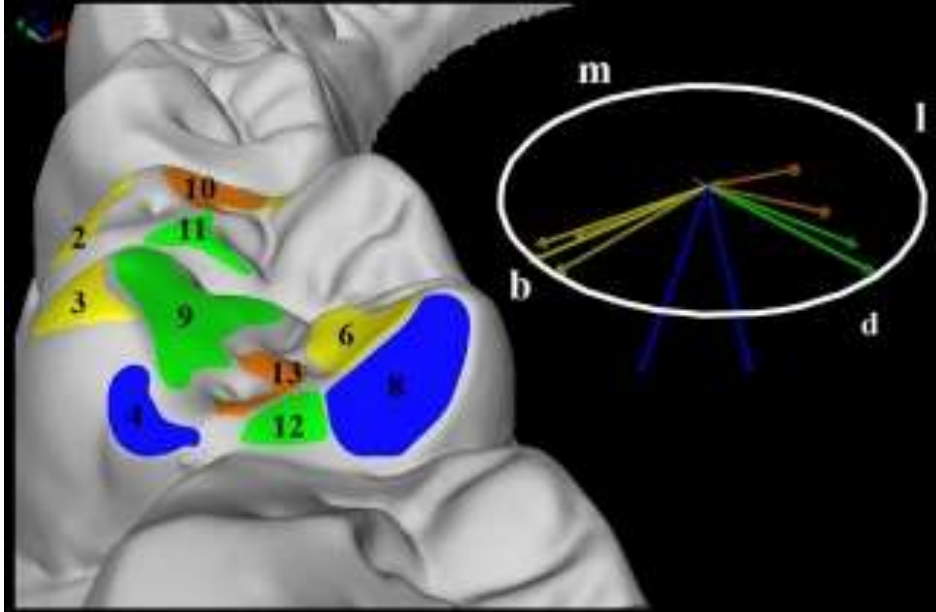
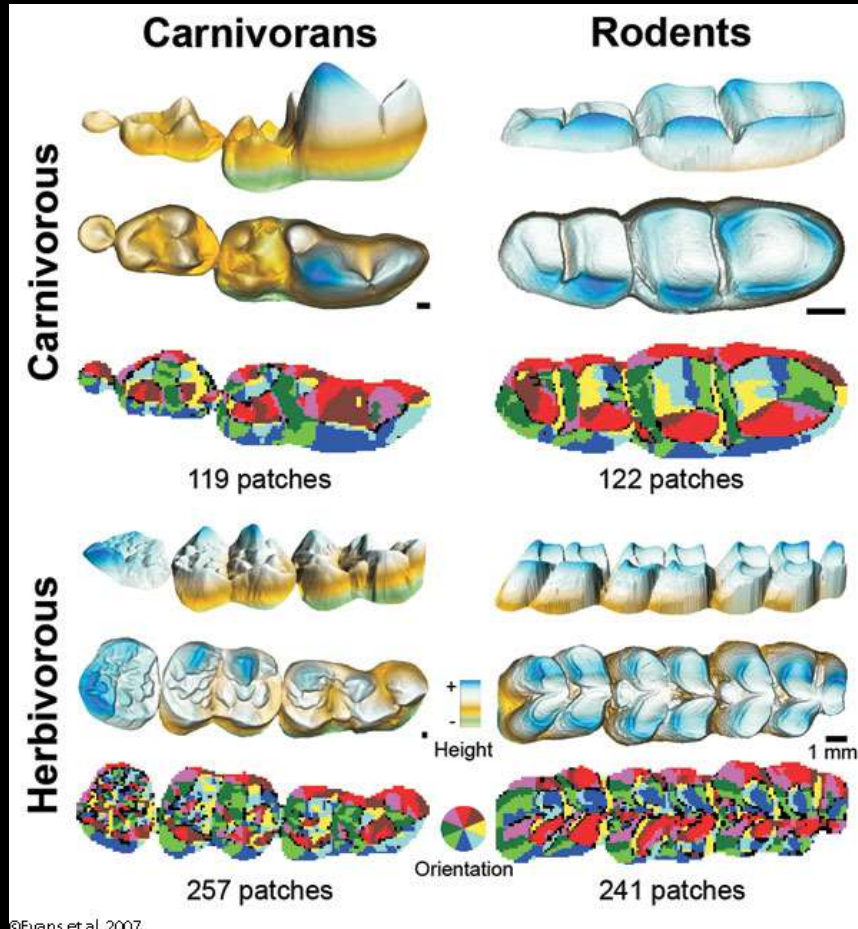


