Issues of Scale: Imaging Micro to Oversized Objects

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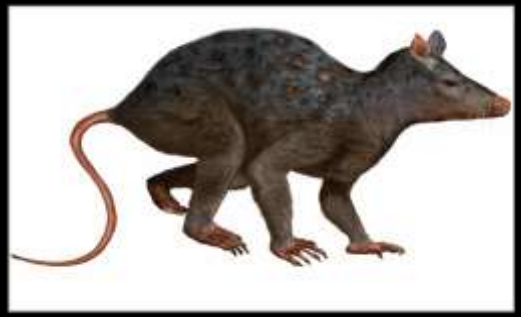
University of Wyoming Fossil Vertebrate Collection

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

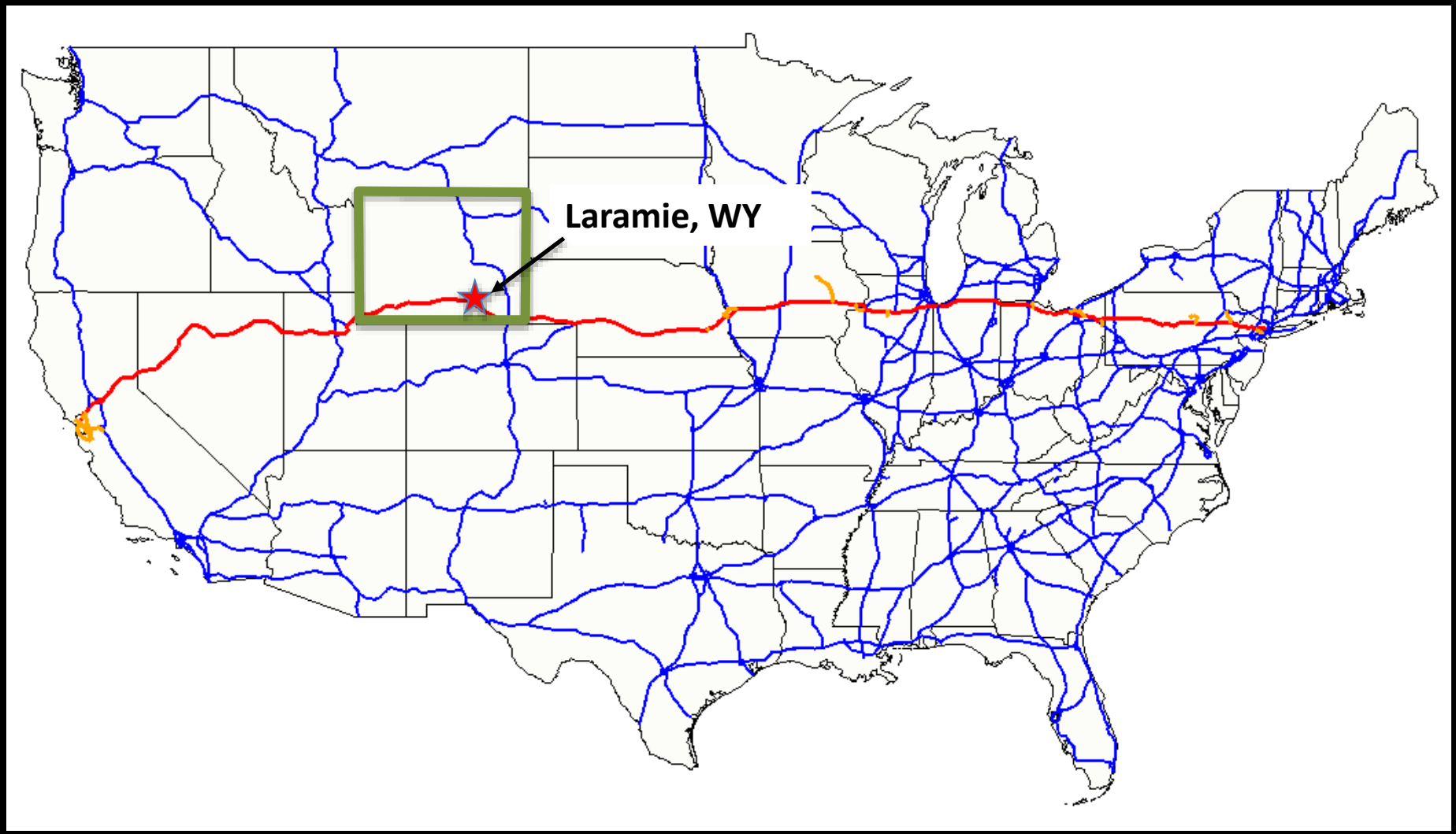
- Only 1 Full-Time (shared) Position
- Very Limited Income

Mesozoic Vertebrates
(Dinosaurs and Marine Reptiles)

