

# NoCTURN Non-Clinical Tomography Users Research Network

an NSF FAIROS RCN

Ed Stanley  
Florida Museum of Natural History



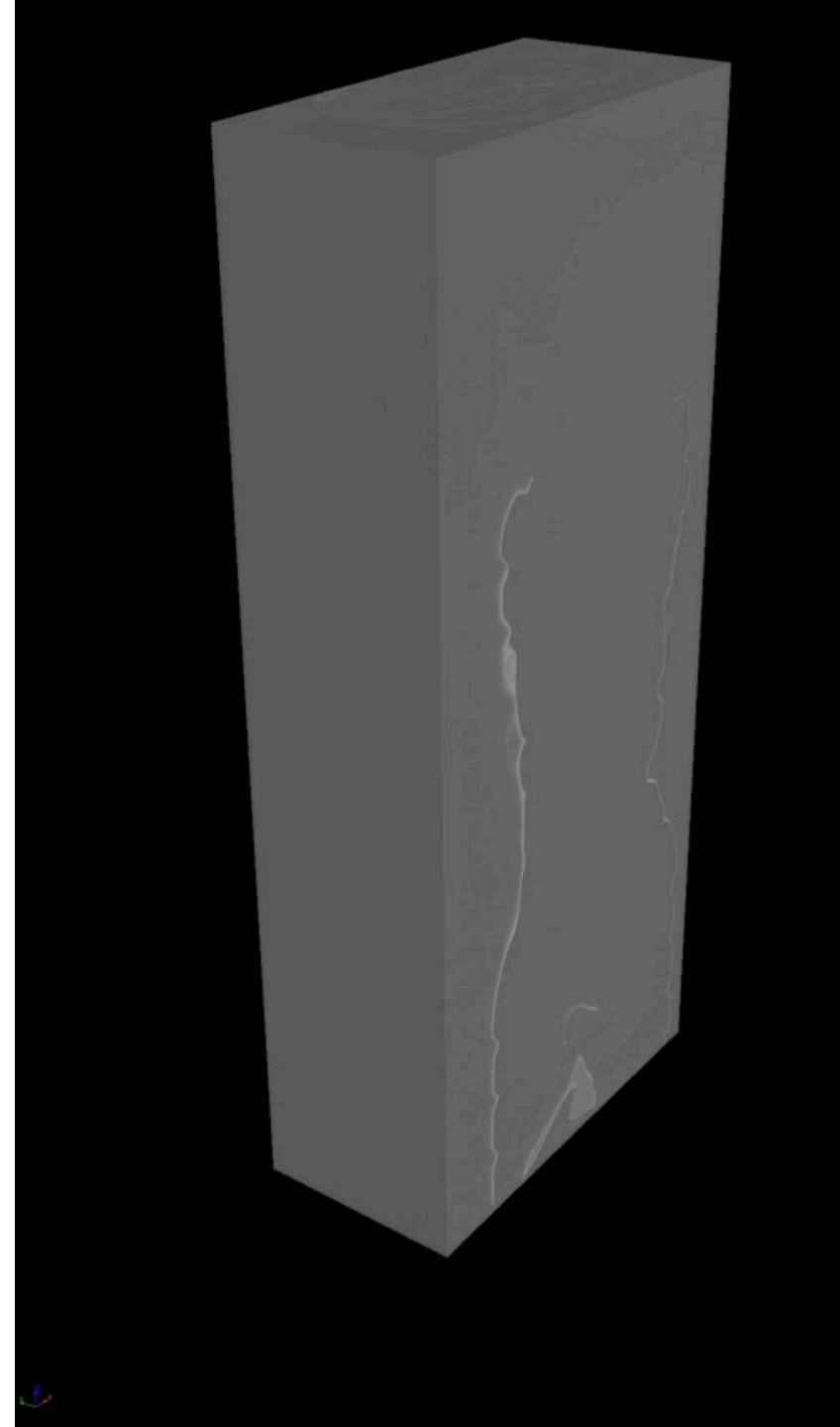
Radiograph

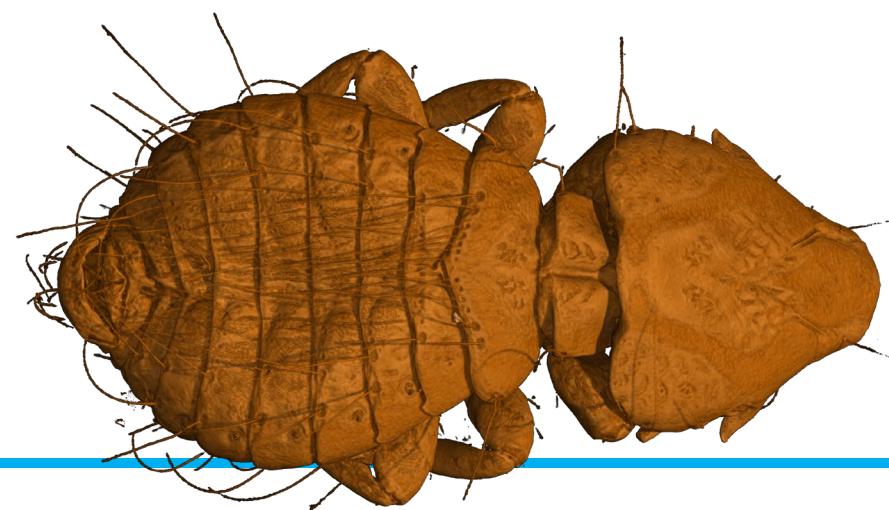
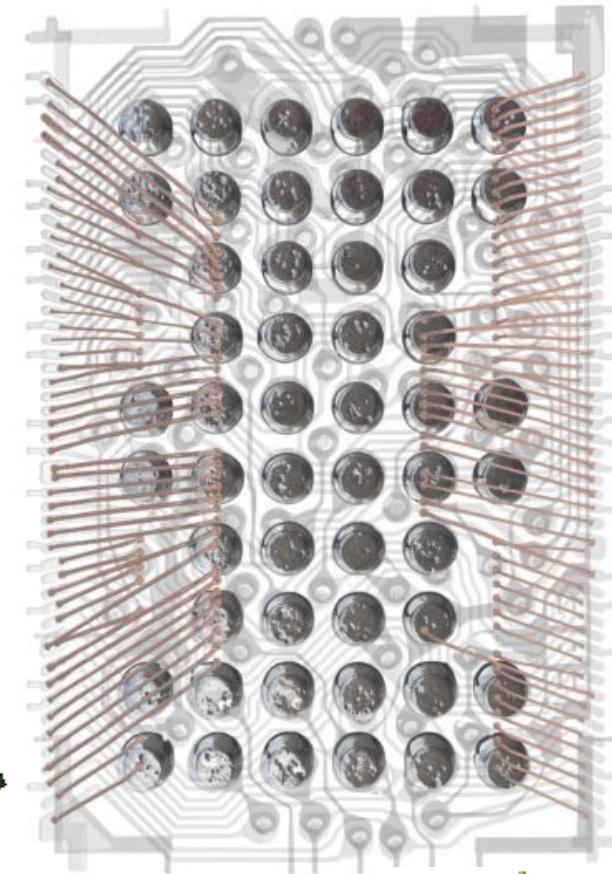
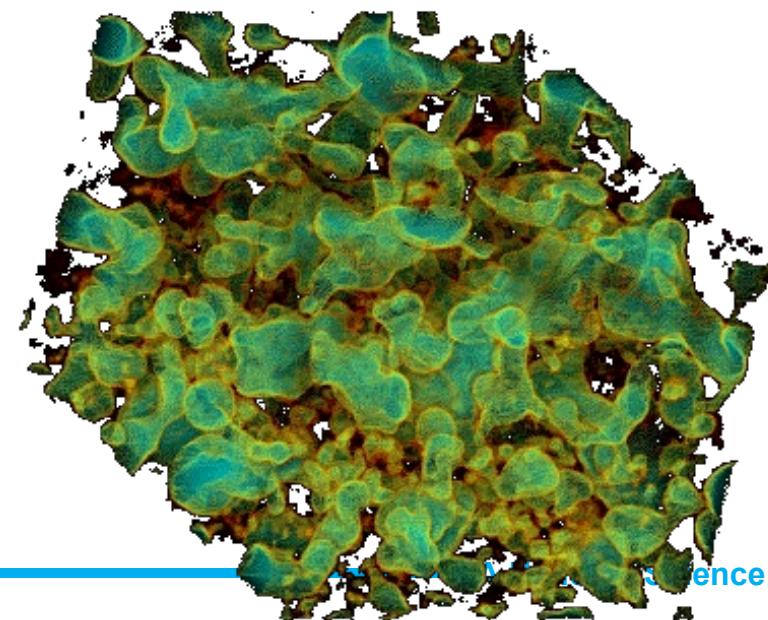
