

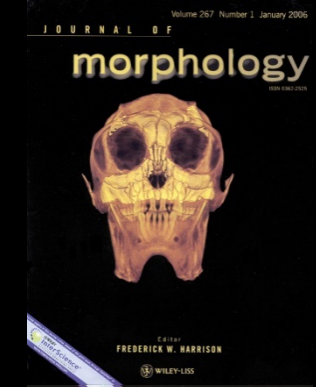
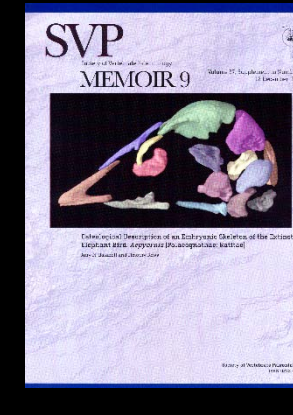
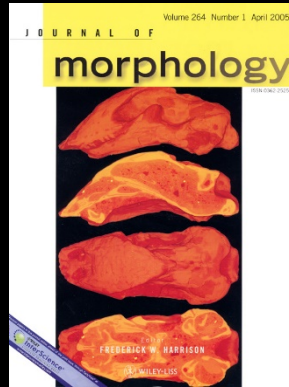
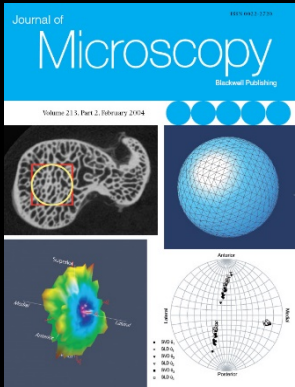
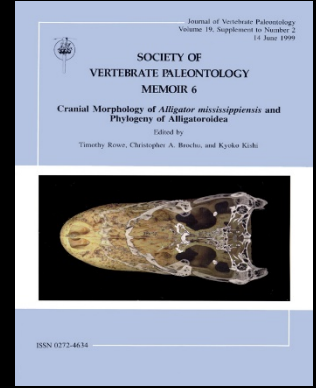
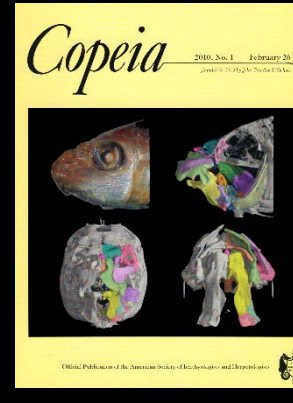
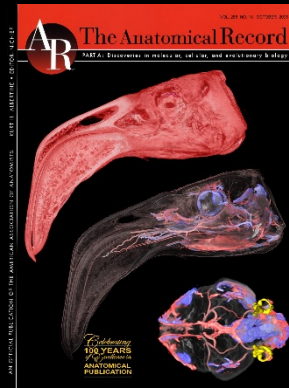
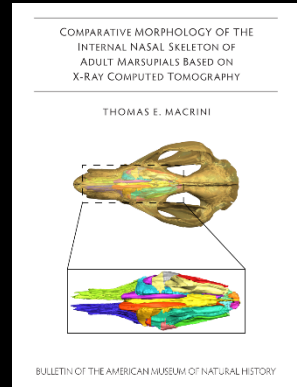
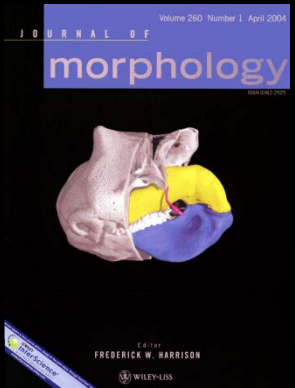
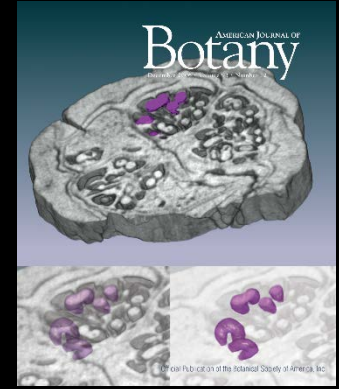
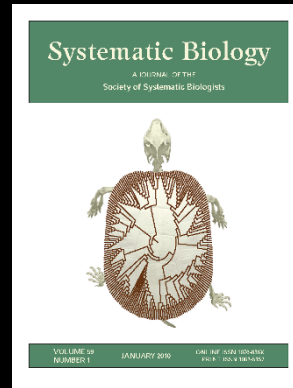
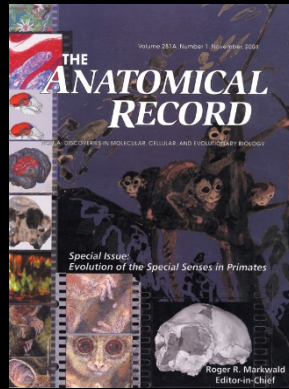
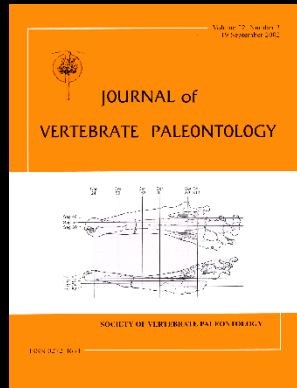