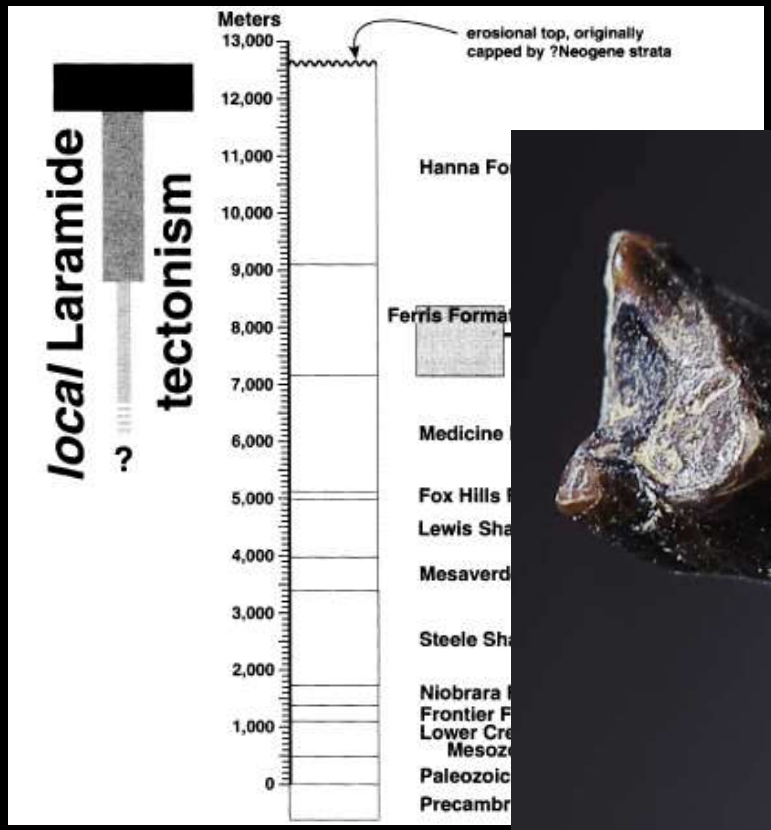
Mesozoic and Paleogene Mammals



Why Digitize



Research Potential

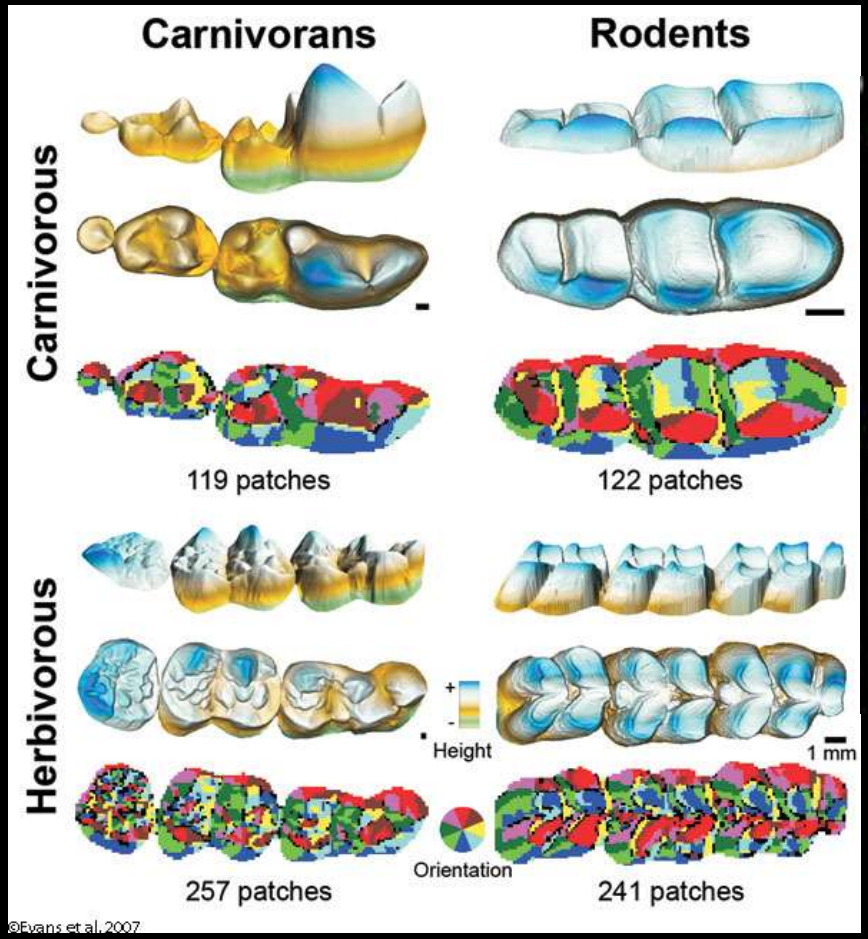


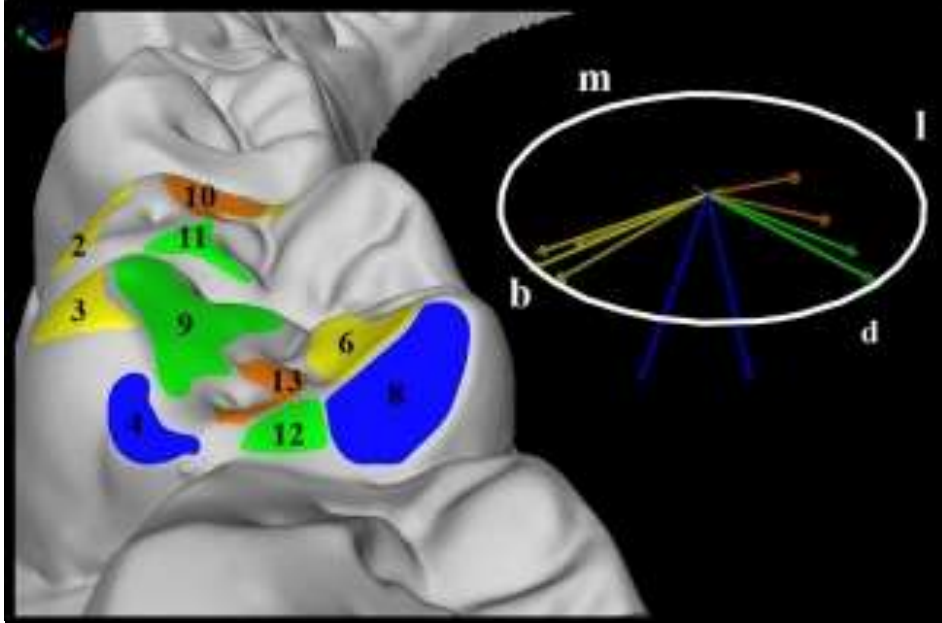
Lillegraven & Eberle., 1979

Gingerich (2006)