Lillegraven & Eberle., 1979



Gingerich (2006)

Research Potential



Fiorenza, 2011

Outreach/Education Potential



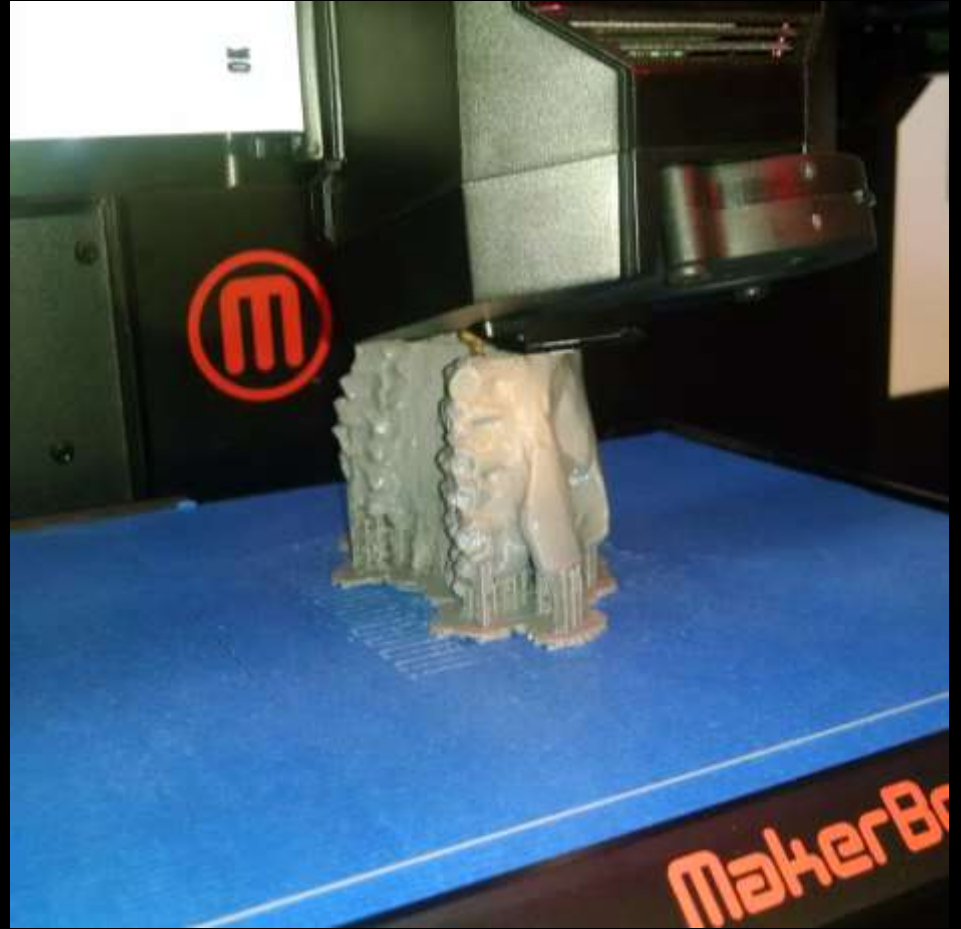
Diceromyonia
© 2004 UCMP



Dinorthis
© 2003 Milwaukee Public Museum



Platystrophia acutilirata
© 1998 Dr. Richard Pasetk,
Humboldt State University
Natural History Museum



