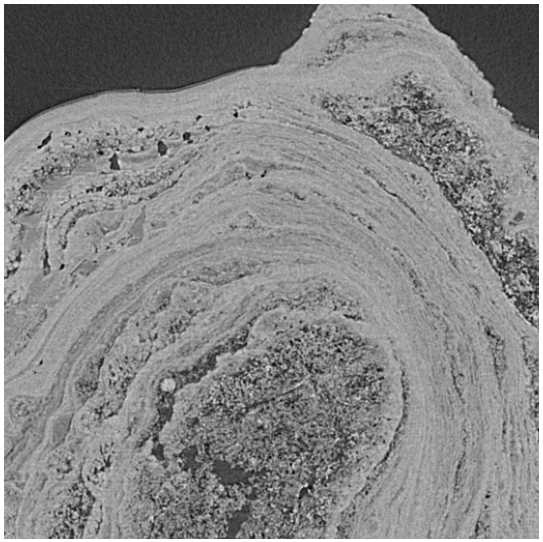
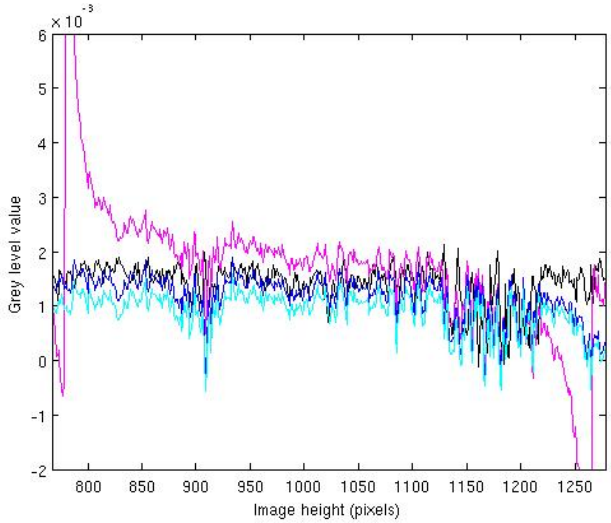
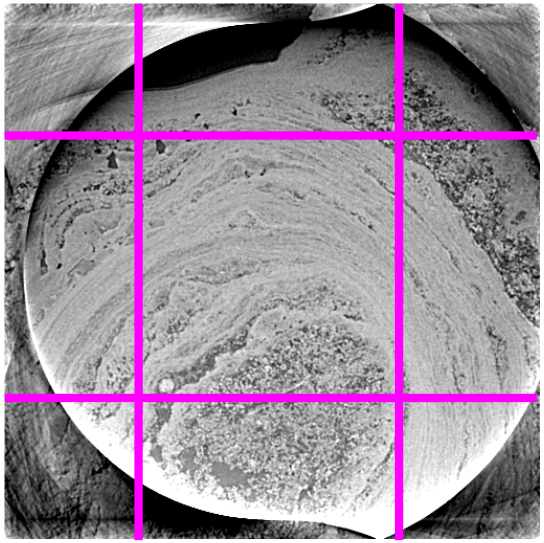
Local tomography artifacts