Research Potential

Research Potential





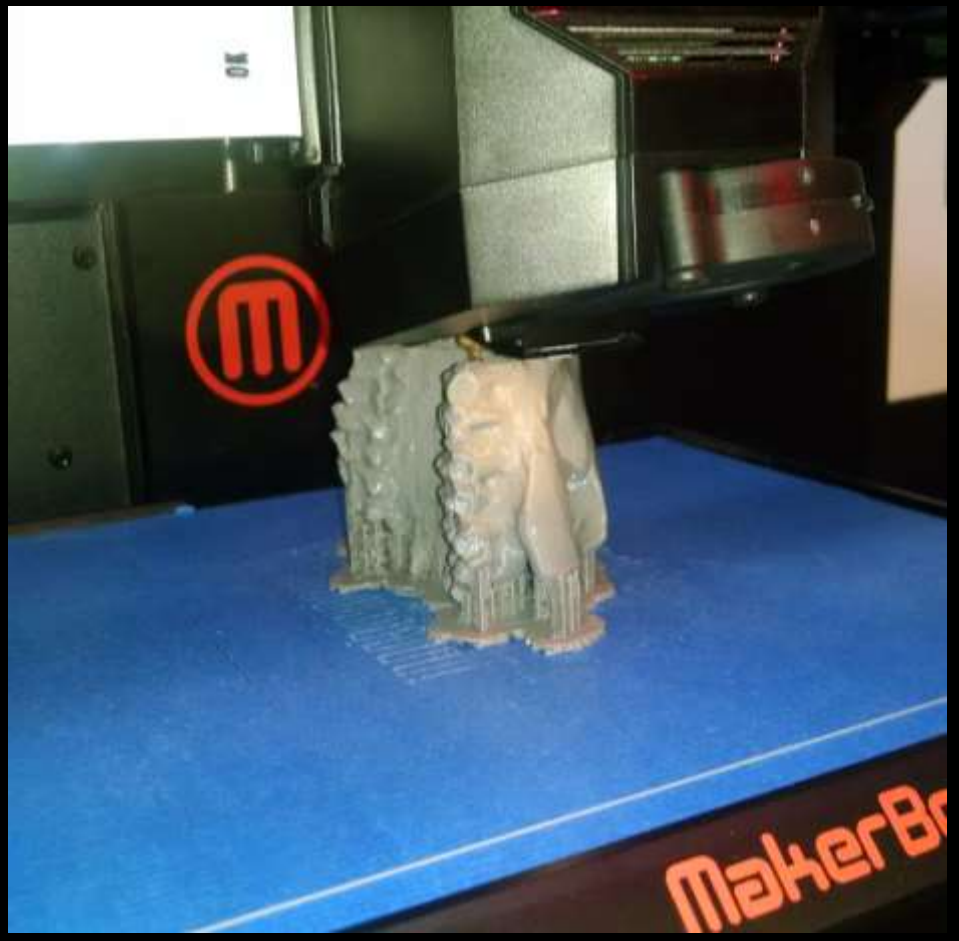
Fiorenza, 2011

Outreach/Education Potential

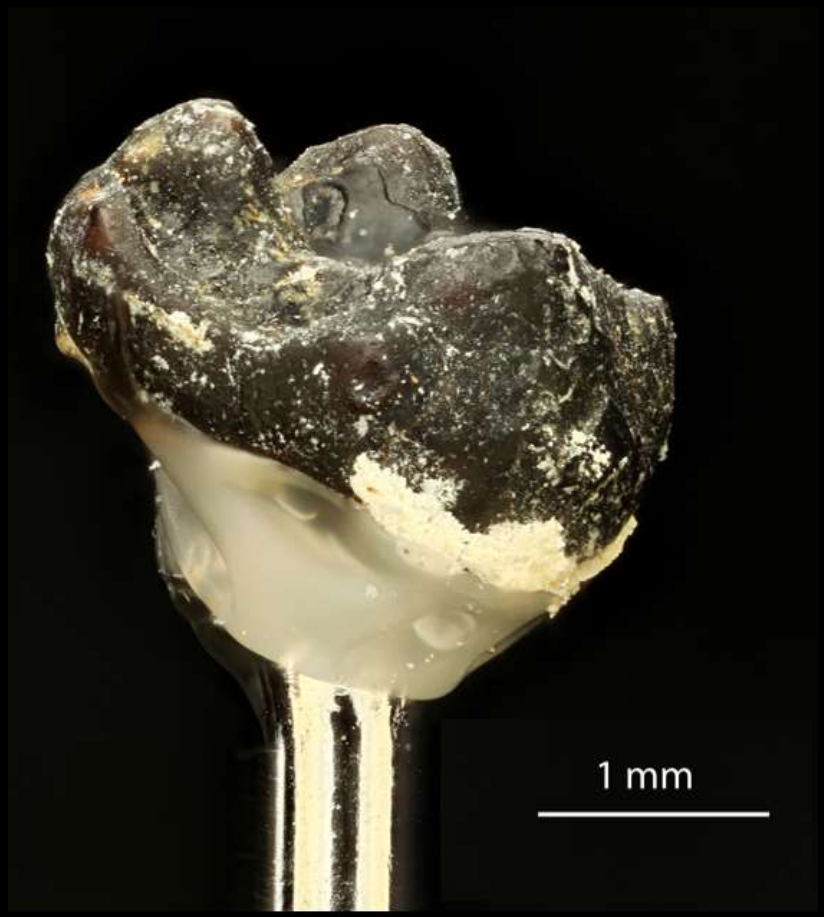
Diceromyonia
© 2004 UCMP

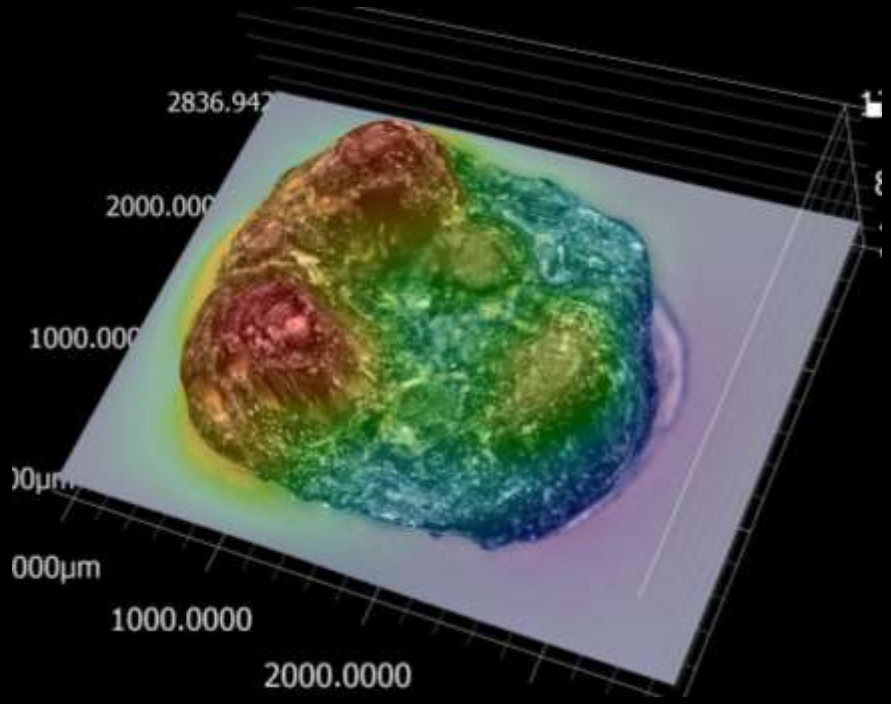
Dinorthis
© 2003 Milwaukee Public Museum