Digitization Goals



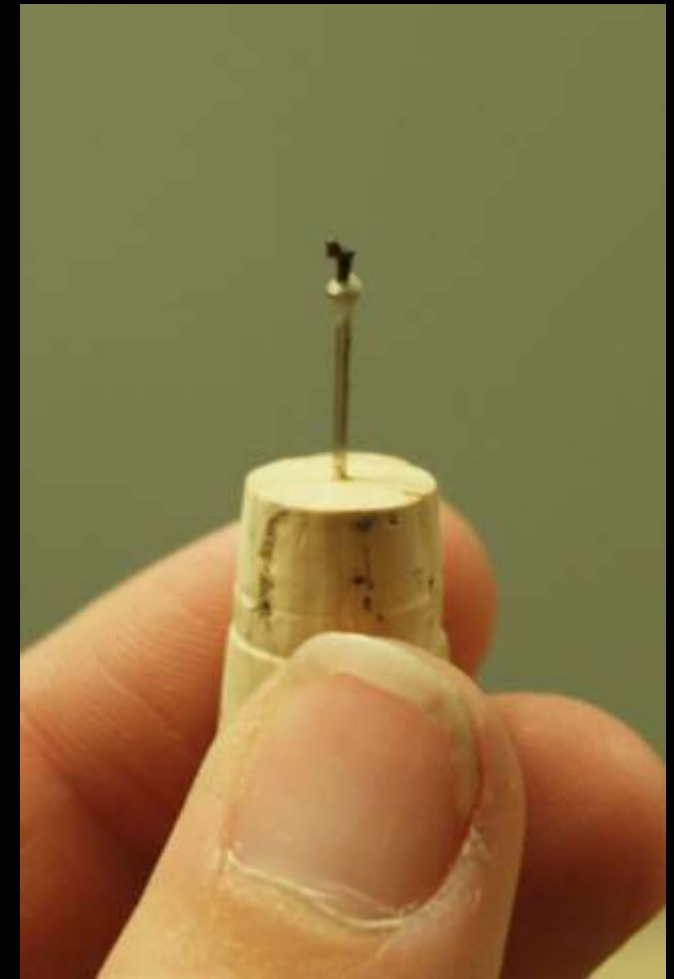
Challenges

(Variation in Color and Composition)



Challenges

(Variation in Size)



Challenges

(Variation in Size)

- Small mammal teeth are Especially Challenging
 - Limited Personnel
 - Limited Funds



Digitization Requires Multiple Methods:

Micro-CT



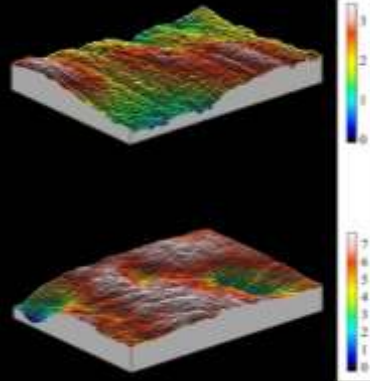
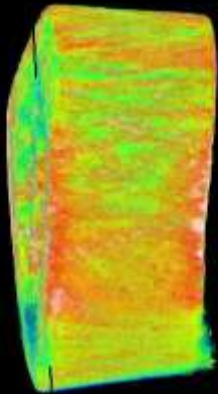
SEM



Next-Engine (Laser)



Photogrammetry



3D Scanner Aids

Paleo Digitization Workshop

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Digitizing the P



Quick Links for Pa

[Paleontology Digit](#)

[Paleontology Digit](#)

[Paleontology Digit](#)

Paleontology Digitization Workshop wiki

This is the wiki page for the paleo digitization workshop held at the Yale Peabody Museum, late September, 2013.

Digitization Resources Wiki Home]]

- [Digitization Resources Wiki Home](#)

3D Scanner Aids

www.aniwaa.com/comparison/3d-scanners/#

Global

Aniwaa
BETA

DISCOVER COMPARE

3D scanners comparison chart

239 RESULTATS
Supprimer filtres

SEARCH

Manufacturer, Model







OK

FILTER

Price

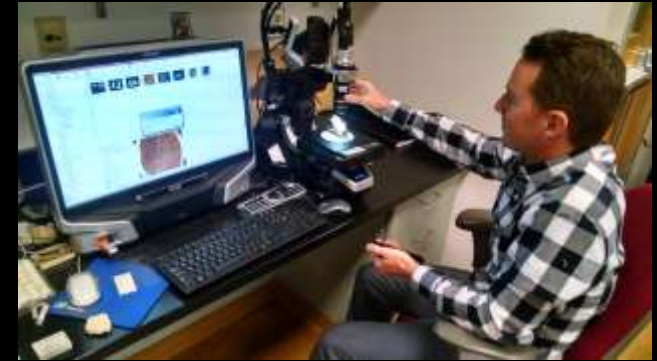
< \$ 1,000

\$ 1,000 - \$ 10,000

Product	Price	Rating	Category	Max resolution
 Scanify Fuel3D Compare Featured	\$ 1,490		Portative	0.35 m
 3D Body Scanner ESUN Compare	\$ 60,000		Body scanner	0.7 m
 100HSX Surphaser Compare	> \$ 100,000		Industrial	0.001 m