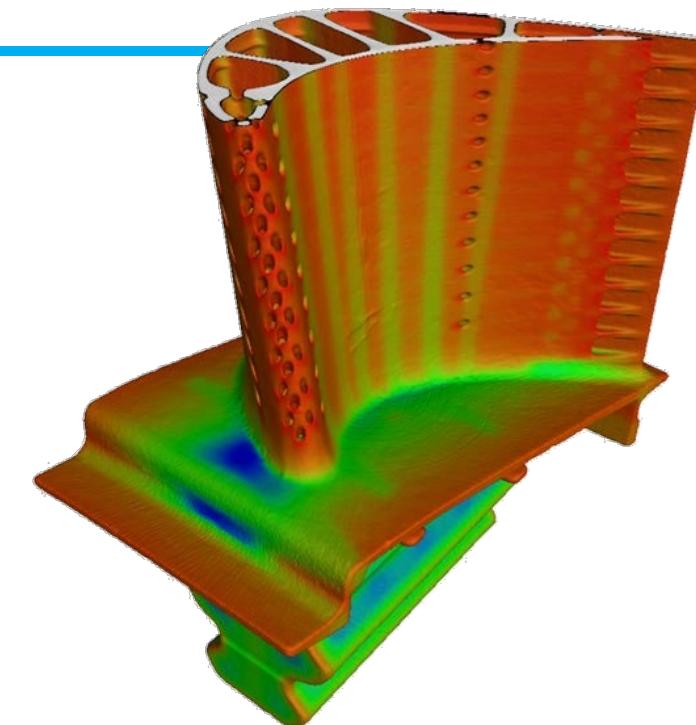
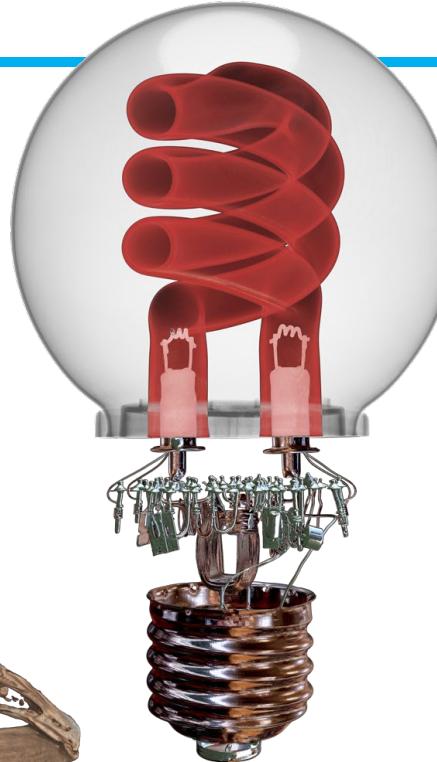
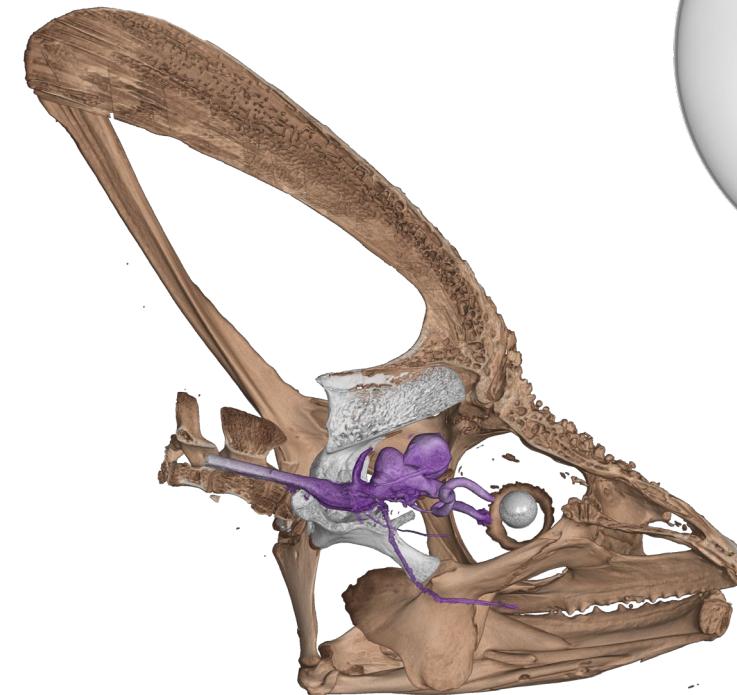


