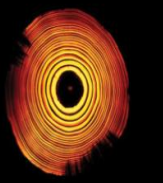
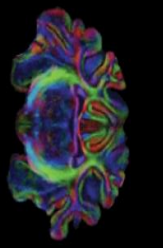
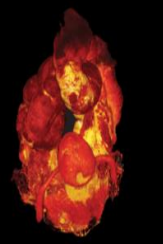







Imaging Critters
Why and How?

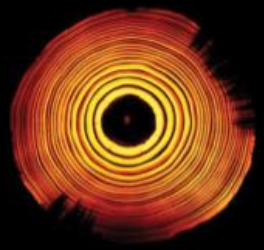
Prof Graham Galloway

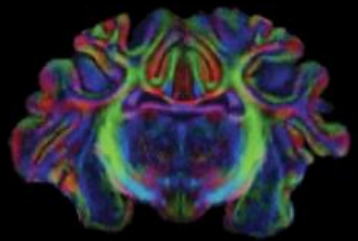
National Imaging Facility

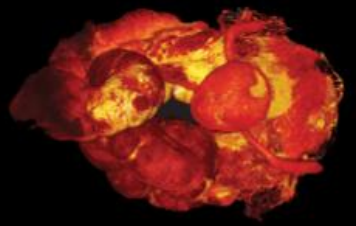
NCRIS
National Research Infrastructure for Australia
An Australian Government Initiative

National Imaging Facility

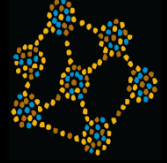
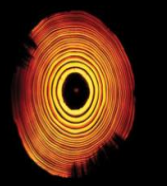
'Exploring Inner Space'

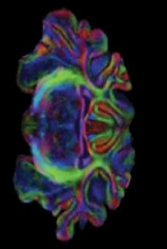
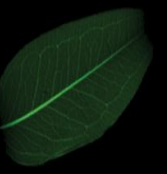
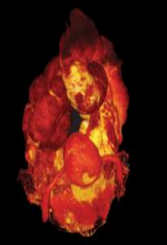