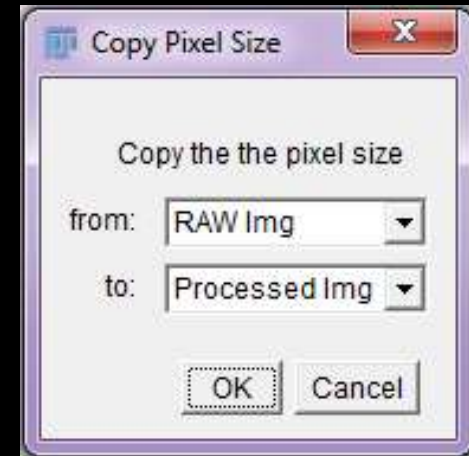
Trade-Offs in Digitization to Consider

Time



Ease of Use/ User- Interface

Funds



File Processing

Storage



Resolution



Approach by the Univ. Wyoming Fossil Vertebrates

Large



© BNPS.CO.UK

Medium



Small



Approach by the Univ. Wyoming Fossil Vertebrates

Large



© BNPS.CO.UK

Medium



Small



Cubify iSense



David Scanner
(3-5k Dollars)



Keyence

Approach by the Univ. Wyoming Fossil Vertebrates

Large

Medium

Small

Proof of concept. Not tested
on a collections level
scale...stay tuned



© BNPS.CO.UK



1 mm



Cubify iSense



David Scanner
(3-5k Dollars)



Keyence

Large Specimens (Elements Larger than 1 meter)



© BNPS.CO.UK

Large Specimens (Elements Larger than 1 meter)



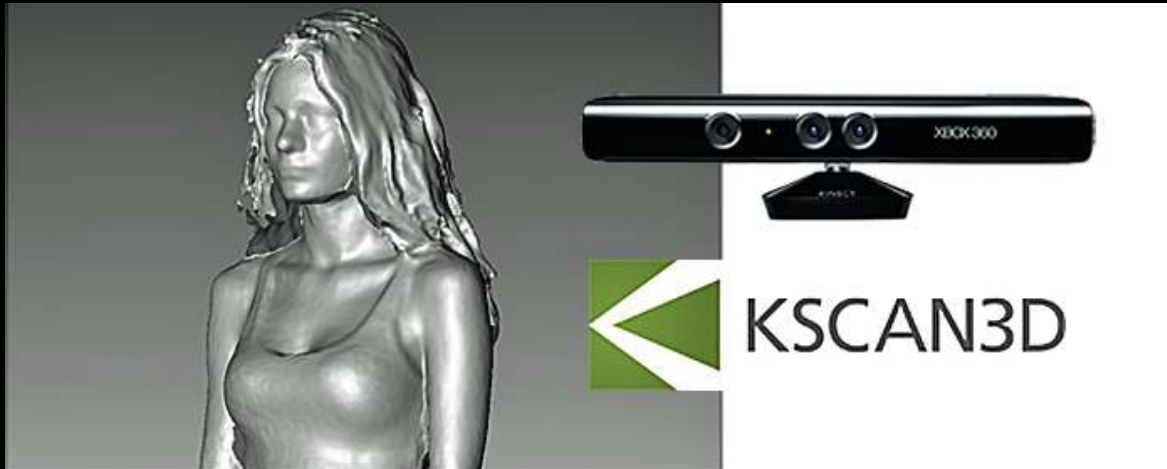
Course Resolution (1mm)

Cheaper: \$200-\$500

© BNPS.CO.UK



Cubify iSense



Medium Specimens (Elements 10cm - 1 meter)



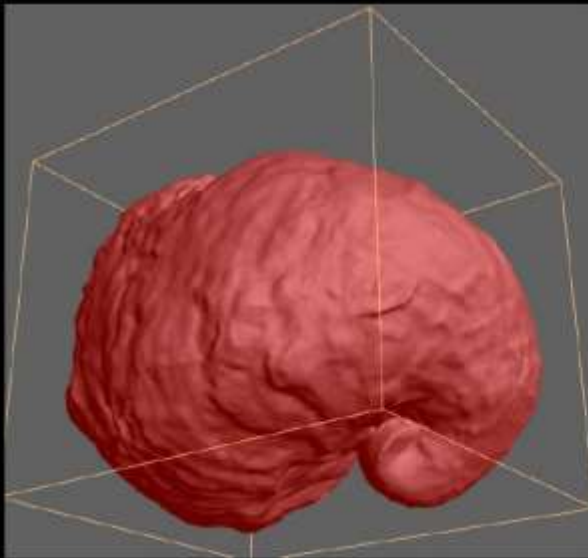
Medium Specimens (Elements 10cm - 1 meter)



