

WORKFLOW FOR CONSERVING AND DIGITIZING HISTORIC MICROFOSSIL COLLECTIONS AT THE AMERICAN MUSEUM OF NATURAL HISTORY

WALKER, Lindsay J.¹, LANDMAN, Neil H. ¹, THOMAS, Ellen², O'LEARY, Ruth¹, HUSSAINI, Bushra M. ¹ and SCALBOM, Linda¹

¹ Division of Paleontology, American Museum of Natural History, Central Park West at 79th Street, New York, NY 10024

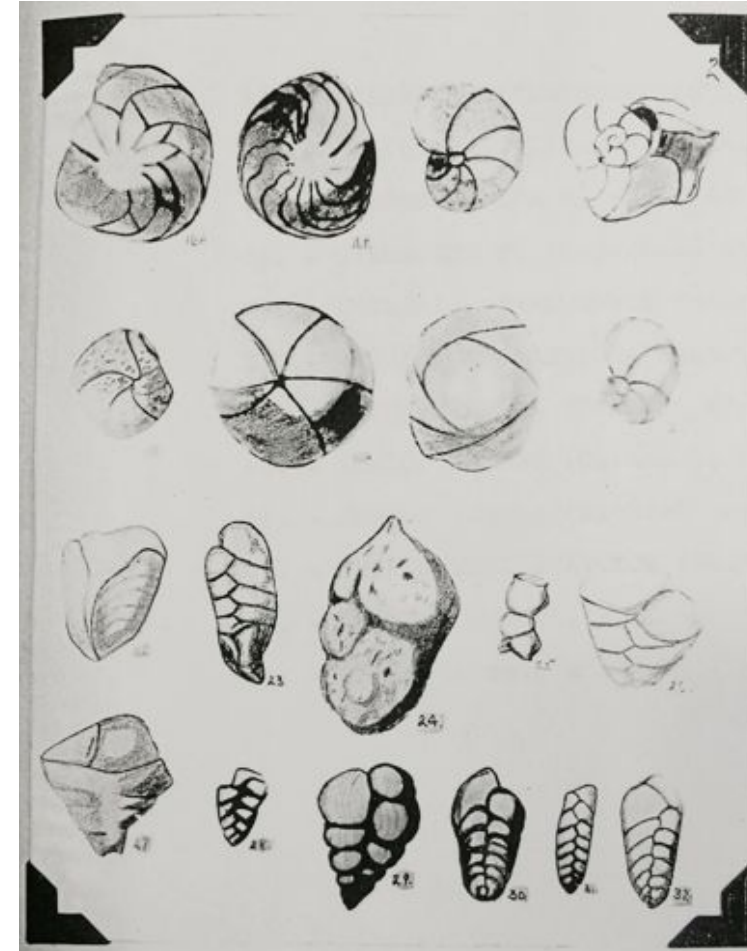
² Geology and Geophysics & Department of Earth and Environmental Sciences, Yale University & Wesleyan University, PO Box 208109, New Haven, CT 06520

CONSERVATION & CURATION

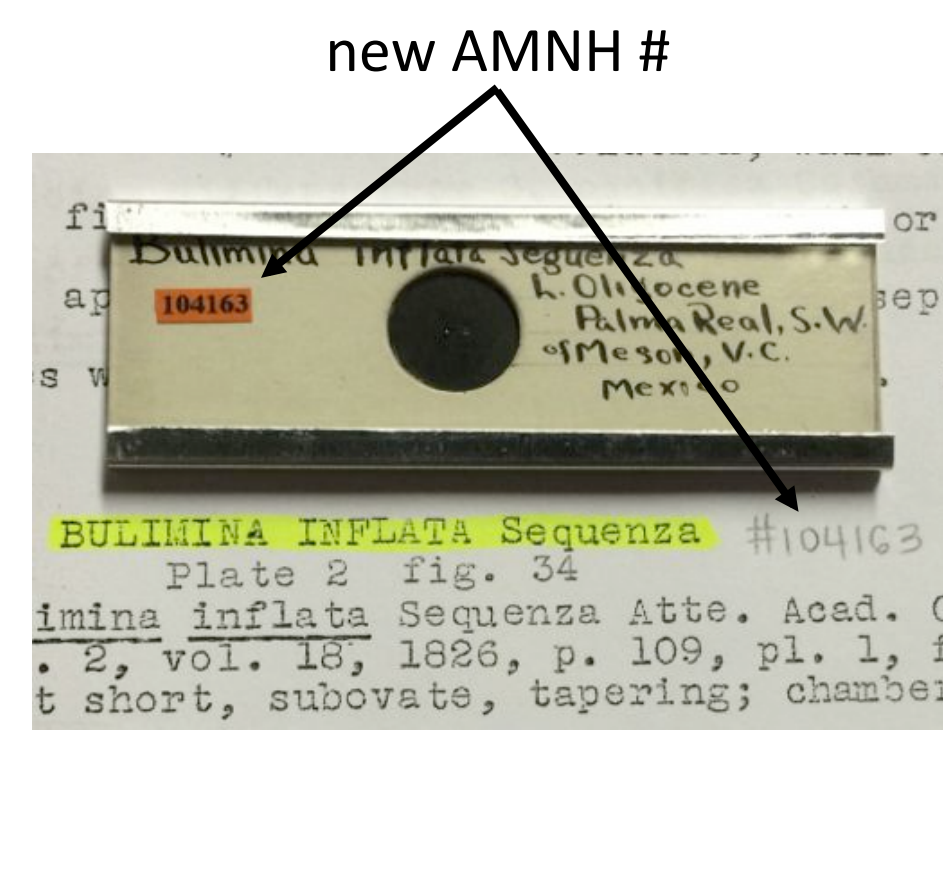
Evaluate the state of each microfossil collection prior to curation, conservation, and digitization. Focal taxa include Foraminifera and Ostracoda, although some collections include larger invertebrates (e.g. small mollusks, bryozoans).