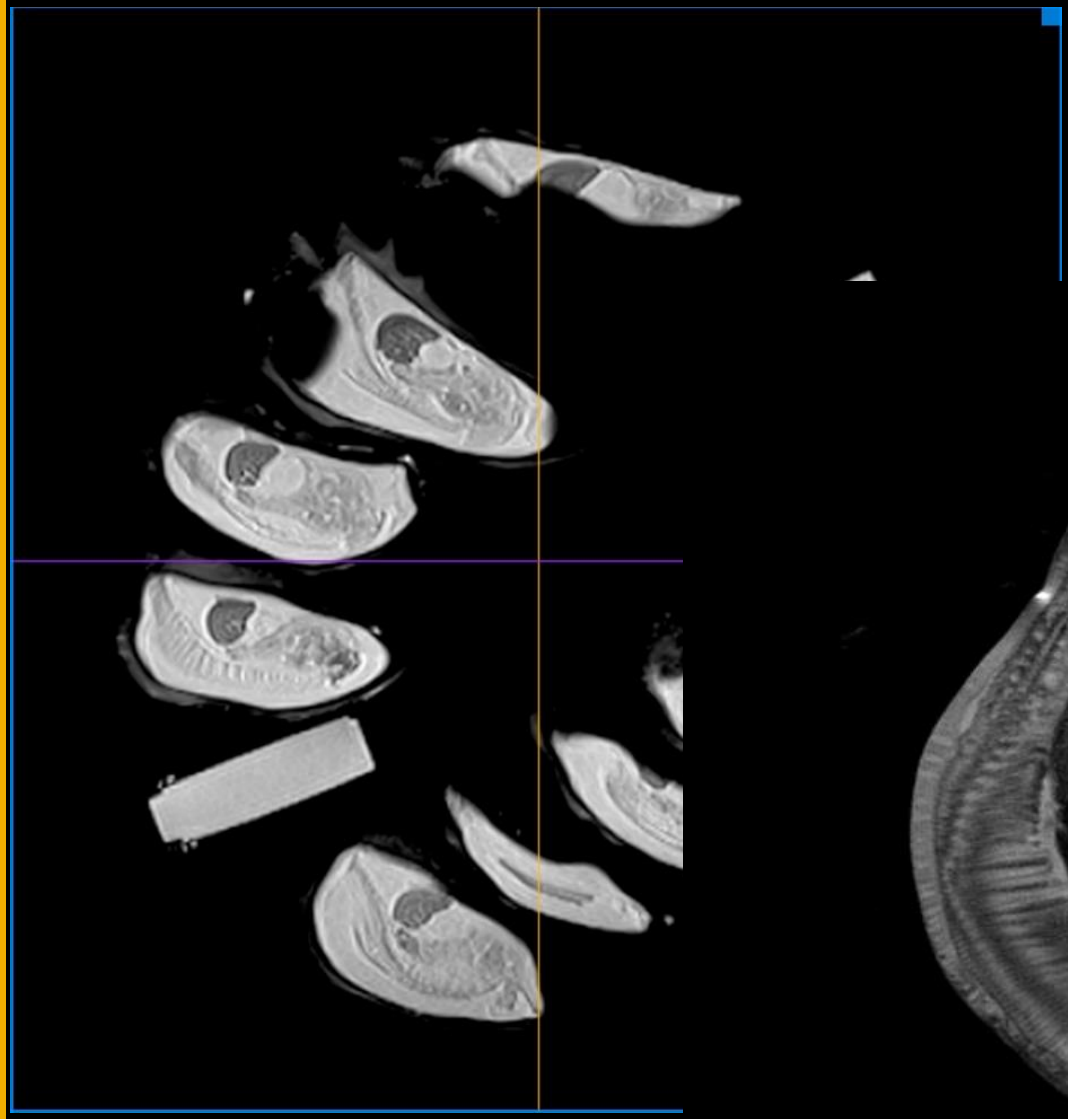


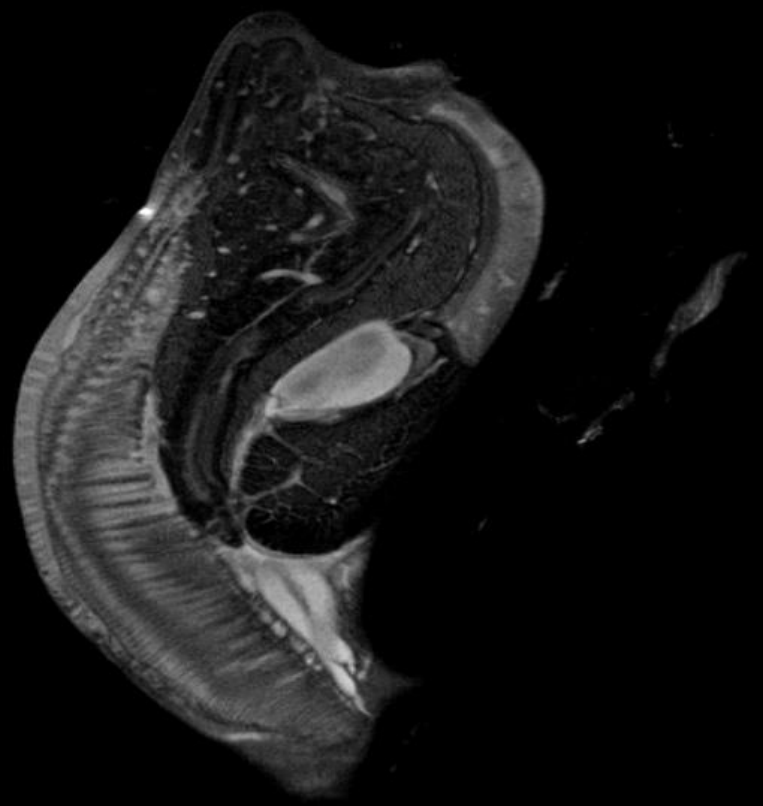


Exploring Inner Space

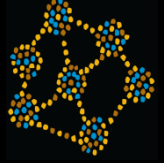
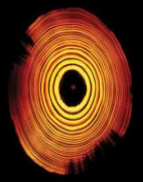