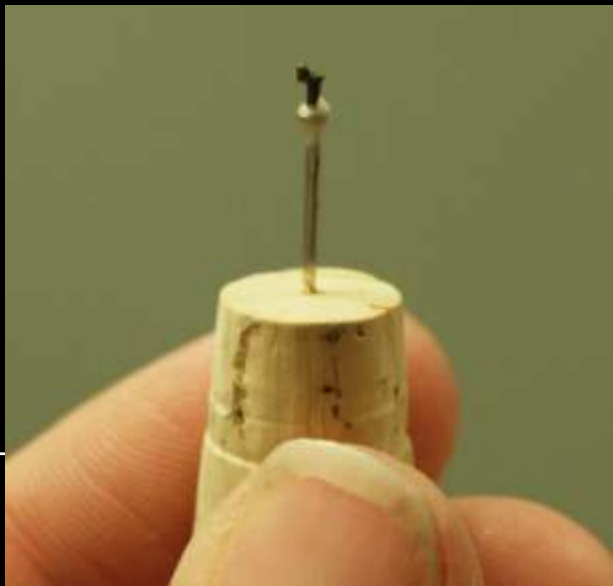
David Scanner
(3-5k Dollars)

Moderate Resolution (best 50 microns)

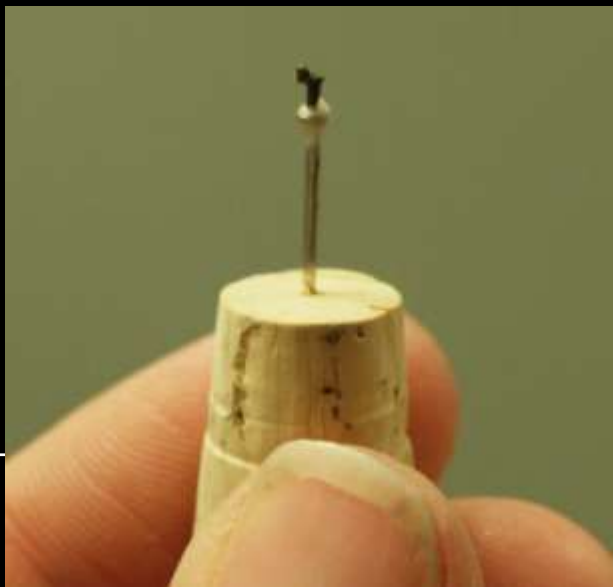
Moderate Priced: \$2000-\$5000



Small Specimens (Elements 100um - 5 cm)



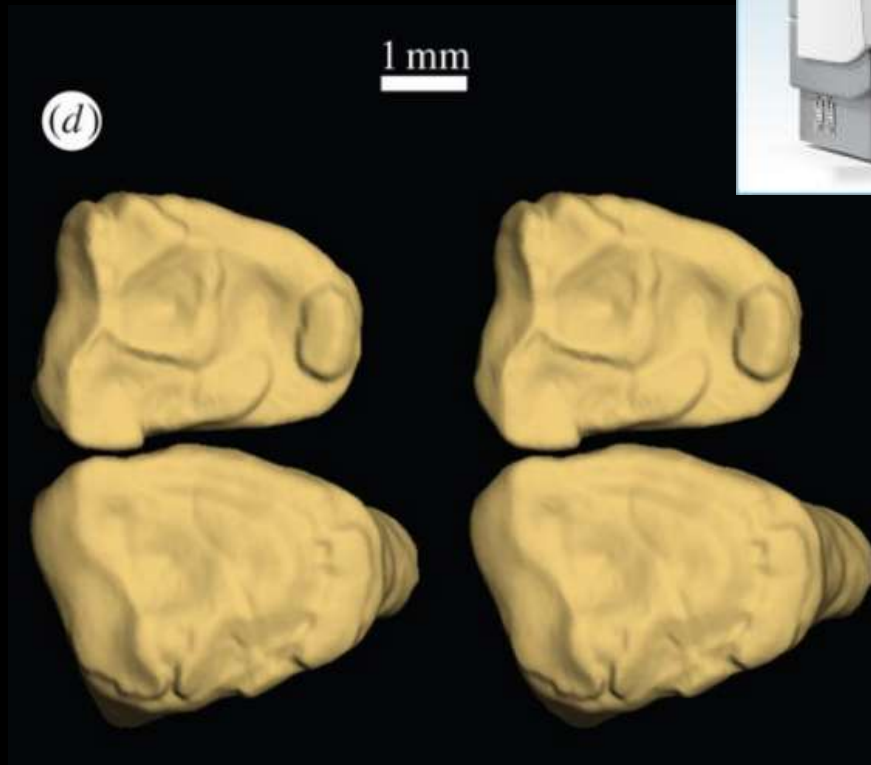
Small Specimens (Elements 100um - 5 cm)