The University of Texas High-Resolution X-ray CT Facility and DigiMorph.org: Past, Present, Future

Jessica Maisano

Jackson School of Geosciences

The University of Texas at Austin



Almost
20 years!

UTCT
The University of Texas High-Resolution X-ray Computed Tomography Facility

The University of Texas High-Resolution X-ray Computed Tomography Facility

The High-Resolution X-ray Computed Tomography Facility at the University of Texas at Austin (UTCT) is a national shared molecular facility supported by the Instrumentation and Facilities Program of NSF's Earth Sciences (EAF) Directorate. UTCT offers scientific researchers across the earth, biological and engineering sciences access to a completely nondestructive technique for visualizing features in the interior of opaque solid objects, and for obtaining digital information on their 3D geometries and properties.

Interested in scanning materials at our facility? See the Scanning FAQ or download the Scan Agreement Form.

Selected Recent Publications

Digmon, P.H., Wray, M.L., Dunbar, J.A., Collins, M.W., Barkovich, A.C., Carr, D., Cox, J.R., Cox, P.E., Drenth, J.B., Early, C.M., Eickert, M.S., Hoshikawa, S.M., Hoshikawa, A.H., Holliday, C.M., Li, Z., Malin, A., Marchant, S., Miller, J., Orban, C.P., Palak, R.J., Thiel, M.L., Tiel, R.P., and Wisner, L.M. (in press) Diffraction-limited, synchrotron-enhanced computed tomography (SynCT): an emerging tool for rapid high-resolution, 3-D imaging of nanoscale cell tissues. *Journal of Anatomy*.



Digital Morphology

A National Science Foundation Digital Library at The University of Texas at Austin

The Digital Morphology library is a dynamic archive of information on digital morphology and high-resolution X-ray computed tomography of biological specimens. Browse through the site and see spectacular imagery and animations and details on the morphology of many representatives of the Earth's flora. Recent additions or updates to the site include:

Nodosaurid Ankylosaur, Pawpawsaurus campbelli

A new paper by A. Paulina-Carabajal, Y.-H. Lee and L. L. Jacobs explores the endocranial morphology of *Pawpawsaurus campbelli* from the upper Albian New River Formation of Tarrant County, Texas. Using high-resolution X-ray CT data, the authors help to fill critical gaps in our knowledge of ankylosaurian cranial neurovascular passages, morphology of the lower ear, and nasal cavities. Learn more about what they found by reading the DigitalMorph account. [View...](#)

Crocodylus rhombifer, Cuban Crocodile

The Cuban crocodile is found today only in Cuba and Isla de la Juventud. However, it previously occurred in the Bahamas and Cayman Islands, as revealed by fossils recovered from underwater caves (blue holes) in the former and organic peat deposits in the latter. Evidence from radiocarbon dates, fossil and archaeological sites, and historical records confirms that *Crocodylus rhombifer* went extinct on these islands within the past 500 years, possibly as a result of overhunting. Learn more about the Cuban crocodile in this DigitalMorph account contributed by Nancy Albury and David Steadman. [View...](#)

