



A role for IMBL in cultural heritage and conservation?

Chris Hall

The Imaging and Medical Beam Line (IMBL)



Imaging and Medical Beamline:



Phase 3.1/3.2: 3A and 3B



Phase 1.1, 1.2
1A and 1B

Phase 2.1, 2.2: 2A and 2B

Australian Synchrotron

Turning bright ideas into brilliant outcomes



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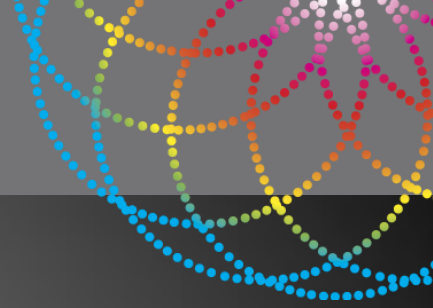


Australian Government

State Government
Victoria
AUSTRALIA



IMBL Facility characteristics



3 experiment enclosures, all accepting white and monochromatic x-ray radiation

- Up to 136m from source to sample =>
 - 60cm x 4cm beam (with SCMPW in 2011)
- High x-ray beam power. 21kW into beam line (A design challenge)
- Preparation facilities (mainly for biomedical, but also useful for other materials.)

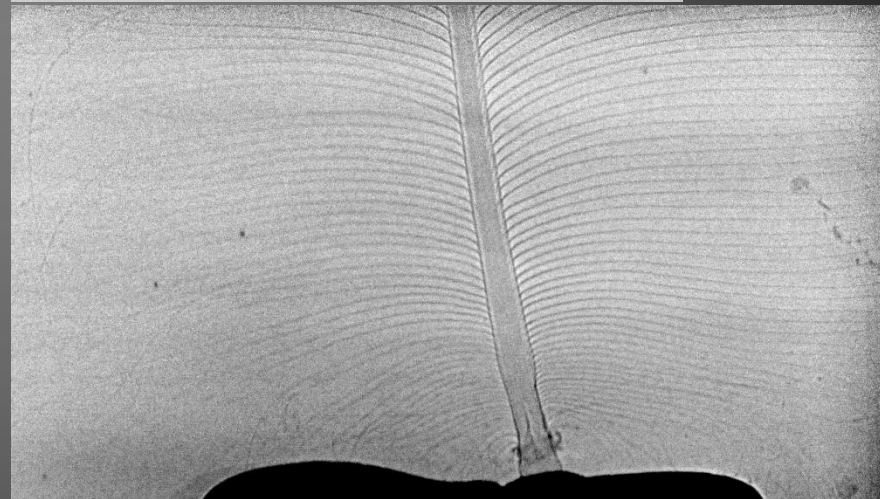
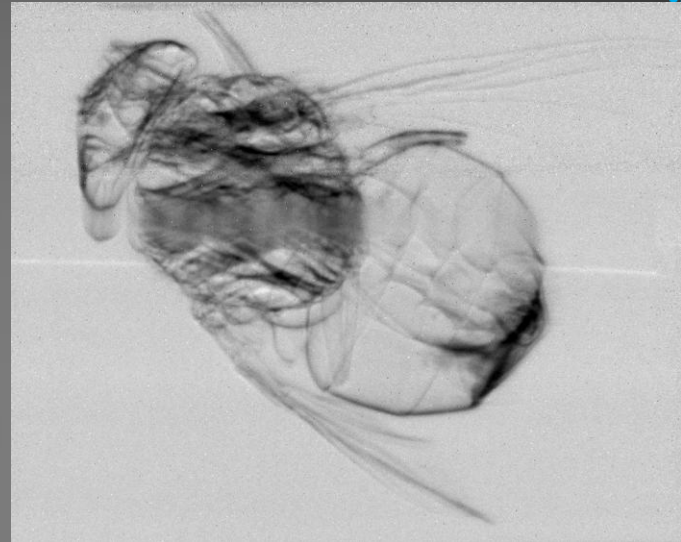
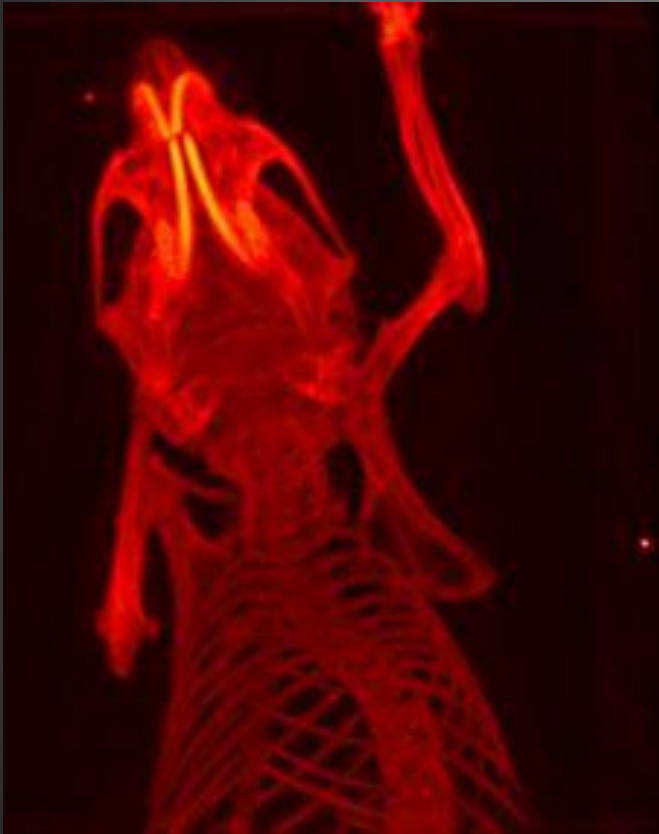
Primary science drivers