Small Specimens (Elements 100um - 5 cm)



Micro-CT



- \$300k
- Technicians
- 2+hours
- Lots of Post-Processing
- Large Files

Small Specimens (Elements 100um - 5 cm)



Micro-CT



- \$300k
- Technician
- 2+hours
- Lots of Prep
- Processing
- Large files

Small Specimens (Elements 100um - 5 cm)

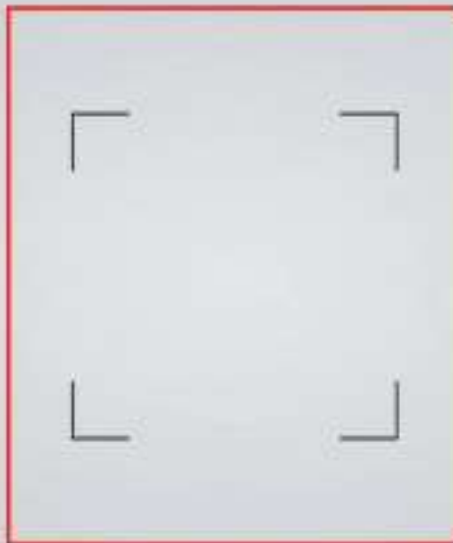
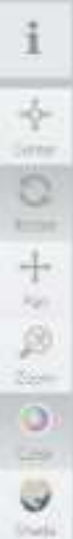
Dental
Intra-Oral Scanners



00:01

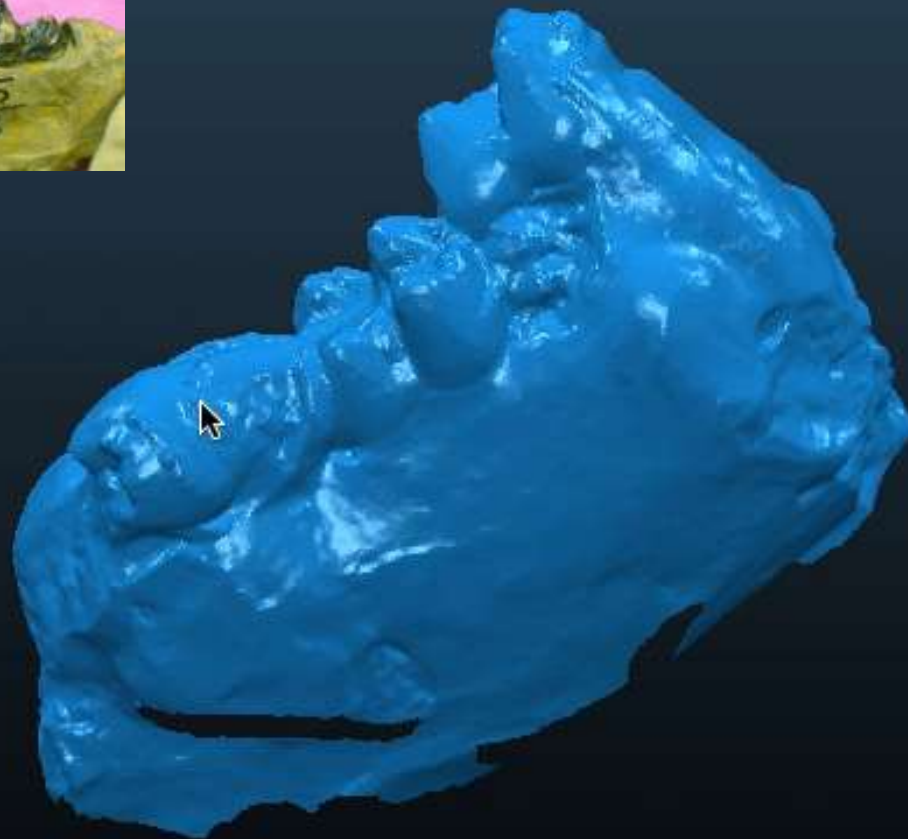
3D images: 0

Default operator
University of Wyoming

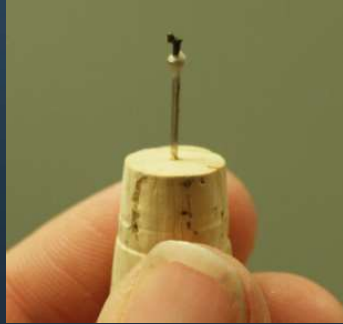


3shape

Small Specimens (Elements 100um - 5 cm)