Determine whether the collection is associated with a publication or thesis. If the document exists, match slides to figured specimens in-text and assign new catalog numbers. If the document does not exist, consult the designated expert (see: QC & Resolving Conundrums).



Diamond (1928) thesis



new AMNH #

Is the slide present? It must be conserved before data capture.

slide present? → conserve



slide missing? → create placeholder

Is the slide missing for a figured specimen? Create a placeholder slide to be used to house relocated specimens. These slides can also represent specimens that were transferred to the NMNH.

Conserve slides in poor condition. These steps include:

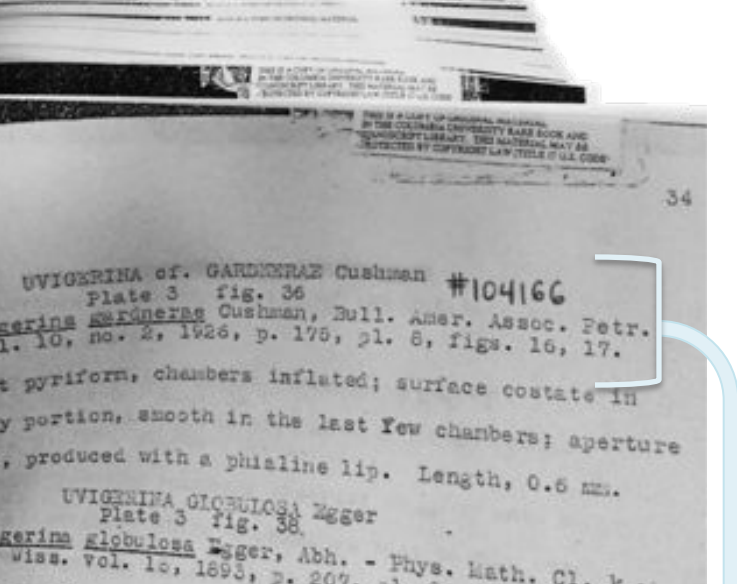
- adding aluminum cases
- cleaning or adding glass covers
- removing debris from wells
- resurfacing cardboard slide covers



resurfacing damage slides

Is the specimen missing? Microfossils may have become detached from vertically stored slides without glass covers. Therefore, emptied boxes are examined for missing specimens by Ellen Thomas, who identifies recovered specimens and places them in their slides.