Horned Puffin, Fratercula corniculata

The horned puffin is a member of Puffinidae, a clade that includes auks, auklets, puffins, gullskates, murres, and murrelets. One of three living puffin species in the Pacific Ocean basin, *Fratercula corniculata* spends most of its life at sea. Horned puffins usually come ashore only to breed, and are monogamous. Learn more about this species, and view its cranial endocast, by reading this new DigitalMorph account by Dr. N. Adam Smith. [View...](#)

The Origin of Turtles

The point of origin of turtles within anoles has long been a source of contention. Better and coauthors. In a recent issue of Nature, examine via high-resolution X-ray CT the enigmatic taxon *Eurotoisaurus d'Opopea*, a 160-million-year-old fossil reptile from the Karoo Basin of South Africa. Their analysis suggests a 40-million-year extension to the turtle stem and moves the ecological context of turtle origins back onto land. Learn more by reading this new DigitalMorph account. [View...](#)

Reasons to CT scan biological and paleontological specimens:











- Nondestructive
- Minimizes specimen handling
- Digital preparation/skeletonization
- Rapid prototyping
- Visually compelling
- Increase access to specimens via WWW

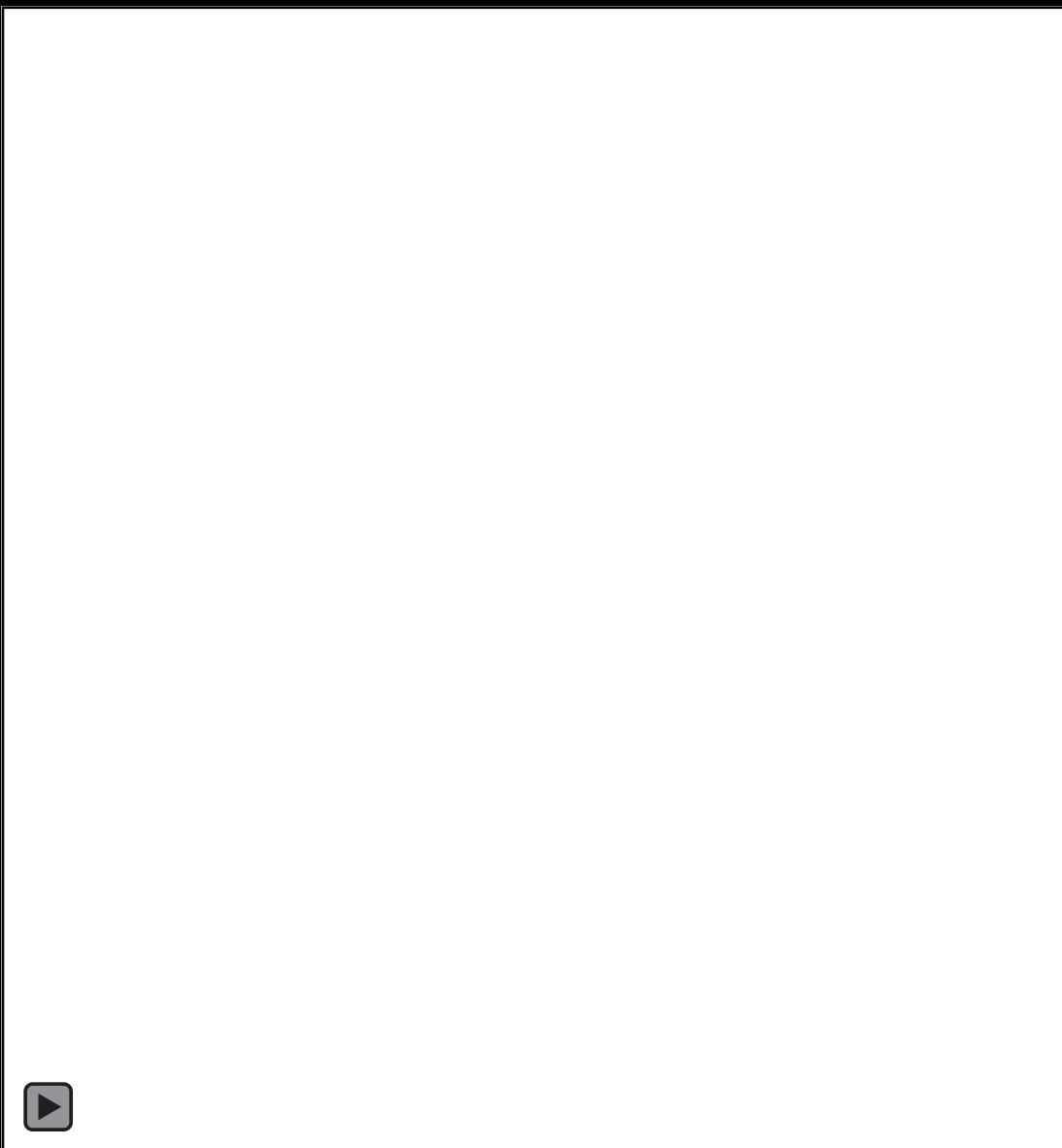
DIGITAL MORPHOLOGY

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<p>DigiMorph</p> <ul style="list-style-type: none"> Home About DigiMorph DigiMorph Help Sponsors Links Recent Publications DigiMorph People <p>Browse the Library by:</p> <ul style="list-style-type: none"> Scientific Names Common Names What's New ? What's Popular? <p>Learn More</p> <ul style="list-style-type: none"> X-ray CT 3-D