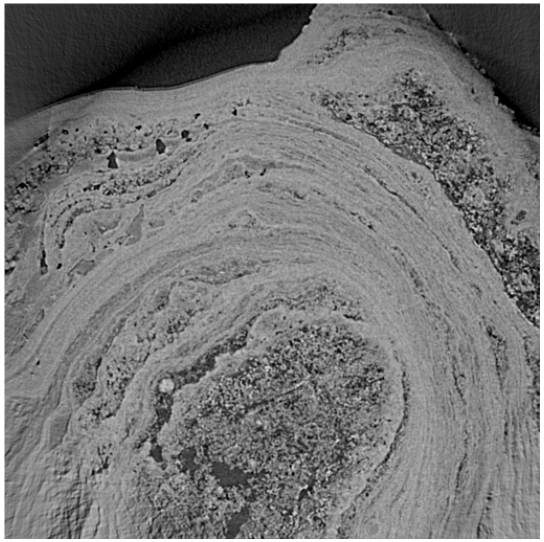
Original

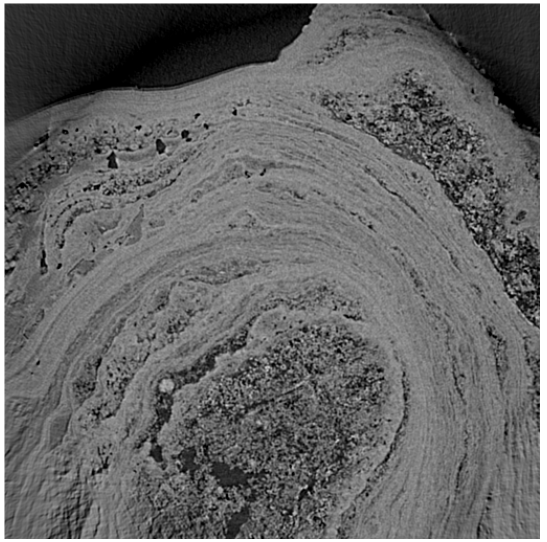




Local







ZP=0

ZP=0.5

ZP=1.5

Local tomography artifacts

- Simple lateral sinogram extension

  ✓ Insensitive to truncation degree
  ✓ Insensitive to position of region of interest
  ✓ Good results for structural analysis

  ✗ Non quantitative
  ✗ Difference in absolute value from slice to slice
  ✗ Calibration points if sample comparison needed
  ✗ More involved algorithms if absolute values needed

Local tomography artifacts

- Many ideas present in the medical imaging community
  - ✘ Specific for medical applications
  - ✘ Patent protected

- Various technique for projection completion
  - Smooth continuation
  - Iterative methods (e.g. sparsity, statistical) – Computationally heavy
- Back projection of the first (Hilbert) or second (Lambda) derivative of projections
  - A priori information needed
  - For specific geometries
- Zoom-in tomography
  - Multiple scans needed

Take-home message

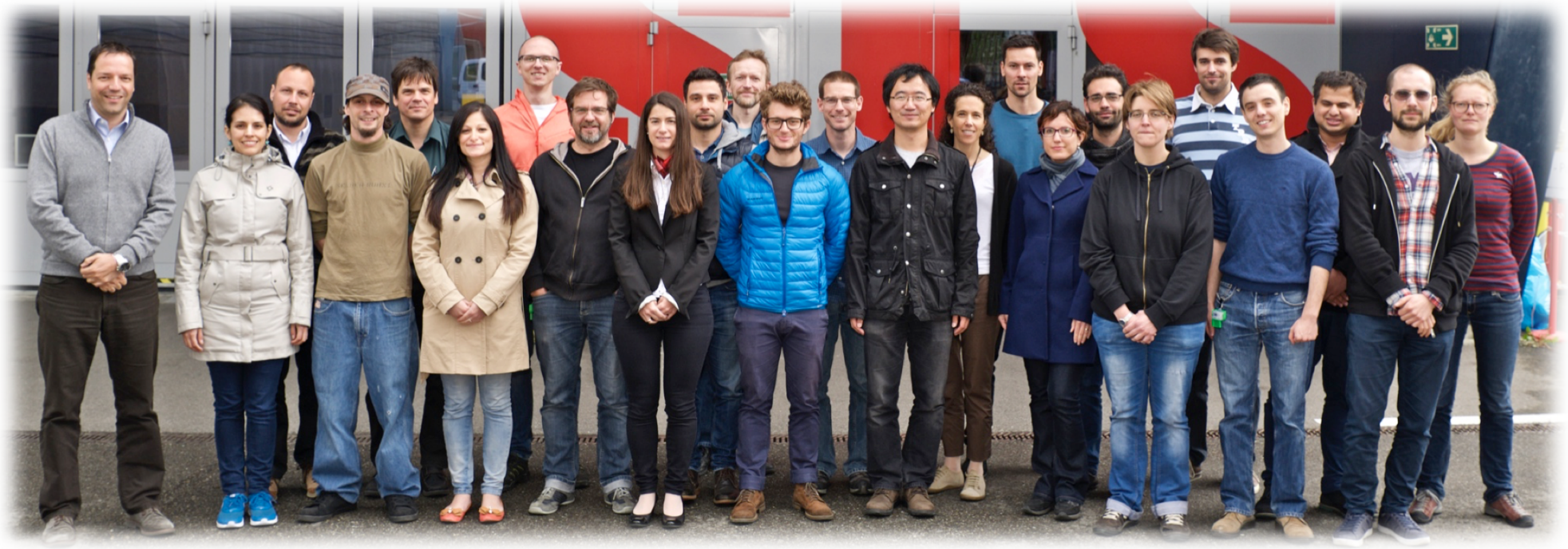
- Synchrotron-based tomographic microscopy is a **powerful method** for non-destructive visualization and quantification of structural information