Small Specimens (Elements 100um - 5 cm)



Small Specimens (Elements 100um - 5 cm)



Small Specimens (Elements 100um - 5 cm)

Keyence

54 Mega Pixel
CCD & Actuator



Digital Microscope

VHX
DIGITAL MICROSCOPE



VHX-600

Small Specimens (Elements 100um - 5 cm)

Hirox Digital Microscope



Macropod Digital Camera Station



Multiple Lenses and Adaptors Increases number of samples it can digitize

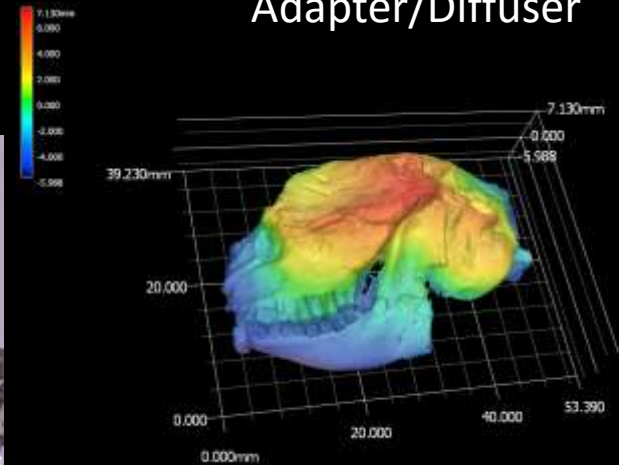
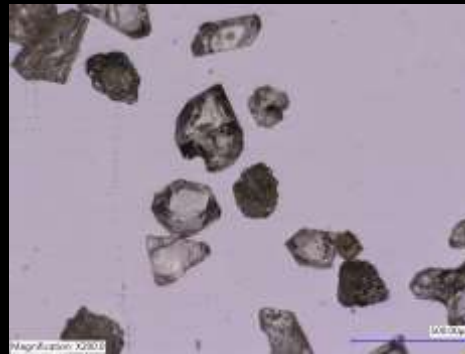