Printing <p>Overview Pages</p> <ul style="list-style-type: none"> Dinosaurs Tapirs Horned Lizards * Endocasts <p>A Production of</p> <ul style="list-style-type: none"> UTCT UT Geosciences TMM DigiMorph Contributors <p>* Expert annotation</p>	<p>The Digital Morphology library is a dynamic archive of information on digital morphology and high-resolution X-ray computed tomography of biological specimens. Browse through the site and see spectacular imagery and animations and details on the morphology of many representatives of the Earth's biota. Recent additions or updates to the site include:</p> <div style="border: 1px solid #ccc; padding: 5px; margin-top: 10px;"> <p style="text-align: center; color: #0056b3; font-weight: bold;">Spathorhynchus fossorium, Fossil Amphisbaenian</p>  <p>Amphisbaenians are enigmatic, limbless, fossorial squamates whose phylogenetic relationships are poorly understood. A new paper by Müller and coauthors in the Journal of Anatomy examines in detail the cranial osteology of <i>Spathorhynchus fossorium</i>, the oldest-known well-preserved amphisbaenian, from the Eocene Green River Formation of Wyoming. This study suggests that some 'primitive' characters may in fact be synapomorphies of an extinct Paleogene amphisbaenian clade. [more...]</p> </div> <table border="0" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <tr> <td style="width: 60%; border-right: 1px solid #ccc; padding-right: 5px;"> <p>Nodosaurid Ankylosaur, <i>Pawpawsaurus campbelli</i></p> <p>A new paper by A. 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DigiMorph specimen selection:

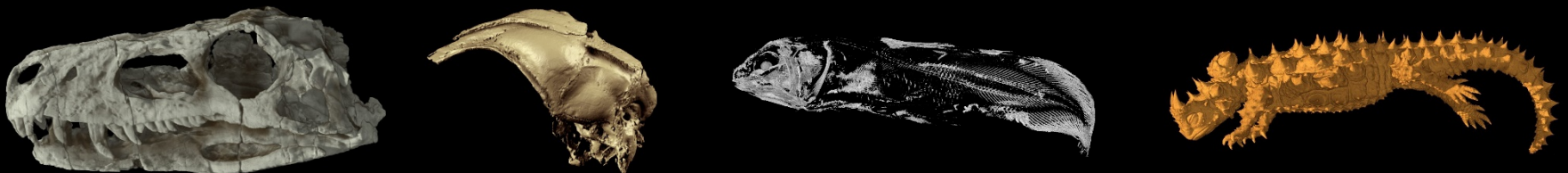
- Common laboratory animals



- Species 'in the news'