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

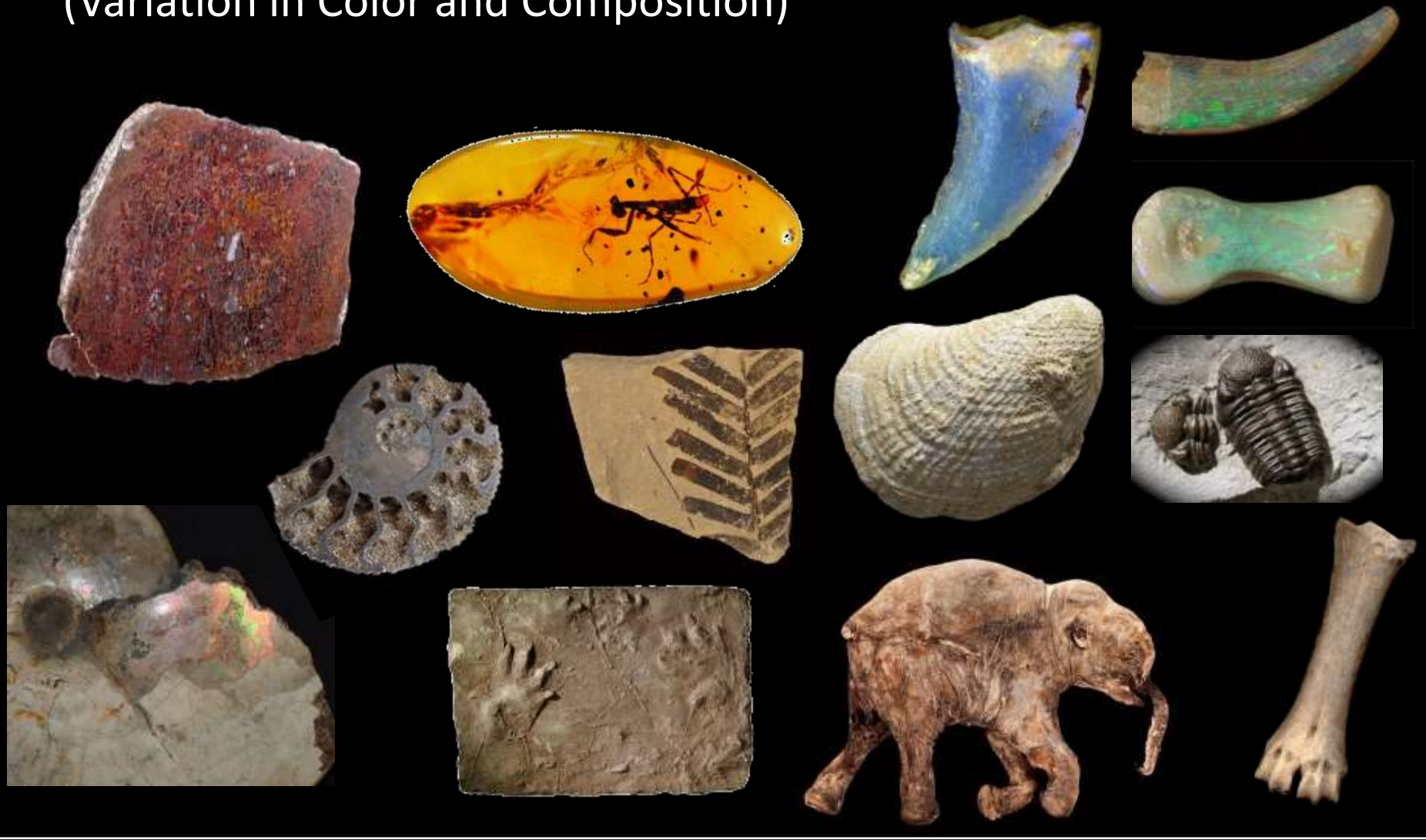


Digitization Goals

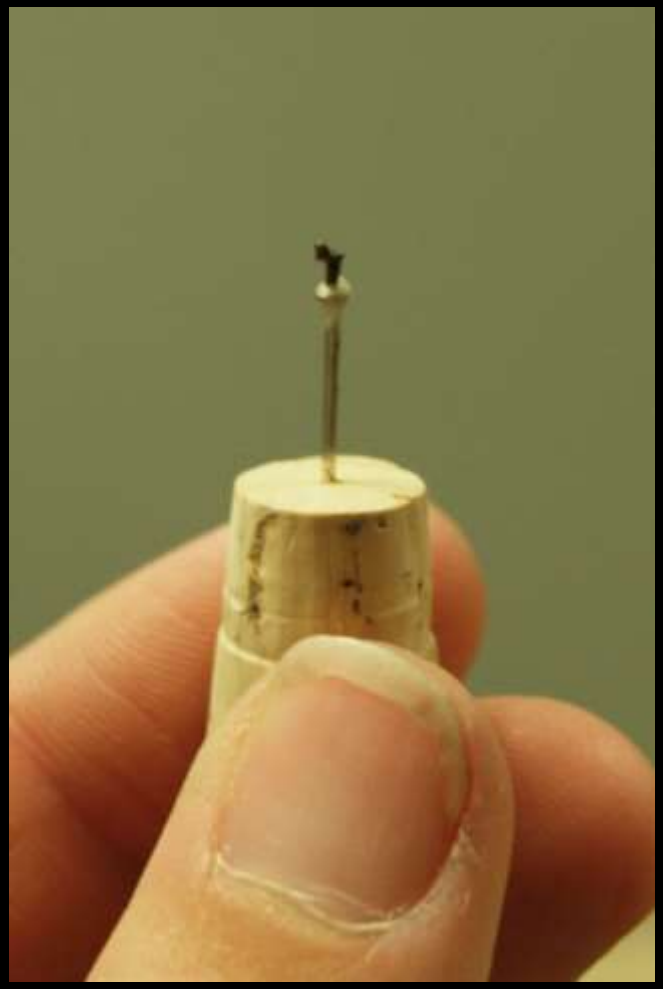




Challenges
(Variation in Color and Composition)



Challenges
(Variation in Size)



Challenges
(Variation in Size)

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

Digitization Requires Multiple Methods:

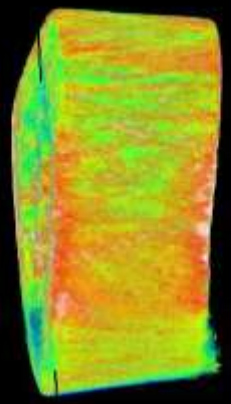
Micro-CT

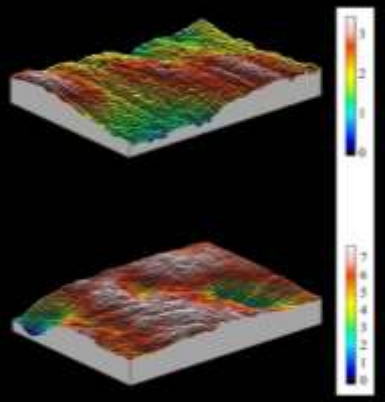
SEM

Next-Engine (Laser)

Photogrammetry

Smaller **Larger**



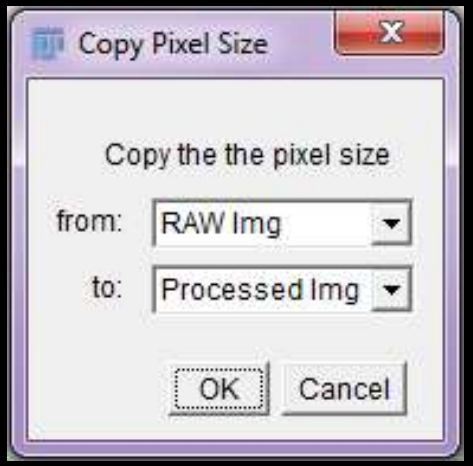


Trade-Offs in Digitization to Consider

Time

Ease of Use/ User- Interface

Funds



File Processing

Resolution

Storage

Approach by the Univ. Wyoming Fossil Vertebrates

Large

Medium

Small

Approach by the Univ. Wyoming Fossil Vertebrates

Large

Medium

Small

Cubify iSense

David Scanner
(3-5k Dollars)

Keyense

Approach by the Univ. Wyoming Fossil Vertebrates

Large

Medium

Small

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

Cubify iSense

David Scanner
(3-5k Dollars)

Keyense

Large Specimens
(Elements Larger than 1 meter)

Large Specimens
(Elements Larger than 1 meter)

Course Resolution (1mm)

Cheaper: $200-$500


Cubify iSense

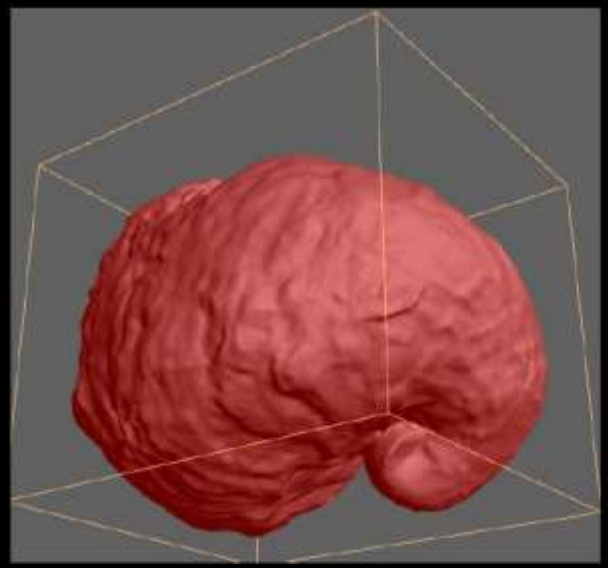
Medium Specimens
(Elements 10cm - 1 meter)

Medium Specimens
(Elements 10cm - 1 meter)

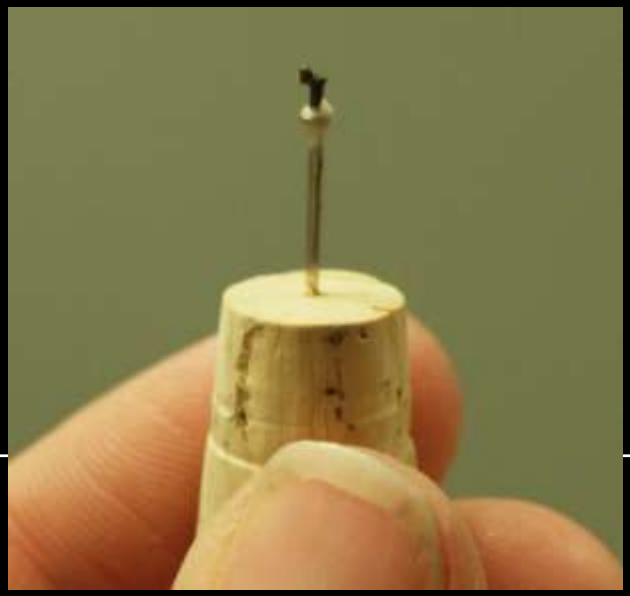
David Scanner
(3-5k Dollars)

Moderate Resolution (best 50 microns)

Moderate Priced: $2000-$5000



Small Specimens
(Elements 100um - 5 cm)