Tomogram



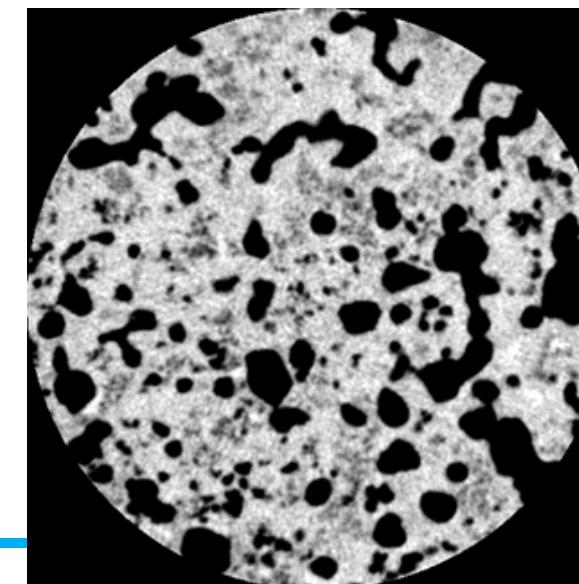
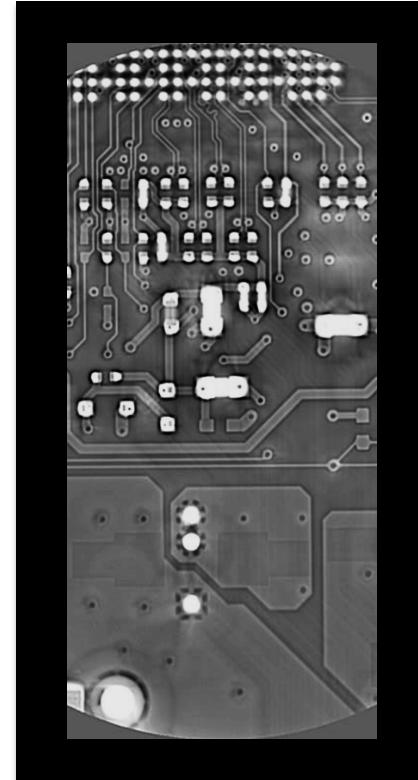
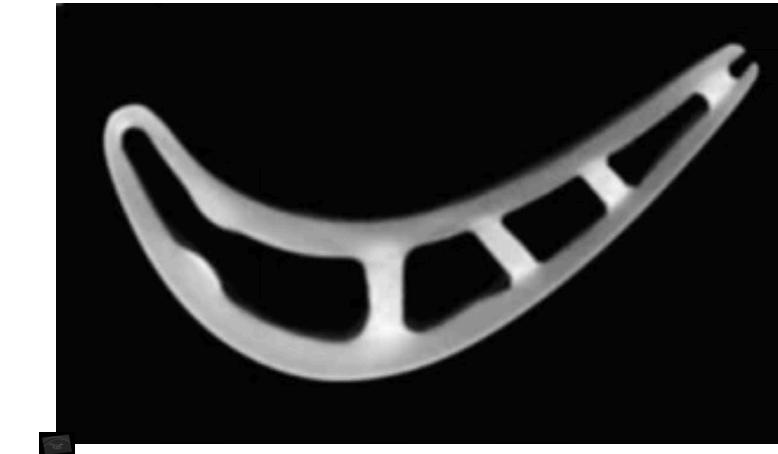
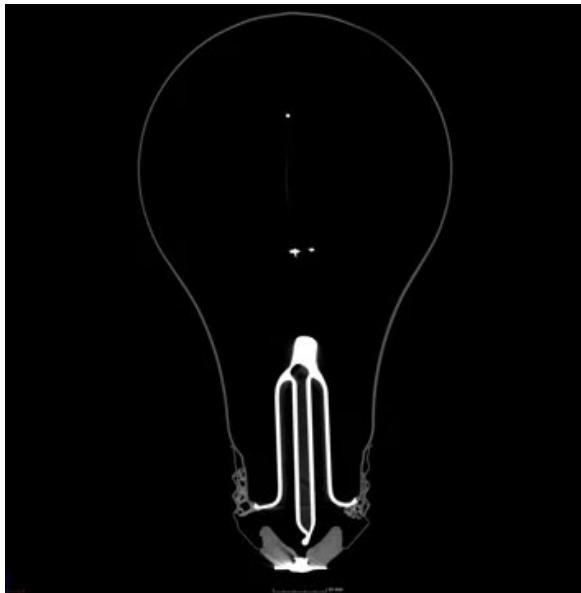
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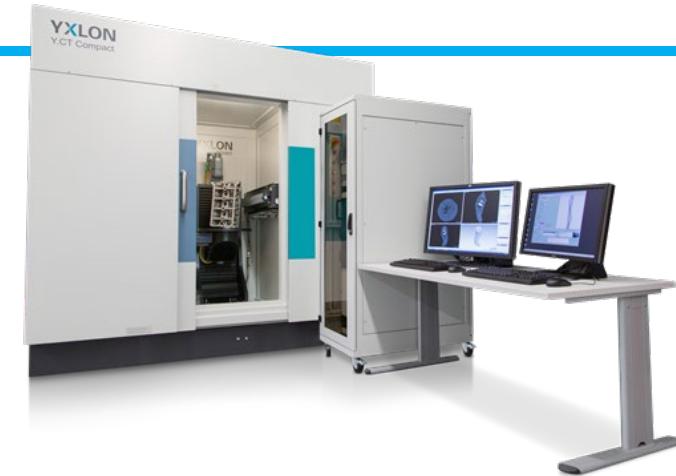
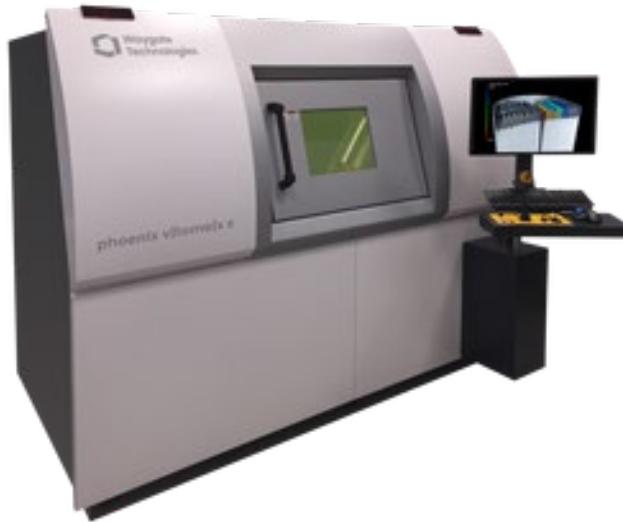
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# Making CT data FAIR