- At modern synchrotron sources, it can cover a broad range of **length** (10s nanometers -10s micrometers) and **temporal** (down to 20 Hz) **scales**

- With the increasing power of the HPC infrastructure, advanced **tomographic reconstruction algorithms** can help pushing temporal, spatial and density resolution

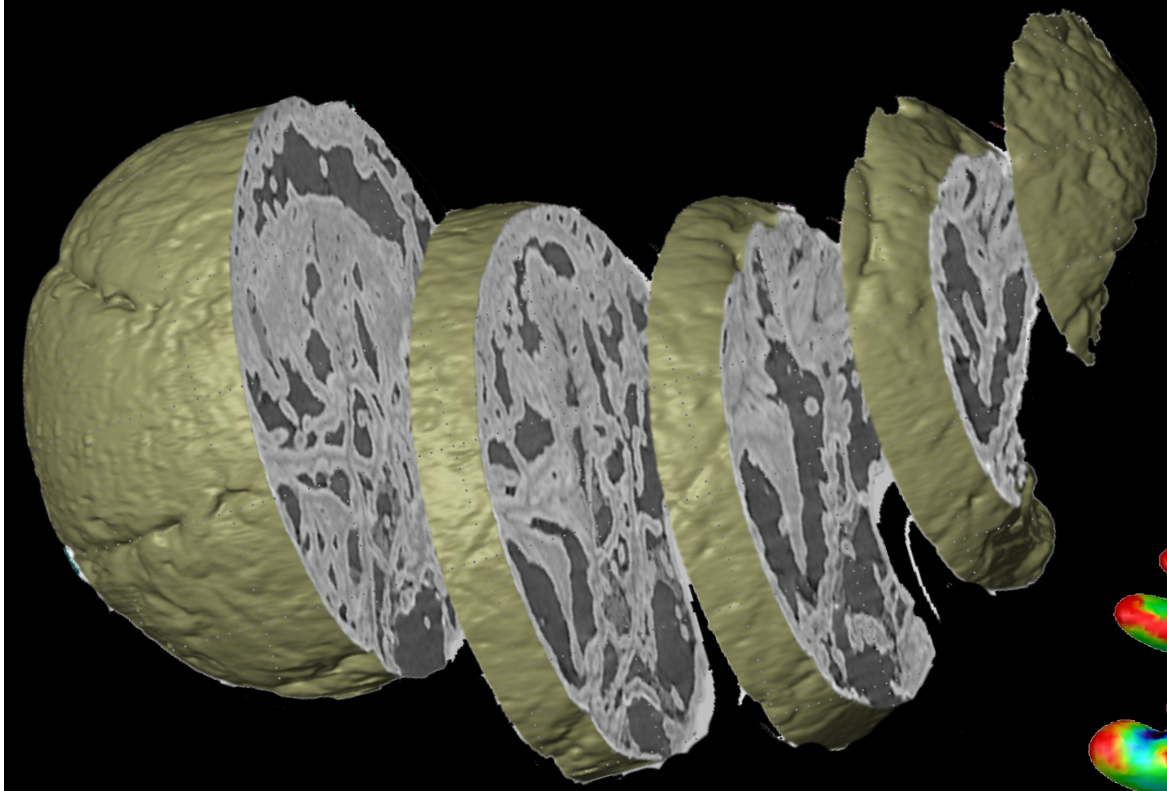
- **Reality is often different from theory** – For truly quantitative imaging, many different aspects need to be taken into account