0-2000x
magnification

180 Deg. Lens Tilt

Detachable Lens

Multiple
Adapter/Diffuser



Automated Focal(z) Stacking

Single Frame from Stack



42 Stacked Images

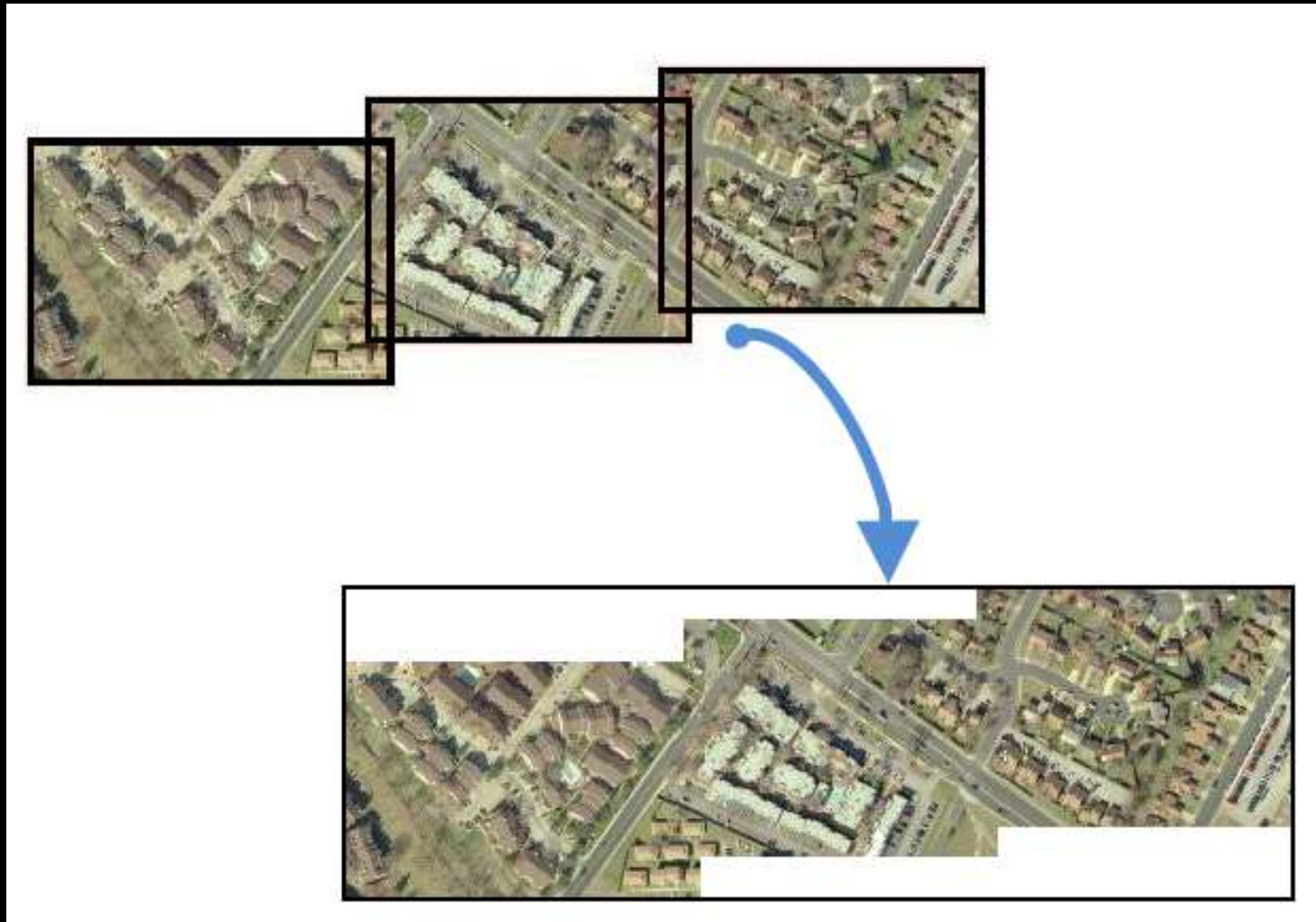


Automated Focal(z) Stacking



1 mm

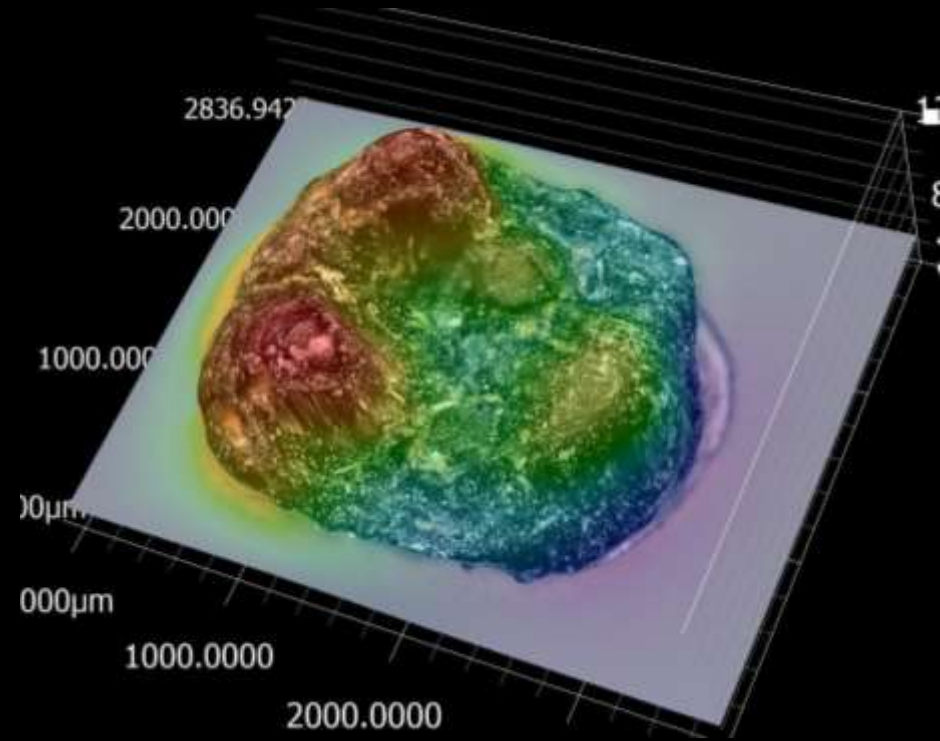
Automated Tiling of Focal Stacked Sections



Automated Tiling of Focal Stacked Sections



3D Model Generation



Automated Mag/Scale and Annotation and Composite



Multi-View



Multi-View and Photogrammetry



Thank you!