## Pros

- 3D volumes—intuitive to access
- Rich datasets—easy to reuse
- Digital data—easy to share
- Consistent output—Tomograms
- Consistent parameters
- Expanding user-base
- Existing database

## Challenges

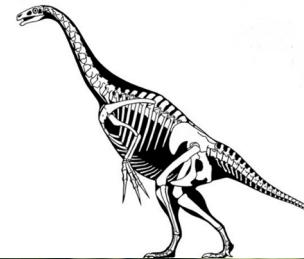
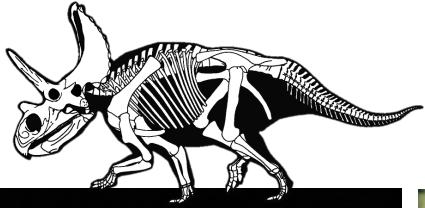
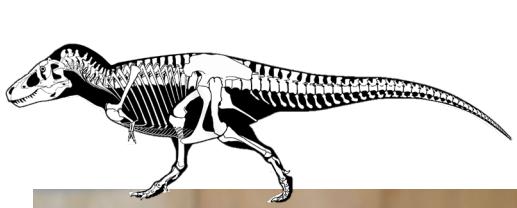
- Large data—hard to store
- Non-standard density values
- Inconsistent metadata vocabularies
- Disconnected community
- Diverse metadata for samples
- Proprietary software
- Proprietary attitudes



## A COVID-era online working group

- Many disparate but essentially similar labs
- Shared challenges and a range of experiences
- Training, troubleshooting, discussion
- Tackle issues with standardization