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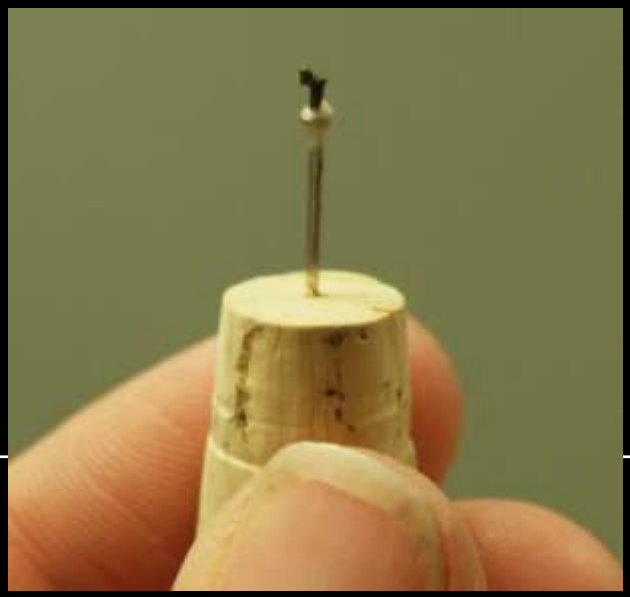
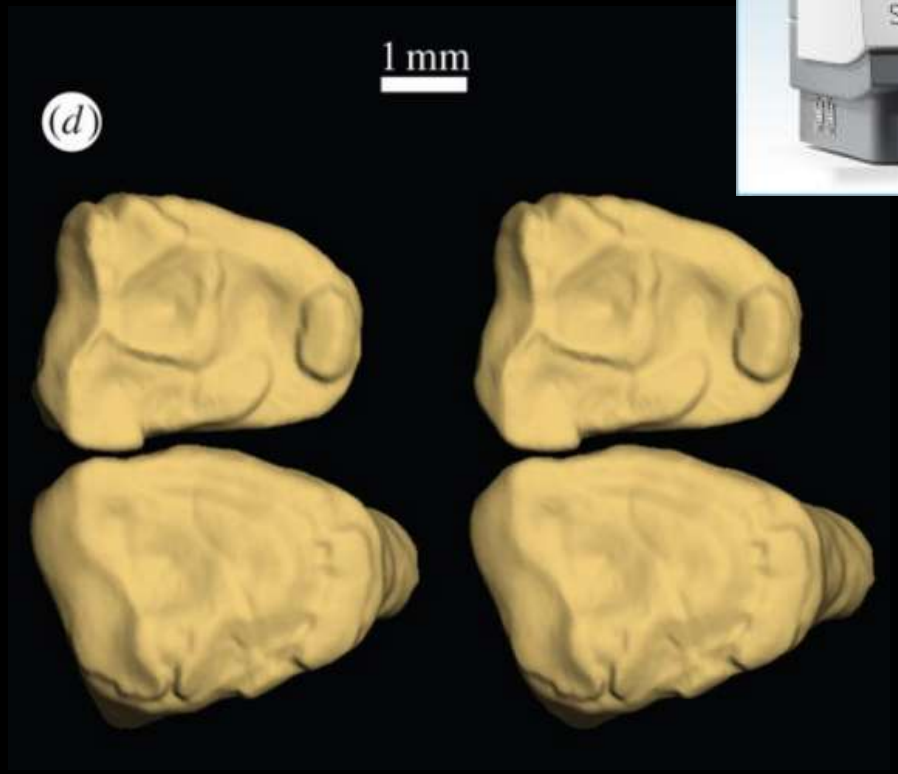


Small Specimens
(Elements 100um - 5 cm)

Micro-CT



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

Small Specimens
(Elements 100um - 5 cm)

Micro-CT

- $300k
- Technician
- 2+hours
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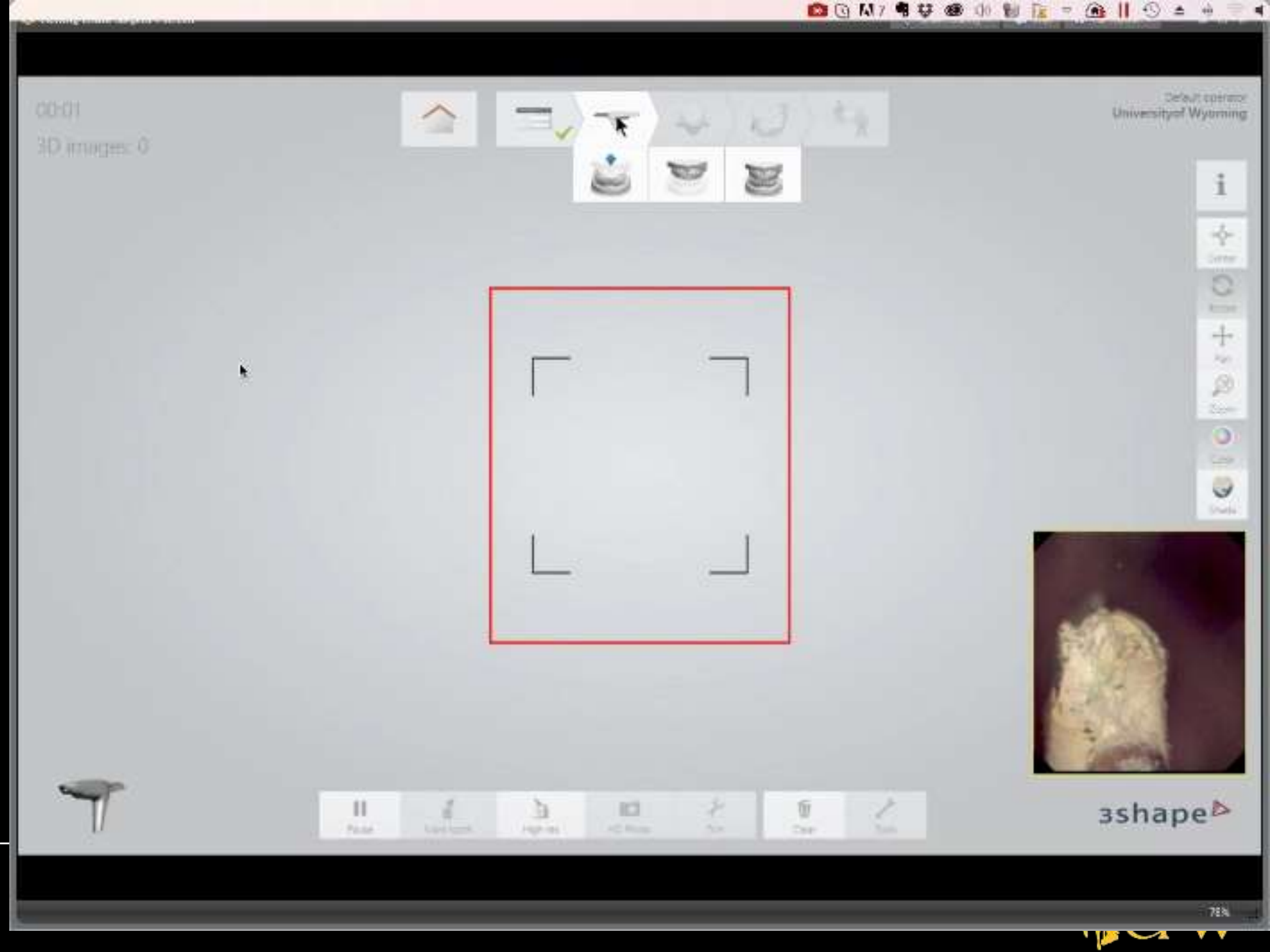
-Processi
-Large