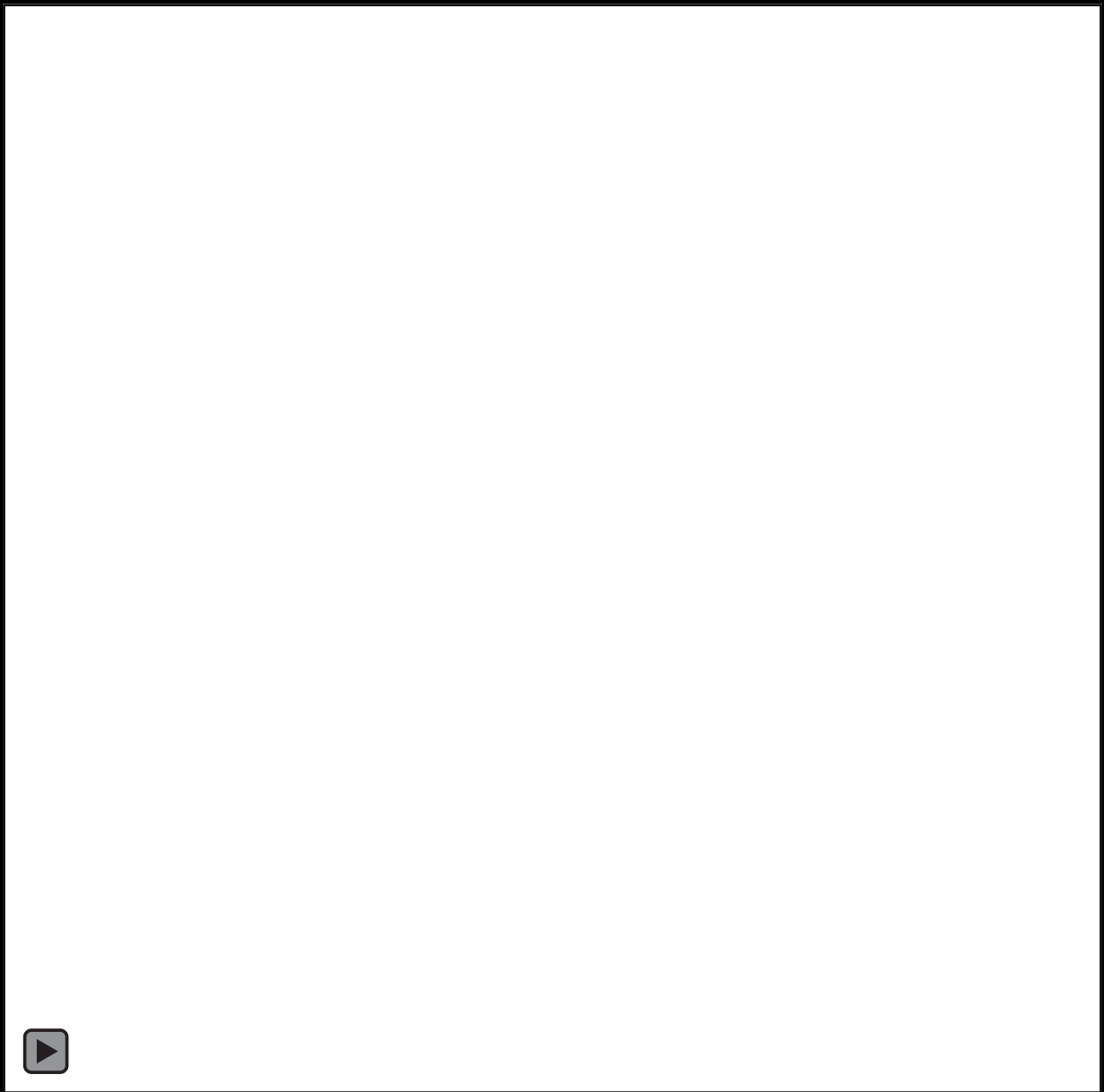


- Species that are particularly rare and/or sexy



Opportunistic DigiMorph specimens:

- Deep Scaly: 130 lizards & snakes
- AmphibiaTree: 27 amphibian species
- All Catfish Species Inventory: 21 catfish
- Rossie dissertation: 50 primates
- Van Valkenburgh: 50+ carnivorans
- Simmons: 22 bats



Reasons to Make HRXCT Data Freely Available:

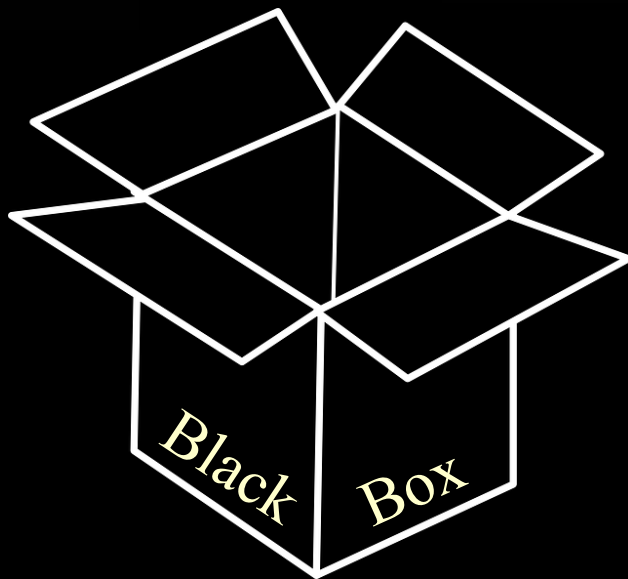
- Enables data repurposing

Rowe, T., et al. 1999. Cranial morphology of *Alligator mississippiensis* and phylogeny of Alligatoroidea. *Journal of Vertebrate Paleontology* 19 (S2), 1-100.

- Tykoski et al., 2002, *Journal of Vertebrate Paleontology*
- Franzosa & Rowe, 2005, *Journal of Vertebrate Paleontology*
- Metzger, 2005, *The Anatomical Record*
- McHenry et al., 2006, *The Anatomical Record*
- Hsiou & Fortier, 2007, *Journal of Geoscience*
- Rayfield et al., 2007, *Journal of Vertebrate Paleontology*
- Bennett, 2008, *Journal of Vertebrate Paleontology*
- Sereno and Larsson, 2009, *ZooKeys*
- Cuff and Rayfield, 2013, *PLoS One*
- Kley et al., 2010, *Journal of Vertebrate Paleontology*
- Holliday, 2013, *PloS One*
- Gay and Milner, 2015, *PeerJ*
- Bierman & Carr, 2015, *Hearing Research*
- Blanco et al., 2015, *Historical Biology*
- Li and Clarke, 2015, *Journal of Anatomy*
- McCurry et al., 2015, *PeerJ*
- Riede et al., 2015, *Journal of Experimental Biology*
- Fortuny et al., 2016, *Nature Scientific Reports*

Reasons to Make HRXCT Data Freely Available:

- Enables data repurposing
- Critical for peer review



Reasons to Make HRXCT Data Freely Available:

- Enables data repurposing
- Critical for peer review
- Prevent data extinction

How to make HRXCT Data Available:

- Journals (Supplementary Information)
- Nature Scientific Data
- figshare, Dryad
- MorphoSource.org
- DigiMorph.org

In Conclusion:

- HRXCT scanning is valuable technology for biological and paleontological specimens
- HRXCT data should be made publicly available when publishing
- Nature Scientific Data, figshare, Dryad, MorphoSource, DigiMorph, etc.

Acknowledgments:

- U.S. National Science Foundation
(EAR 0345710, 0646848, 0948842, 1258878, 1561622;
IIS-9874781, 0208675; EF-0334961)
- iDigBio



Save the Date

First North American ToScA Symposium

June 6-8, 2017

Jackson School of Geosciences

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