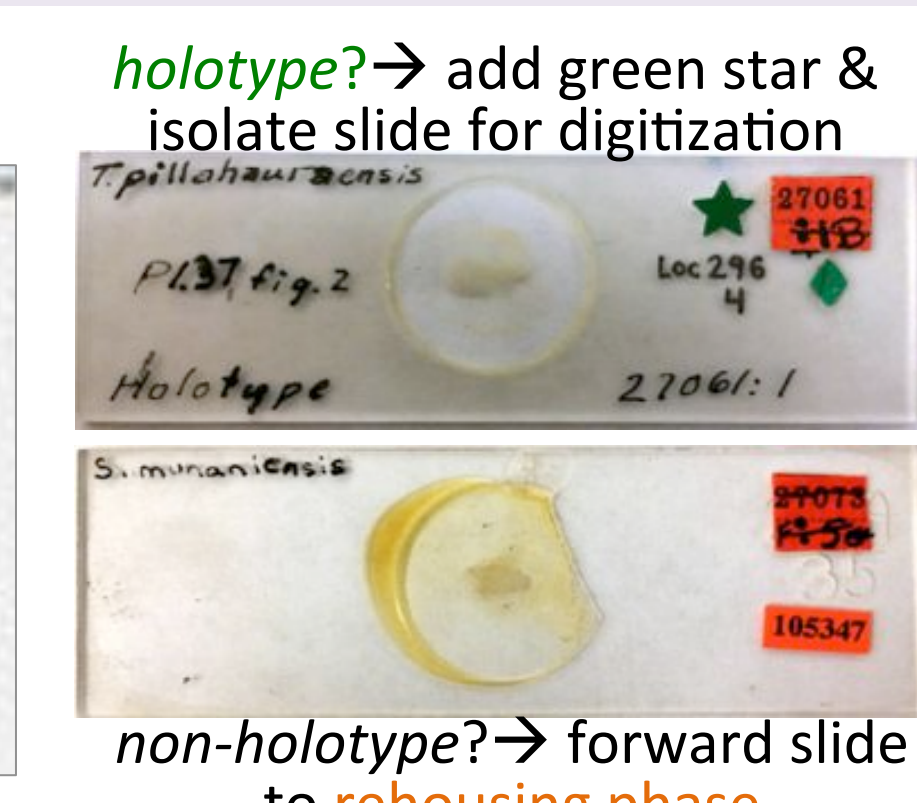
Prepare for data capture by gathering all associated information (taxonomy + collecting information) from literature, slides, and specimen boxes. This information will be entered verbatim into the Panorama® database after rehousing is complete (see: Storage).



Panorama® microfossil database

★ HOLOTYPE

Add a green star to holotypes and isolate these specimens for digitization (see: Microscope Imaging & CT Scanning). Other types (e.g. paratypes) may be shunted to imaging and/or CT stages if deemed taxonomically important by Ellen Thomas.



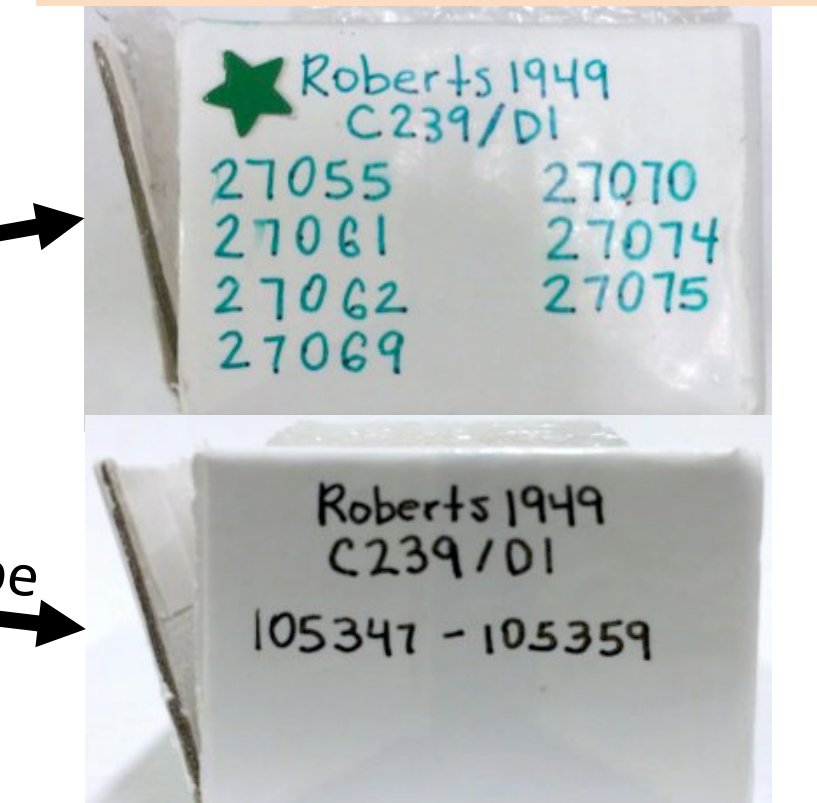
holotype? → add green star & isolate slide for digitization

★ STORAGE

Rehouse holotypes together and label box(es) with green ink. All other specimens are housed separately in boxes labeled with black ink.



reboxed collection



Robert's 1949 C239/D1

Using the Panorama® database, create new database records (or modify existing records) for curated, conserved, and reboxed specimens. Then print two hard copy back-ups for each record:

- 1 specimen label (store within larger specimen box)
- 1 data capture sheet (store in 3-ring binder)

★ QC & RESOLVING CONUNDRUMS

Ellen Thomas routinely provides quality control (QC) advice to staff, interns, and volunteers.