Small Specimens
(Elements 100um - 5 cm)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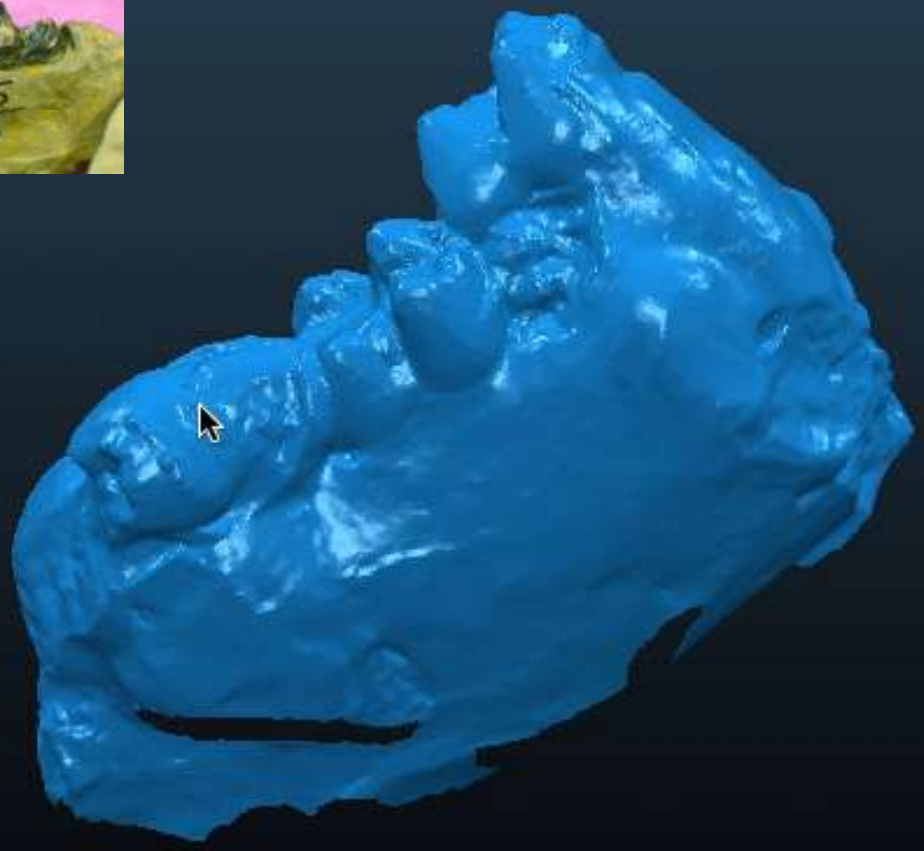
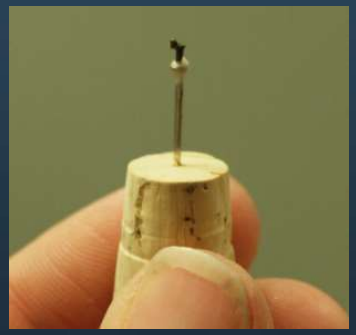
3D images: 0
Default operator
University of Wyoming
3shape

Small Specimens
(Elements 100um - 5 cm)



Small Specimens
(Elements 100um - 5 cm)



Small Specimens
(Elements 100um - 5 cm)

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(Elements 100um - 5 cm)

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(Elements 100um - 5 cm)