**Morgan Chase**  
*American Museum  
of Natural History*



**Paul Gignac**  
*The University of  
Arizona*



**Jessie Maisano**  
*The University of  
Texas*



**Ed Stanley**  
*Florida Museum of  
Natural History*



**Brent Gila**  
*The University  
of Florida*

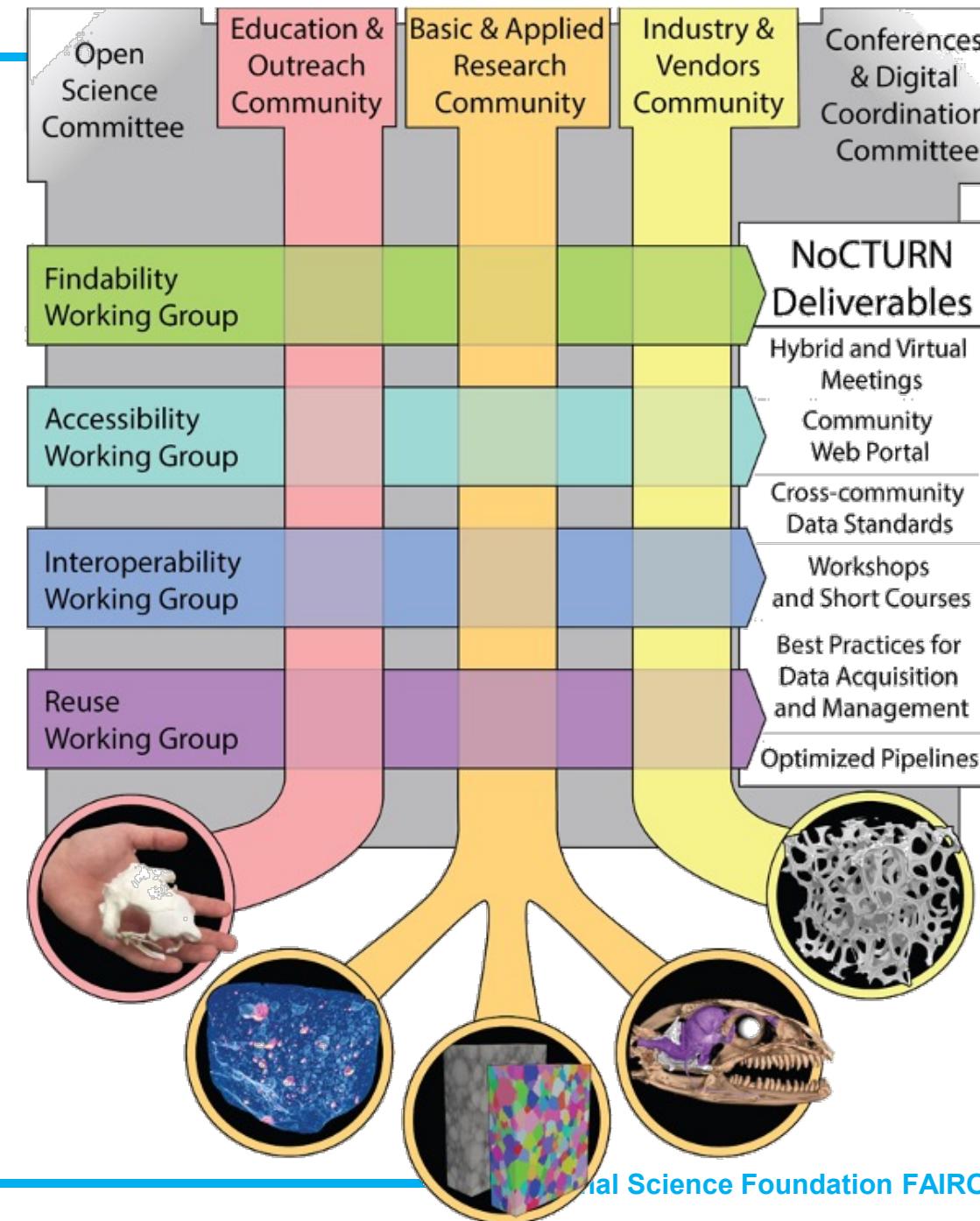


# Our Network

- >150 computed tomography specialists – *and newcomers* – across Education, Research, and Industry, using **neutron, synchrotron, and X-ray imaging** modalities;
- **Engaging the *international academic tomographic community*** via participant recruitment from imaging facilities, academic departments, and data repositories *to reduce the barriers to entry to the field*;
- **Stimulating improvements to community practices** that focus on *Findability, Accessibility, Interoperability, and Reuse*; and
- **Working directly with private companies** that manufacture the hardware and software to standardize data acquisition, handling, and sharing *to better reflect the Open Science standards* championed by federal funding agencies.