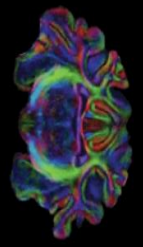
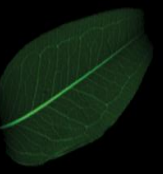
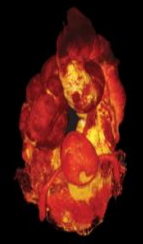




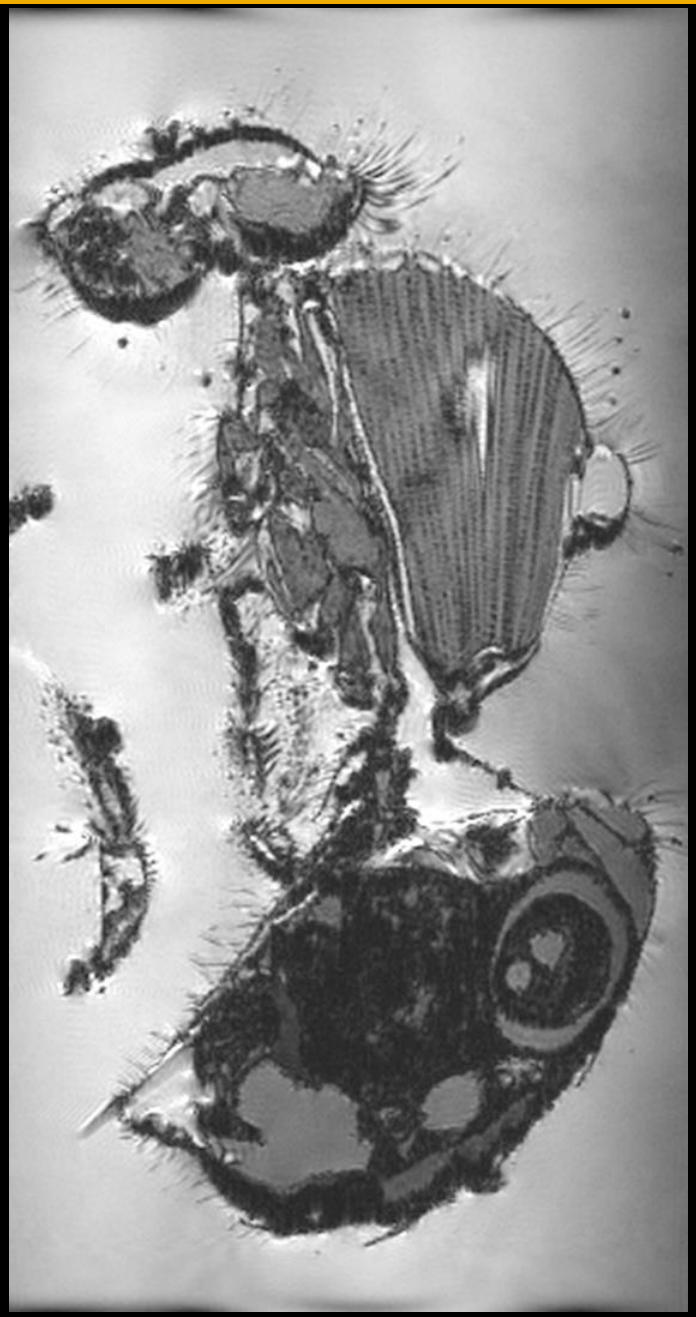


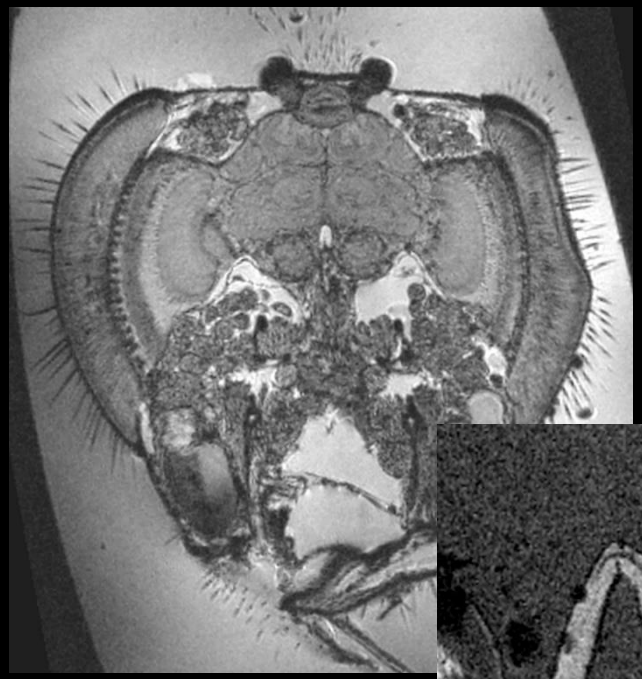


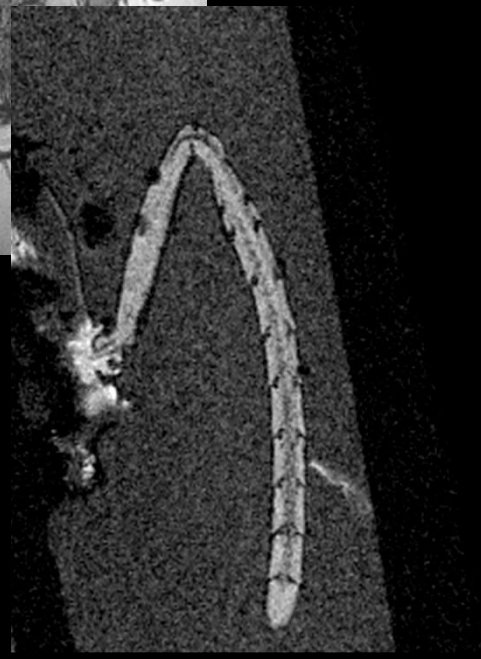