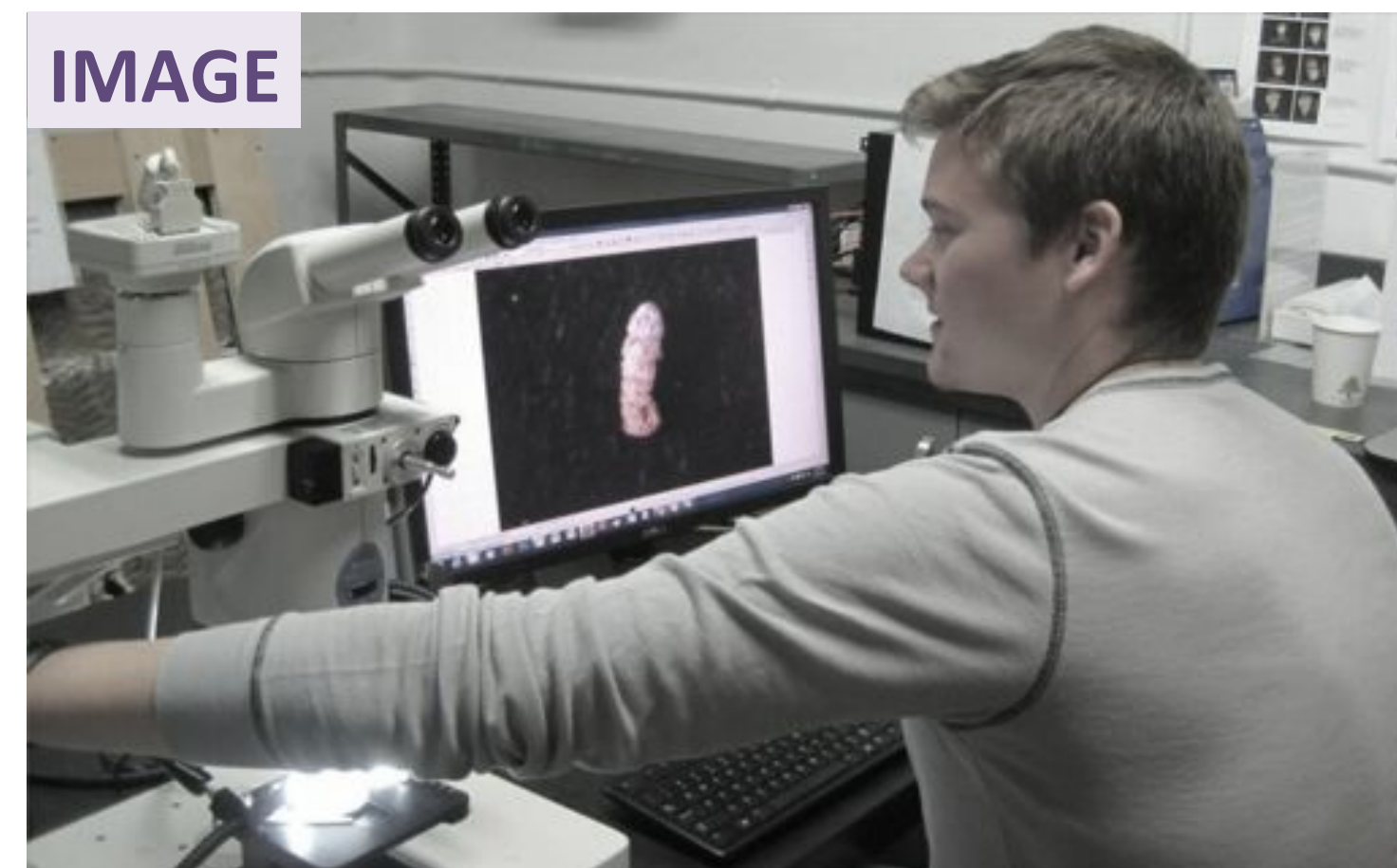
Ellen Thomas

Not every specimen's path to conservation and digitization is straightforward. When resolving conundrums, some scenarios are repeatedly encountered. Examples are outlined below:

Conundrum	Possible Solution
A collection cannot be matched to a publication or thesis.	Designate a time/space collection (e.g. "Eocene, Jackson MS").
Slides are found disassociated from their original collection.	Isolate orphaned slides and integrate them into their respective collections as they are curated and/or re-visited.
All of the above	Specimens may be deemed comparative study material associated with a collection of figured specimens.
A specimen is still missing, even after the original box is examined.	Check the NMNH online database. The specimen may have been inadvertently transferred to this institution.

MICROSCOPE IMAGING

Image holotype specimens using the microscope (Nikon™ SMZ 1500) and camera attachment. If multiple views are required to capture full information about a type specimen (e.g. trochospiral foraminifera, interior/exterior of ostracod valves), several images may be made. Non-holotype (e.g. syntype, topotype) specimens may also be imaged if deemed taxonomically important.