Hirox Digital Microscope

Macropod Digital Camera Station

Multiple Lenses and Adaptors Increases number of samples it can digitize

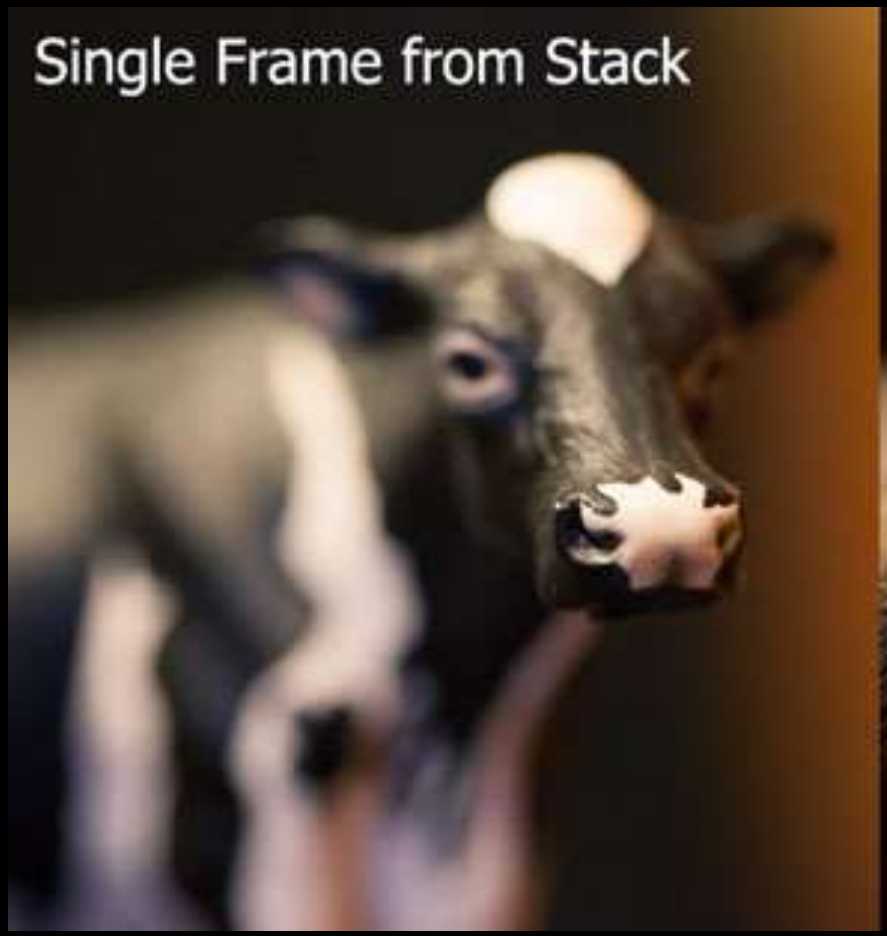
0-2000x magnification

180 Deg. Lens Tilt

Detachable Lens

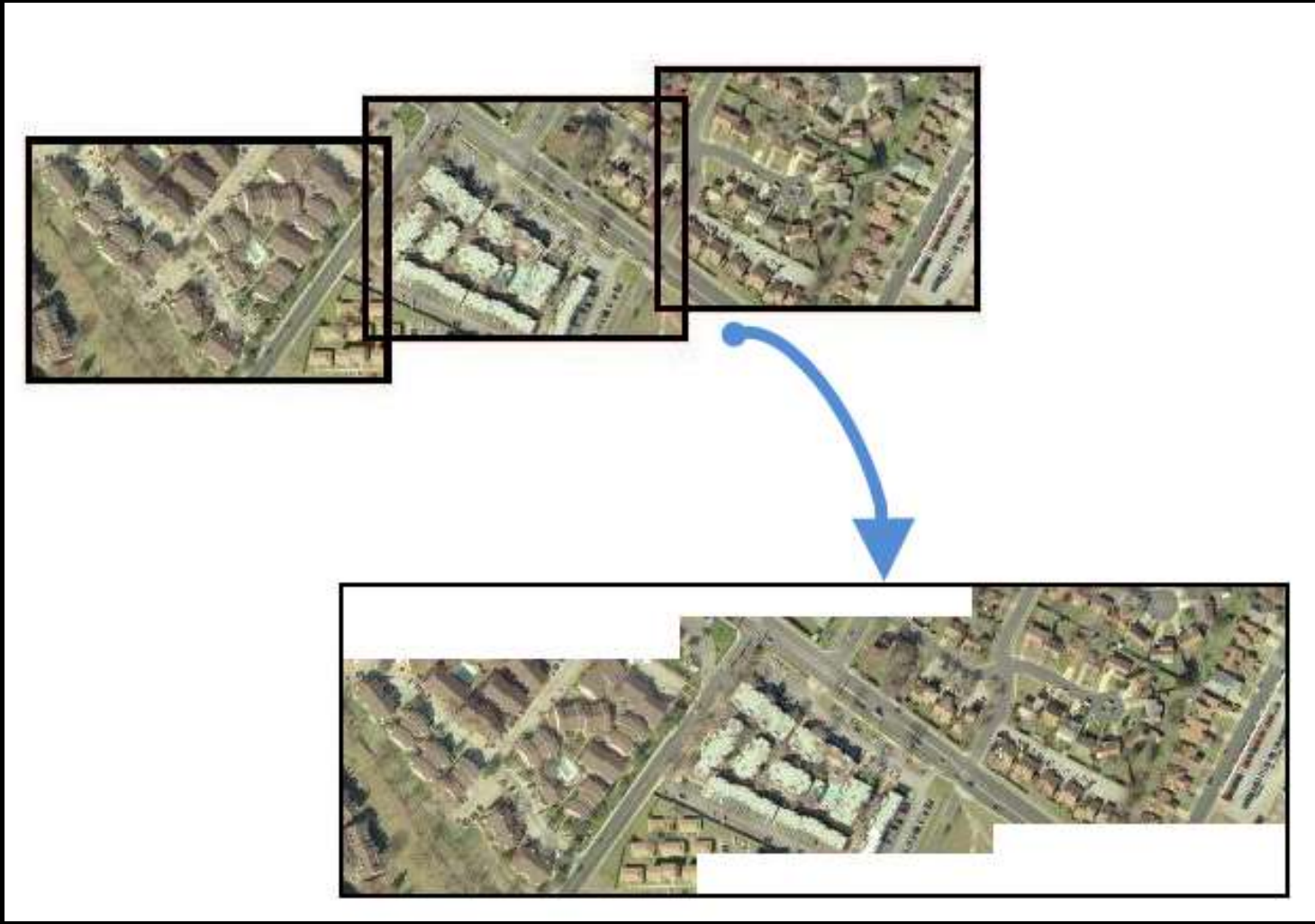
Multiple Adapter/Diffuser

Automated Focal(z) Stacking



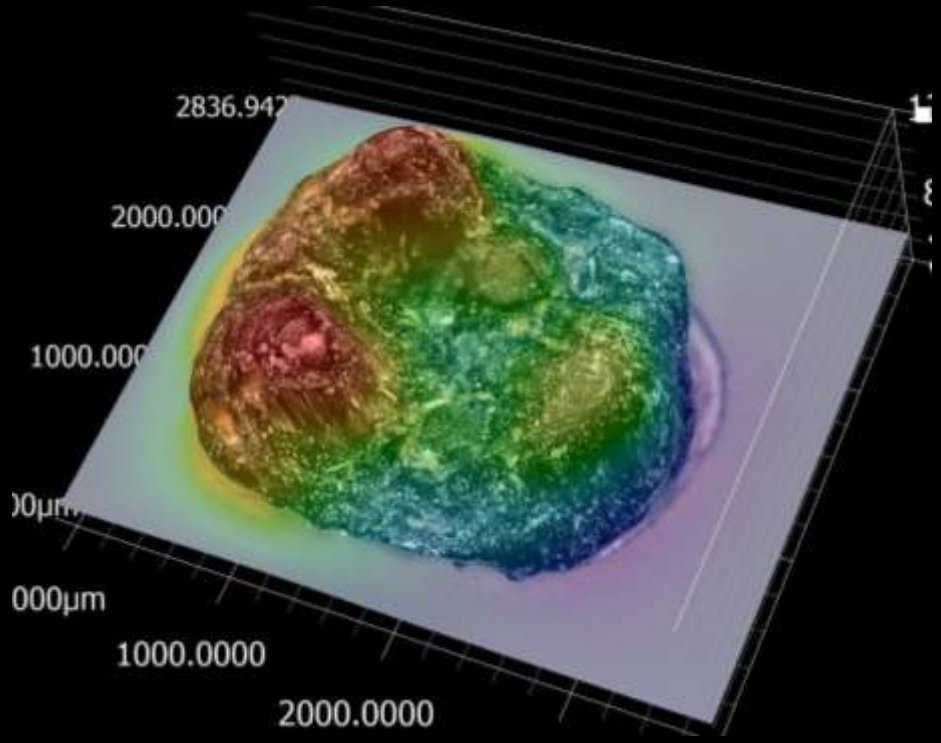
Automated Focal(z) Stacking

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!

iDigBio
Integrated Digitized Biocollections

NSF

GEOLOGY & GEOPHYSICS

University of Wyoming
UW
Geological Museum
Since 1887

UW | University of Wyoming

UW