Exploring Inner Space

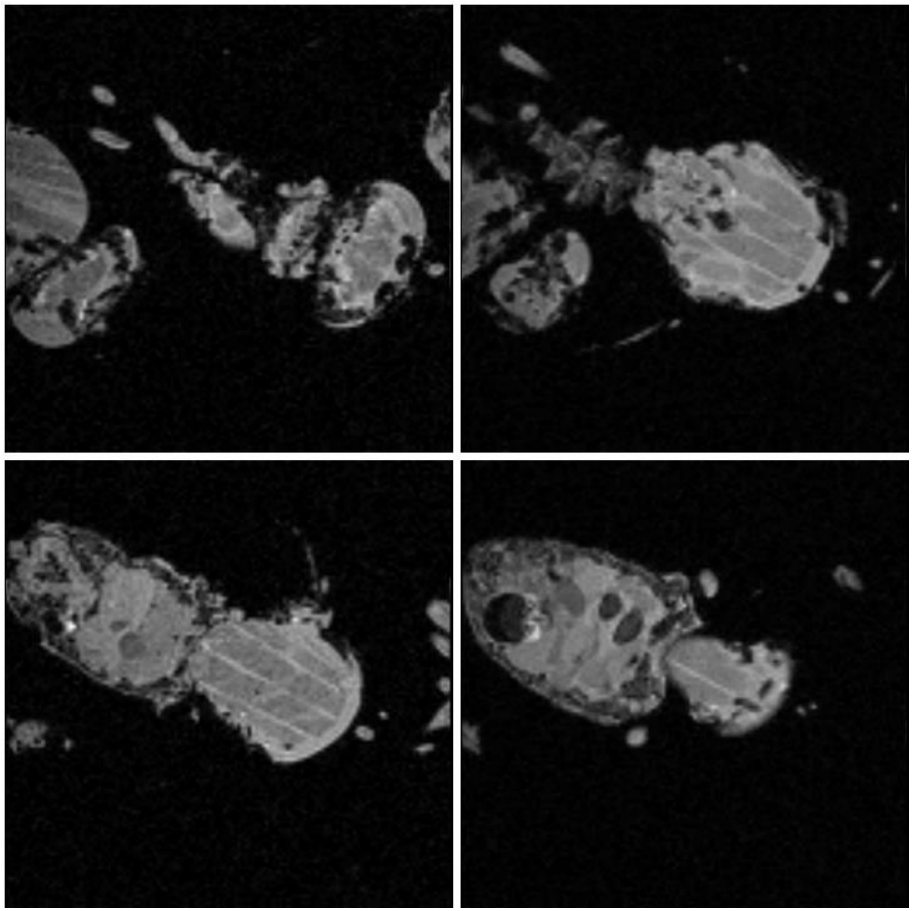




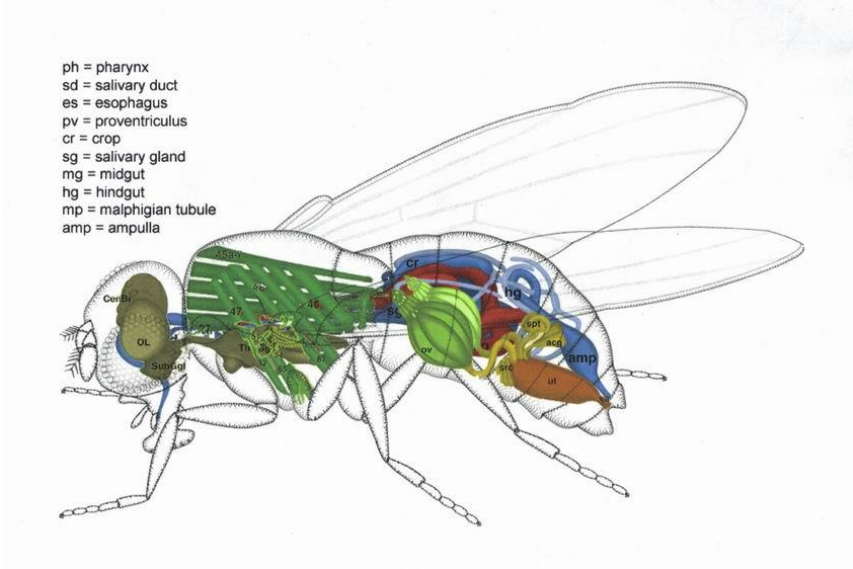


Drosophila 3D High Resolution Imaging

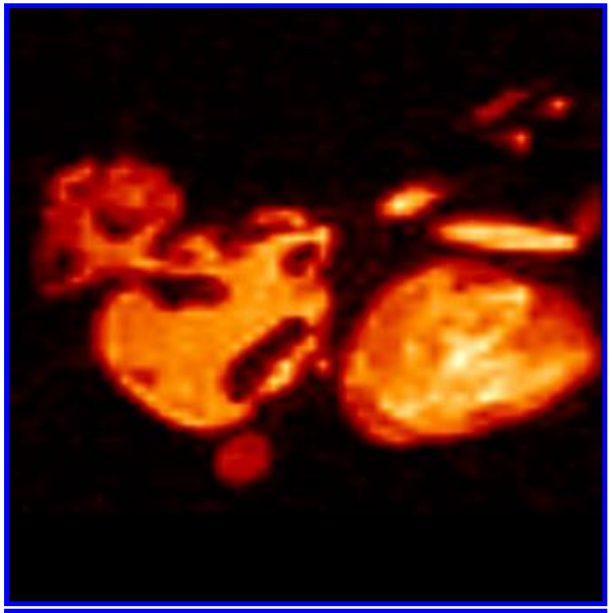
4 slices from the 3D data