Intern Samuel Martin capturing and editing stacked microscope images

Derivative .jpg versions are saved for all original images (stacked .tiff files) for editing in Adobe® Photoshop®.

To edit each image:

- replace the original background with matte black
- add a scale bar, the AMNH catalog number, and scientific name (stated verbatim from associated publication or thesis)
- crop extraneous border area
- rename and save as new .jpg for online dissemination



AMNH-FI-90324 Valvulineria paleogredensis



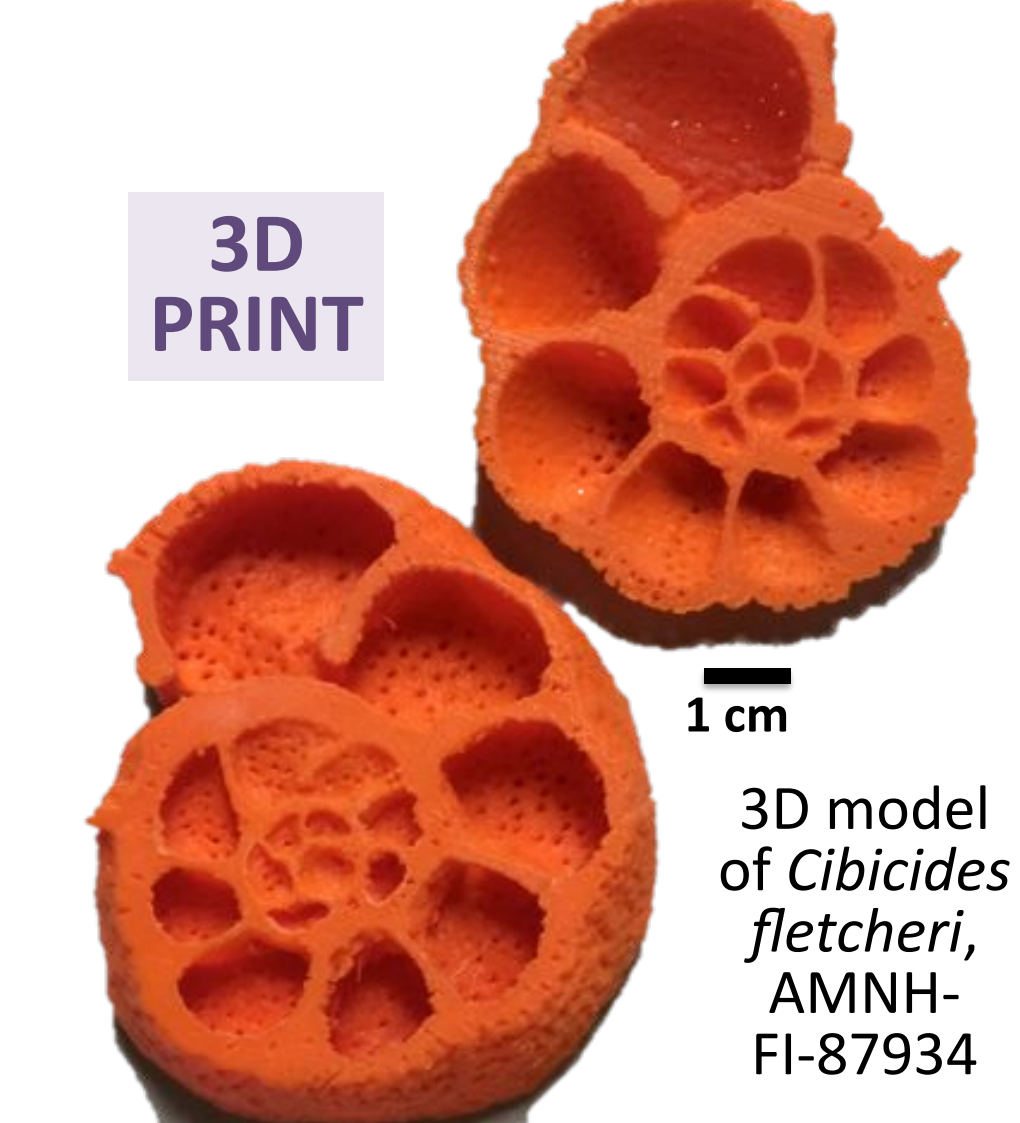
AMNH-FI-96107 Trachyleberis radiata

CT SCANNING

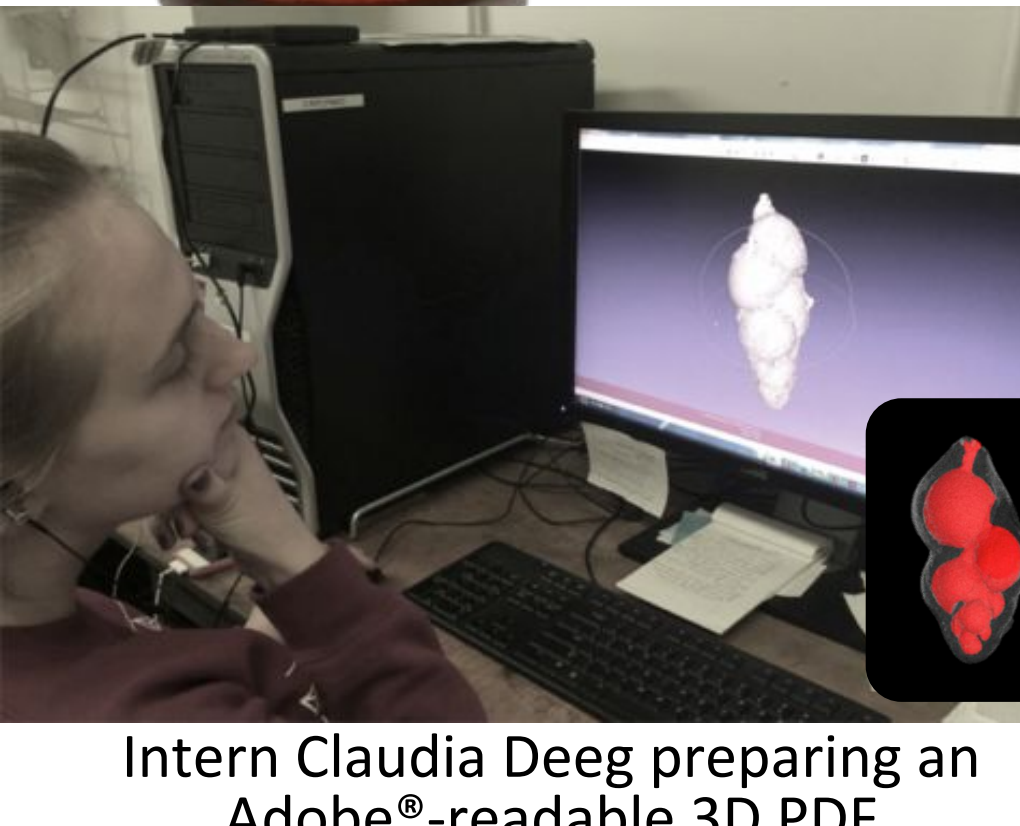
1. Send select holotypes to AMNH Microscopy and Imaging Facility for scanning.
2. Reconstruct 2D scan images to create 3D CT data in Datos®.
3. Import reconstructed CT files to VGStudio MAX® for post-processing and rendering.
4. Prepare 3D PDF file (.u3d) in MeshLab for sharing.
5. Prepare CT files for 3D printing with Netfabb®.