## NoCTURN Organizational Template



Adam Rountrey

**Aki Watanabe**

Alan Turner

Alejandro Rico-Guevara

Alex Hall

**Alex Waters**

Alexa Sadier

Alice Leavey

Alva Mihalik

Amanda Krause

Amy Balanoff

Andrew Ramsey

Angela Criswell

Anna Nele Herdina

Annina Luck

Anton du Plessis

April Neander

Arthur Porto

Aubrey Funke

Ben Ache

Beth Brainerd

Bhart-Anjan Bhullar

Bill Hayes

**Brent Gila**

Brian Beatty

Bryan McLean

Caitlin Yoakum

Carol Ward

Casey Holliday

Catherine Early

Chris Law

Claire Terhune

Cinar Terhan

Daniel Field

Daniel Ksepka

Danny Wescott

**Dave Edey**

David Blackburn

David Kay

Deborah Cunningham

Devorah Gleiber

Dirk Steiner

Doug Boyer

Doug Rowland

Edoardo Pasca

**Edward Stanley**

Edwin Dickinson

Elizabeth Brainerd

Emily Lessner

Eric Wilberg

Eva Hoffman

Farah Ahmed

Felix Gremse

Forrest LaFleur

Franklin Duffy

Freya Goetz

Gabe Bever

Gary Scheiffele

Greg Budner

Heather Smith

Ian Browne

Ian Cost

Jaco Hagoort

**Jaimi Gray**

Jasmine Croghan

Jay Warnett

Jeff Urbanski

Jennifer Broo

**Jennifer J Hill**

Jessica Arbour

Jessica Ware

**Jessie Maisano**

Jesús Marugán-Lobón

Joan Richtsmeier

Jocelyn Sessa

Johannes Müller

John Bates

John Henry Scott

Jonah Choiniere

Jonathan Huie

Jordan Wilson

Joseph Bevitt

Juan Daza

Julia Clarke

Karly Cohen

Kate Dobson

Katheryn Franklin

Keith Duncan

**Kelsi Hurdle**

Kevin Leonardic

Khanh To

Kimberley Chapelle

Kristen Batte

Kristin Mahlow

Kuldeep Singh

Larry Witmer

Lauren Simonitis

**Leigha Lynch**

Lin Andrews

Lindsay Gaona Dougan

Lindsay Zanno

Liz Martin

Manon Wilson

Maria Harkiolaki

Martin Turner

Maša Prodanović

Matthew Dykes

Mike Marsh

**Morgan Chase**

Murat Maga

Nathan Kley

Nick Brierley

Patrick Lewis

**Paul Gignac**

Phil Salmon

Philip Bastians

Philip Cox

Rachel Narducci

Rachel Olson

Rachel Roston

Ramon Negasan

Randi Depp

Rich Johnston

Richard Ketcham

Roger Wende

Romy Hanna

Rosy Manser

Russell Garwood

Ryan Felice

Ryan Zeigler

Sandra Engels

Sandy Kawano

Sara Jaye Mueller

Scott Echols

Scott Eckley

Selby Olson

Sharlene Santana

Stephanie Smith

Stephen Marchant

Steve Brusatte

Stuart Stock

Susan Borda

**Susan Motch Perrine**

Tanya Berardini

**Teresa Porri**

Tim Ryan

Valeria Aceves

Valerie de Leon

Wesley De Boever

William Harris

Zach Gurberg

Zach Randall

Zhi Luo

Ziheng Li



Albright College  
American Museum of Natural History  
[Amsterdam UMC](#)  
[ANSTO](#)  
Brown University  
Bruce Museum  
[Bruker/Micromorphotonics](#)  
Burke Museum of Natural History  
Carnegie Mellon  
Cornell University  
Denver Museum of Nature and Science  
Diamond Light Source  
[Diondo](#)  
Donald Danforth Plant Science Center  
Drexel University  
Duke University/Morphosource  
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Field Museum  
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- ~monthly Zoom meetings
- November virtual All-Network Meeting
- May in-person All-Network Meeting
  - Slack channel
  - publications
  - website





- CT Vocabulary
- Career Forum
- CT Map of the World
- Data Management and Sharing Plan Template
- How to Access Datasets in Online Repositories (oVert Partnership)

Complete list of X-ray CT terminology

- ▼ Imaging Fundamentals
  - X-radiation
  - [Histogram](#)
  - [Histogram](#)
  - Noise
  - [Point Spread Function](#)
  - [Voxel](#)
  - [Resolution & Voxel Size](#)
  - Tomography
- ▼ MicroCT Hardware
  - X-ray Sources
    - [X-ray Tubes](#)
      - [Microfocus X-ray Tubes](#)
      - [Nanofocus X-ray Tubes](#)
      - [Open X-ray Tubes](#)
      - [Sealed X-ray Tubes](#)
  - X-ray Detectors
- ▼ MicroCT Image Acquisition
  - [Beam Shape](#)
  - [Kvp / Voltage](#)
  - [Imaging Trajectory](#)
    - [Circular](#)
    - [Helical / Spiral](#)
    - Laminography

## NoCTURN Career Forum

Recent Job Postings:



[XCT Laboratory Manager at Field Museum](#)  
July 9, 2024

The Field Museum in Chicago is excited to announce an opening for an XCT Laboratory Manager in the Negaunee Integrative Research Center. This role offers the unique opportunity to oversee a state-of-the-art XCT facility featuring NSI X5000 and NSI X25...

[Read more](#)



[iDigBio: Program Manager, Science & Research \(Biology, Science\) Position at Florida State University](#)  
April 8, 2024

Responsibilities The focus of this position (Job ID 57164) is empowering the biodiversity collections communities with successful strategies for digitization of specimens via discovery and development of resources, participation in collaborations, and management of a digitization help desk and digitization...

[Read more](#)



[Computed Tomography Dataset Management and Sharing Plan](#)

View and download a copy of the Open Science Committee's Data Management Sharing Plan for computed tomography data. Use for your own research and share with your institutions and libraries!

Computed Tomography Dataset Management and Sharing Plan

Introduction

Following the U.S. federal guidelines on data management, this plan delineates protocols for the proper management of computed tomography datasets created throughout the project. This vital component of the proposal is designed to align with the intellectual merits and broader impacts relevant to the scientific community. The Non-Clinical Tomography Users Research Network (NoCTURN) has formulated the following recommendations specifically for CT derivatives unrelated to human health and healthcare data.

Section 1: Data Classification

- **Data Types and Quantity:**
  - Detail the types of data and estimate data sizes (e.g., in storage, volume, specimen number, or other informative metric) to be generated, including 2D slices, 3D volume renderings, surface files, etc. Identify which data types will be preserved and shared, along with the reasoning behind these decisions (e.g., facilitating further research, encouraging educational use, museum guidelines).
- **Metadata and Documentation:**
  - Enlist metadata, other relevant parameters, sample origin, and interpretation of the scientific

Section 2: Technical Requirements

- Mention any specialized tools, software, shared scientific data (e.g., DICOM) they can be accessed (e.g., open-source)
- For CT-specific vocabulary, see the

[www.nocturnnetwork.org](http://www.nocturnnetwork.org)





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# Publications

 Tomography of Materials and Structures  
Volume 3, September 2023, 100015

Meta-data for absorption tomography measurements

Stuart R. Stock<sup>a</sup>    , Francesco De Carlo<sup>b</sup>

<sup>a</sup> Department of Cell and Developmental Biology, Feinberg School of Medicine, and Simpson Querrey Institute, Chicago, IL 60611, USA  
<sup>b</sup> Advanced Photon Source, Argonne National Laboratory, Lemont, IL 60439, USA

Received 10 July 2023, Revised 5 October 2023, Accepted 9 October 2023, Available online 12 October 2023, Version of Record 17 October 2023.