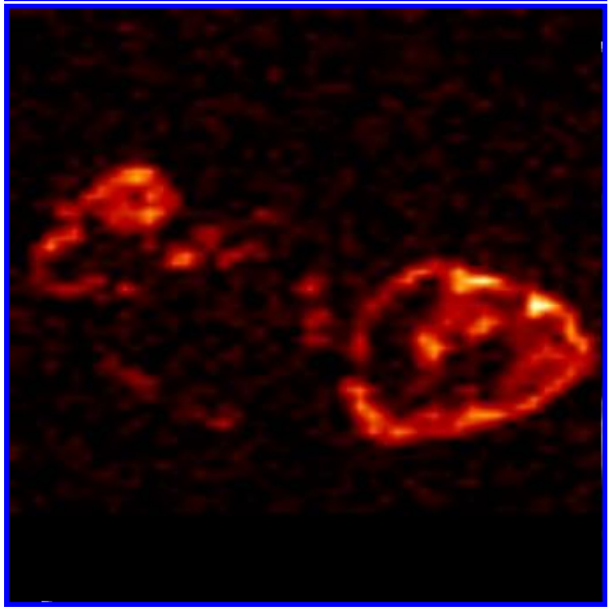
Method	: Gradient Echo 3D
FOV	: (4.2 x 2.1 x 2.1) mm^3
Matrix	: 256 x 128 x 128
Resolution	: 16.4 µm isotropic voxel
TR	: 50 ms
TE	: 5 ms
Averages	: 24
T_{exp}	: 5h 27 min



Drosophila Chemical Shift Selective Imaging