Acknowledgment

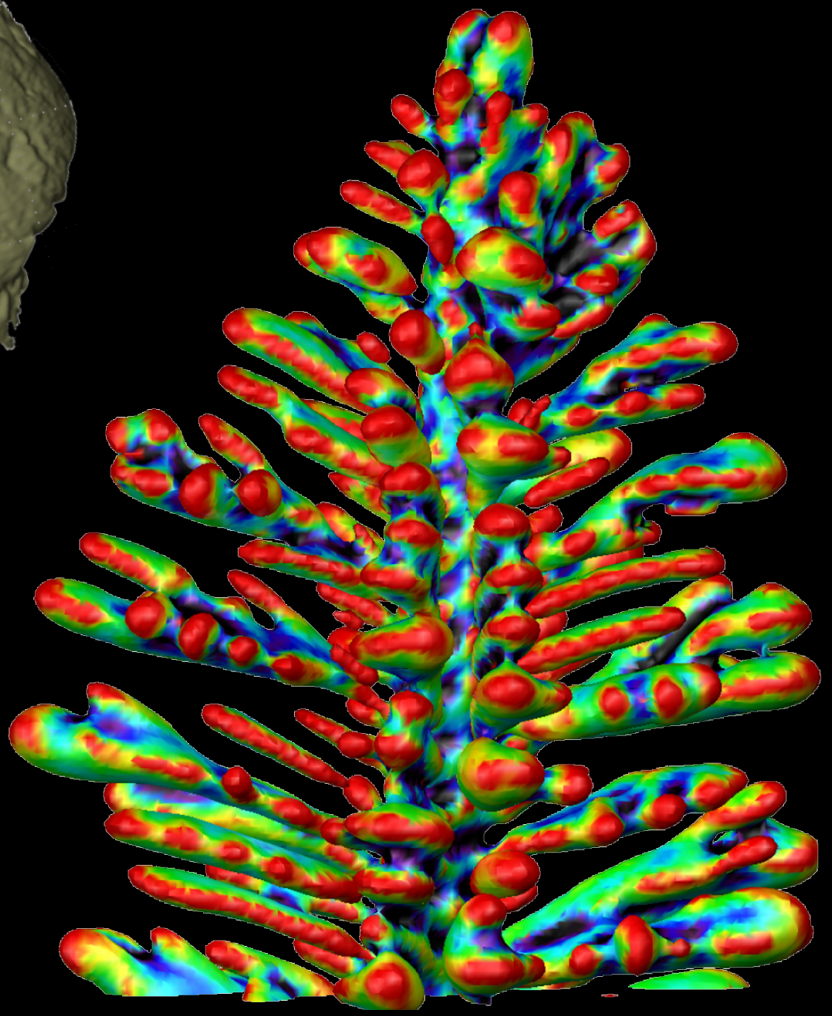


TOMCAT team

Thank you for your attention



540 M years old fossilized embryo of *Markuelia secunda*
Image: courtesy S. Bengtson



Mean curvature colored dendrite (Al/Cu alloy)
Image: courtesy J. Fife