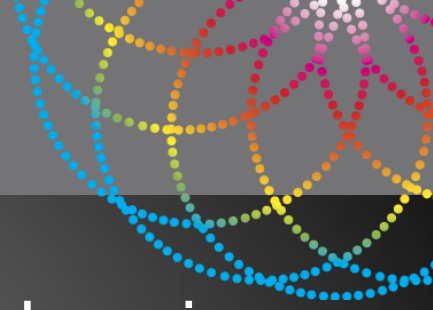
- High *contrast* resolution imaging. Biomedical tissues, and other materials
 - Time resolved radiography (33 frames per second).
 - Radiotherapy research (MRT, PAT, SSRT)
 - Rapid extension of preclinical programmes to clinical research with patients: Cardiac / cardiovascular imaging, lung imaging, tissue imaging (breasts, bones and organs)

Imaging techniques

- Projection radiography



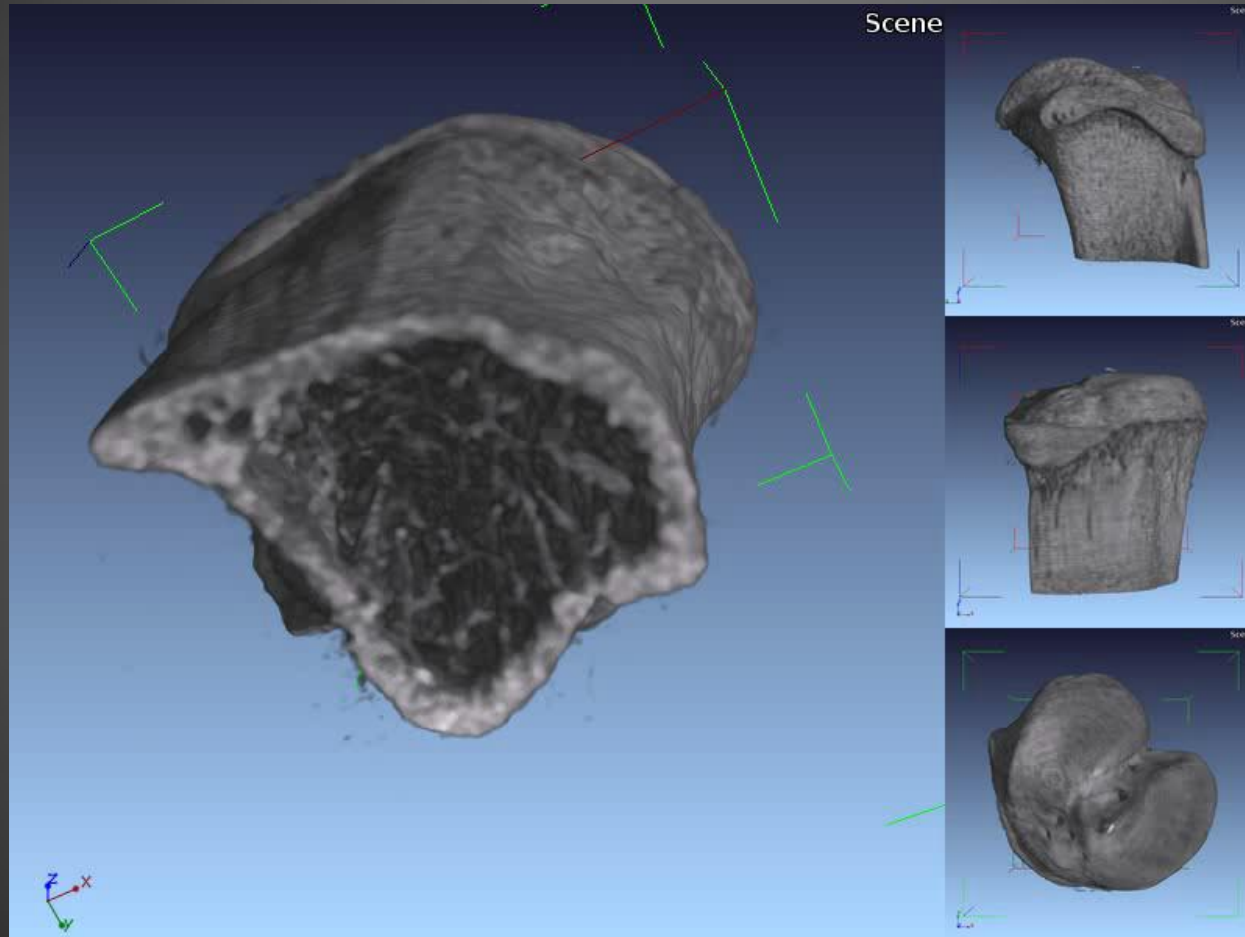
Projection Radiography



- Objects up to 50 cm wide and > 50 cm deep in 3B. Single shot.
- Objects up to 10 cm wide (1 cm deep) in 2B
- Monochromatic (or polychromatic) x-rays
 - 10 keV – 120 keV
- Two (three) phase contrast techniques.
 - Propagation PC
 - DEI
 - Grating (Talbot) interferometric imaging.