Water



Fat

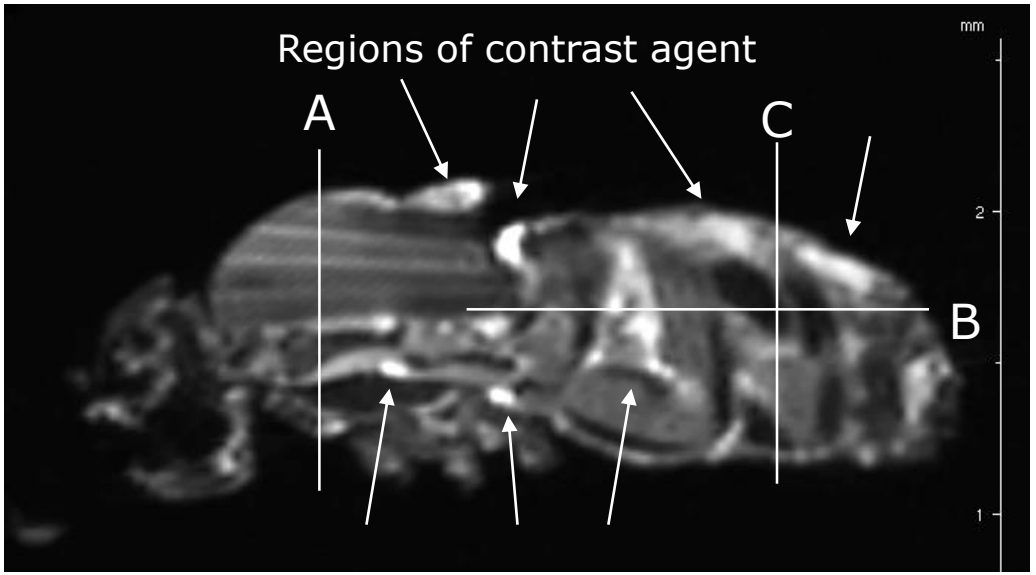
Method	: Chemical Shift Selective Gradient Echo 3D
FOV	: (3.2 x 2.2 x 2.2) mm^3
Matrix	: 64 x 64 x 64
Resolution	: (50 x 34 x 34) µm
TR	: 50 ms
TE	: 2.1 ms
Averages	: 4
T_{exp}	: 13 min.