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<https://doi.org/10.1016/j.tmater.2023.100015> 

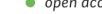
 Tomography of Materials and Structures  
Volume 5, June 2024, 100031

The role of networks to overcome large-scale challenges in tomography: The non-clinical tomography users research network

Paul M. Gignac<sup>a b c</sup>   , Valeria Aceves<sup>d</sup>, Stephanie Baker<sup>f</sup>, Jessica J. Barnes<sup>g</sup>, Joshua Bell<sup>h</sup>, Doug Boyer<sup>i</sup>, Deborah Cunningham<sup>f</sup>, Francesco De Carlo<sup>j</sup>, Morgan H. Chase<sup>c</sup>   , Karly E. Cohen<sup>k</sup>, Matthew Colbert<sup>e</sup>, Theresa De Cree<sup>f</sup>, Juan Daza<sup>l</sup>, Edwin Dickinson<sup>m</sup>, Valerie DeLeon<sup>k</sup>, Lindsay Dougan<sup>n</sup>, Franklin Duffy<sup>n</sup>, ChristiAna Dunham<sup>f</sup>, Catherine M. Early<sup>o</sup>, Dave R. Edey<sup>e</sup>...Christopher M. Zobek<sup>x</sup>

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<https://doi.org/10.1016/j.tmater.2024.100031>   

**JOURNAL ARTICLE**

## Increasing the impact of vertebrate scientific collections through 3D imaging: The openVertebrate (oVert) Thematic Collections Network

David C Blackburn  Doug M Boyer, Jaimi A Gray, Julie Winchester, John M Bates, Stephanie L Baumgart, Emily Braker, Daryl Coldren, Kevin W Conway, Alison Davis Rabosky ... [Show more](#)

**Author Notes**

*BioScience*, Volume 74, Issue 3, March 2024, Pages 169–186,  
<https://doi.org/10.1093/biosci/biad120>

**Published:** 06 March 2024 [Article history](#) ▾

A correction has been published: *BioScience*, biae027,  
<https://doi.org/10.1093/biosci/biae027>

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*"To reach more potential users of 3D specimen data, we need more easily accessible online resources aimed at a general audience, not only scientists. The recent NSF-funded Non-Clinical Tomography Users Research Network provides a starting place for this work by developing working groups focused on findability, accessibility, interoperability, and reuse of CT data and is working to reach communities in research, education and outreach, and industry."*



Findability  
Working Group

Accessibility  
Working Group

Interoperability  
Working Group

Reuse  
Working Group

Persistent Identifiers

Repository Standards

Open-source data formats

Metadata persistency and Scan data directory

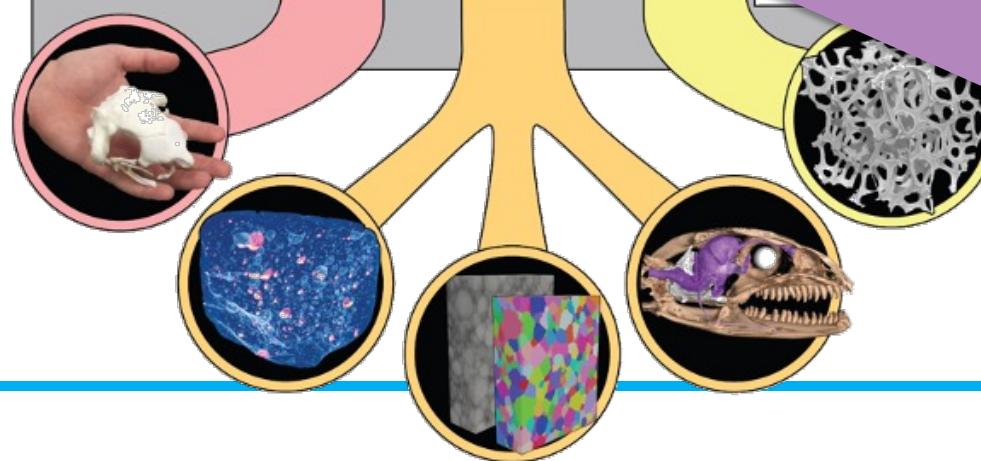
Tomography vocabularies & “Rosetta Stone”

Data usage licenses

Data and metadata provenance

Minimal reported attributes in publications

Recommended repositories



## Research Experiences for Teachers in Engineering and Computer Science

[View guidelines](#)

NSF 24-503

Project 1 (NY): Collecting and Understanding 3D Digital Data in Biology

Project 2 (AZ): Assessing Access and Engagement in K–6 Educators

## Year III



- Focus on Deliverables:
  - Manuscript: *Organizing Computed Tomography around a Paradigm of Open Science—Who, What, Where, When, Why, & How*
  - 3D Kits for Educators
  - SICB & SVP Data Accessibility Workshops
  - Scanner parameter comparison with phantoms
- 2025 NoCTURN + ToSCA Meeting in New York
  - Merging with *Tomography for Scientific Advancement*