Rendered external and internal morphology of Vaginulinopsis baggi, AMNH-FI-88925

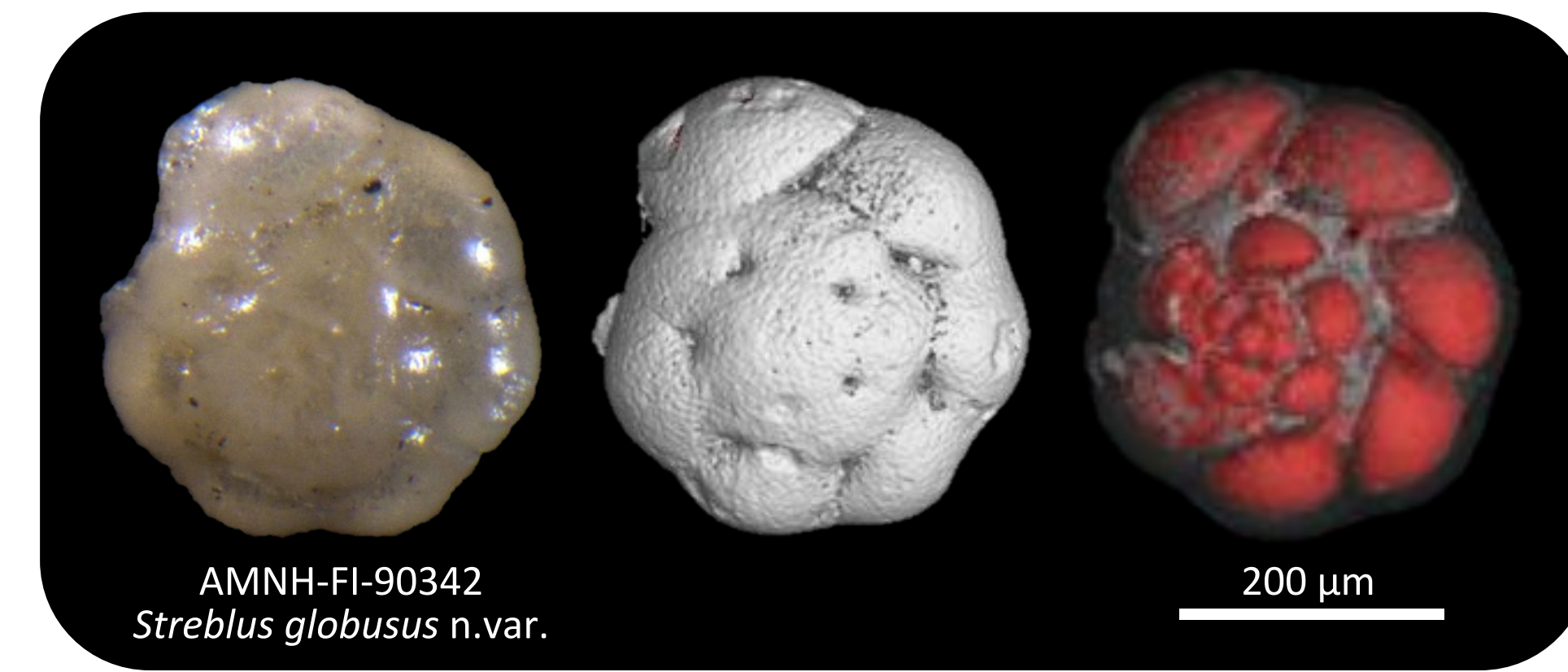


3D model of Cibicides fletcheri, AMNH-FI-87934

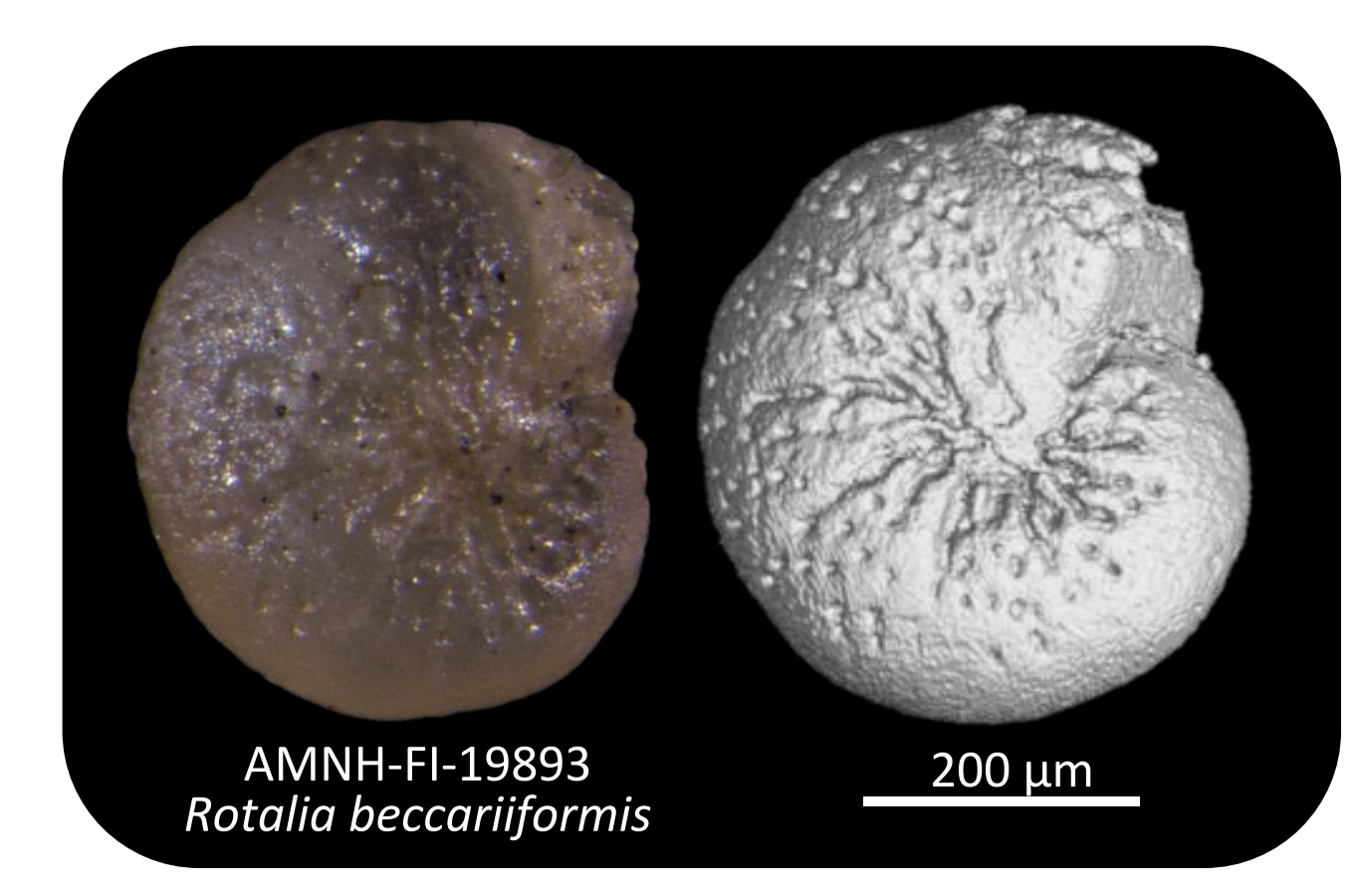


Intern Claudia Deeg preparing an Adobe®-readable 3D PDF

2D → 3D



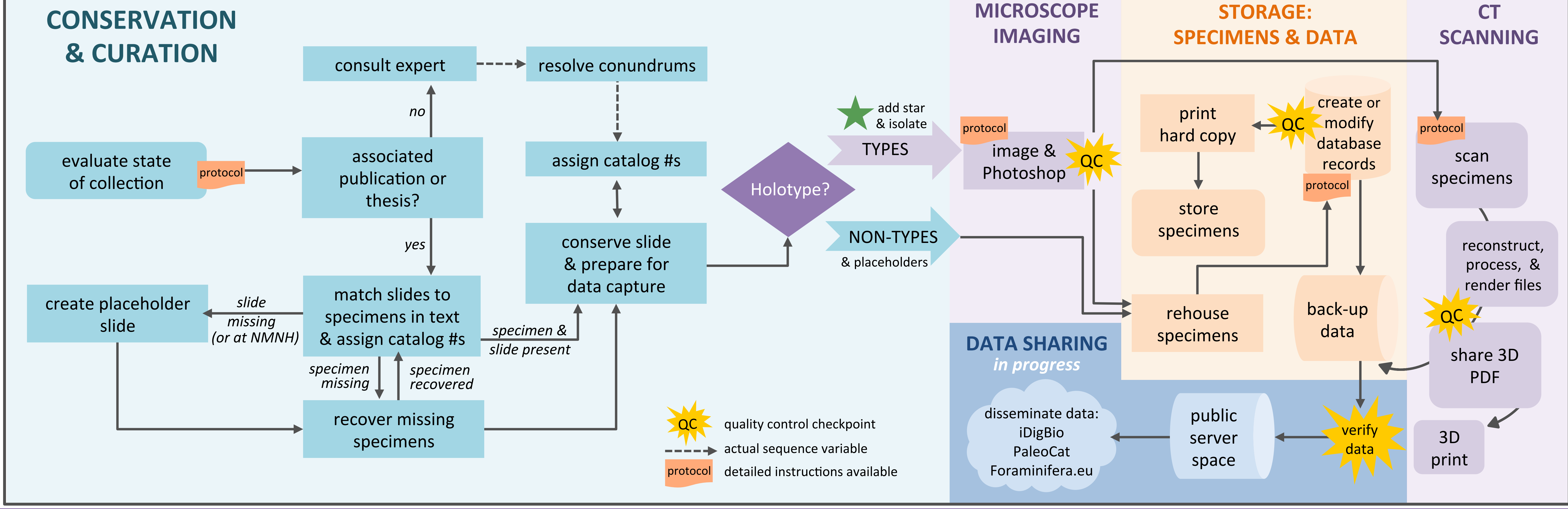
AMNH-FI-90342 Streblus globulus n.var.



AMNH-FI-18893 Rotalia beccariformis



1 cm



updated specimen label

Once rehousing and digitization is complete, store microfossil collections together in the type room.

Back-up data daily (database, image, and CT scan files) to the in-house server and designated external hard drives.

DATA SHARING

Resultant images and database records are now being verified and prepared for web dissemination. Images will be available online for research and outreach applications in 2016 via iDigBio.org, Foraminifera.eu, and the AMNH's online database.

FUTURE

Ultimately, this project aims to broaden access to these microfossil collections for researchers, students, and the public. Doing so will facilitate crowd-sourcing and discussion to resolve long-standing taxonomic questions, resulting in greatly improving estimates of diversity change with changing climate through geologic time.

ACKNOWLEDGEMENTS

Funding: NSF DBI #1203394
2015 interns: Morgan Black, Claudia Deeg, Samuel Martin, Brittney Oleniczak
CT support: Morgan Hill, Shaun Mahmood, Henry Towbin
Imaging support: Steve Thurston, Katherine Bendo

See concurrent poster session:
3D-PRINTING MICROFOSSILS
T44, Session 30, Booth 114



QR code: ipmicofossils.blogspot.com