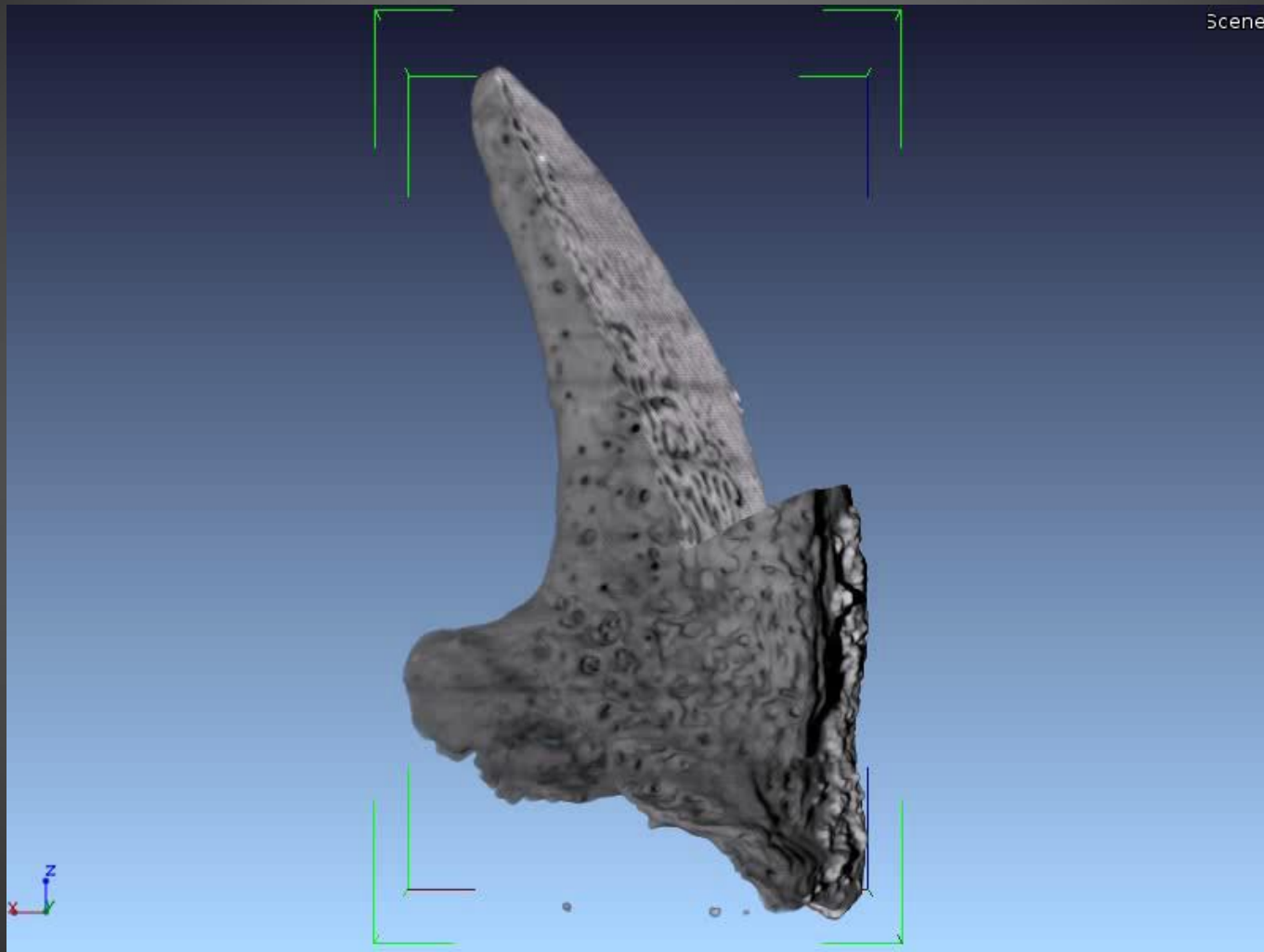
Imaging techniques

3D imaging (computed tomography)



Pink beam CT, 1mm x 4mm, single scan, 900 projections, 20µm resolution

Paleontology at IMBL



380 million-year-old fossil placoderm. Courtesy – Catherine Boisvert, ARMI



Time resolved (video) radiography



In Summary

- IMBL 3B is very suited to CT imaging of large objects
- Until there is a microCT beamline IMBL will also attempt to host microCT Users.
- We currently have one general purpose detector (12 micron pixels, 130 mm by 40 mm)
- We are developing a larger detector for 3B
- Other local Users are purchasing x-ray detectors with fine resolution/fast framing.

Examples in imaging from other synchrotrons

- ESRF - Lee Berger, University of Witwatersrand
 - 9 April 2010 in – 1.9 million year old hominid skeleton. (*Science* 328. no. 5975, pp. 195 – 204) (See video on *CnetTV*)
- Elettra – Marco Fioravanti (University of Florence)
 - Study of the wood, and varnish of ancient violins.
- ESRF – Paul Tafforeau (University of Poitiers)
 - Large variety of paleontological specimens. See SRI'09. Collaboration with Kate Trinajstić at Curtin University of Technology.

Thank you for your attention



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