Courtesy of B. Simon, A. Teleman, S. Cohen, M. Sattler, EMBL, Heidelberg

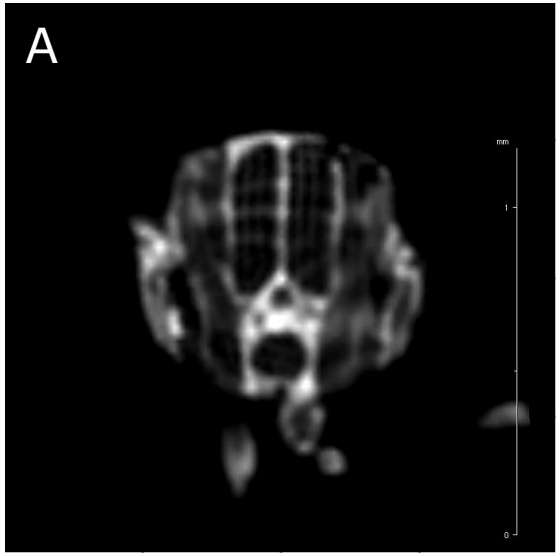
Drosophila 3D High Resolution Imaging

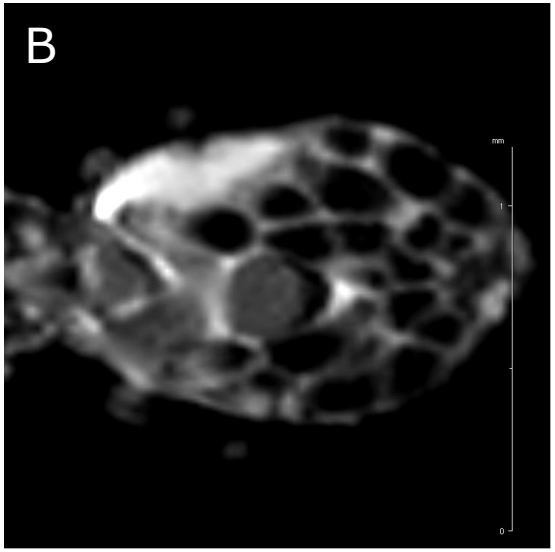
After the oral application of contrast agent

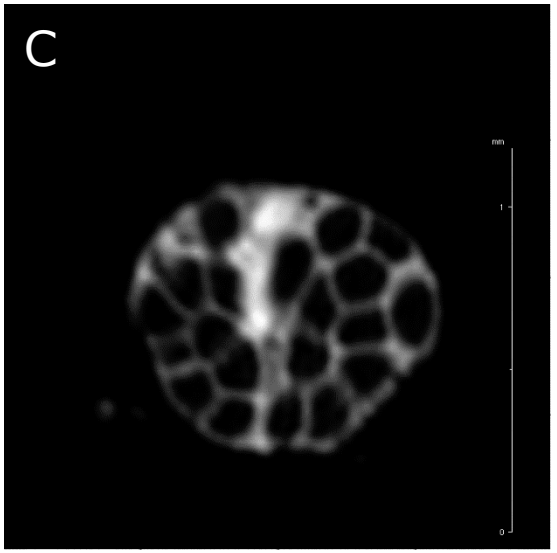
Magnevist GdDTPA



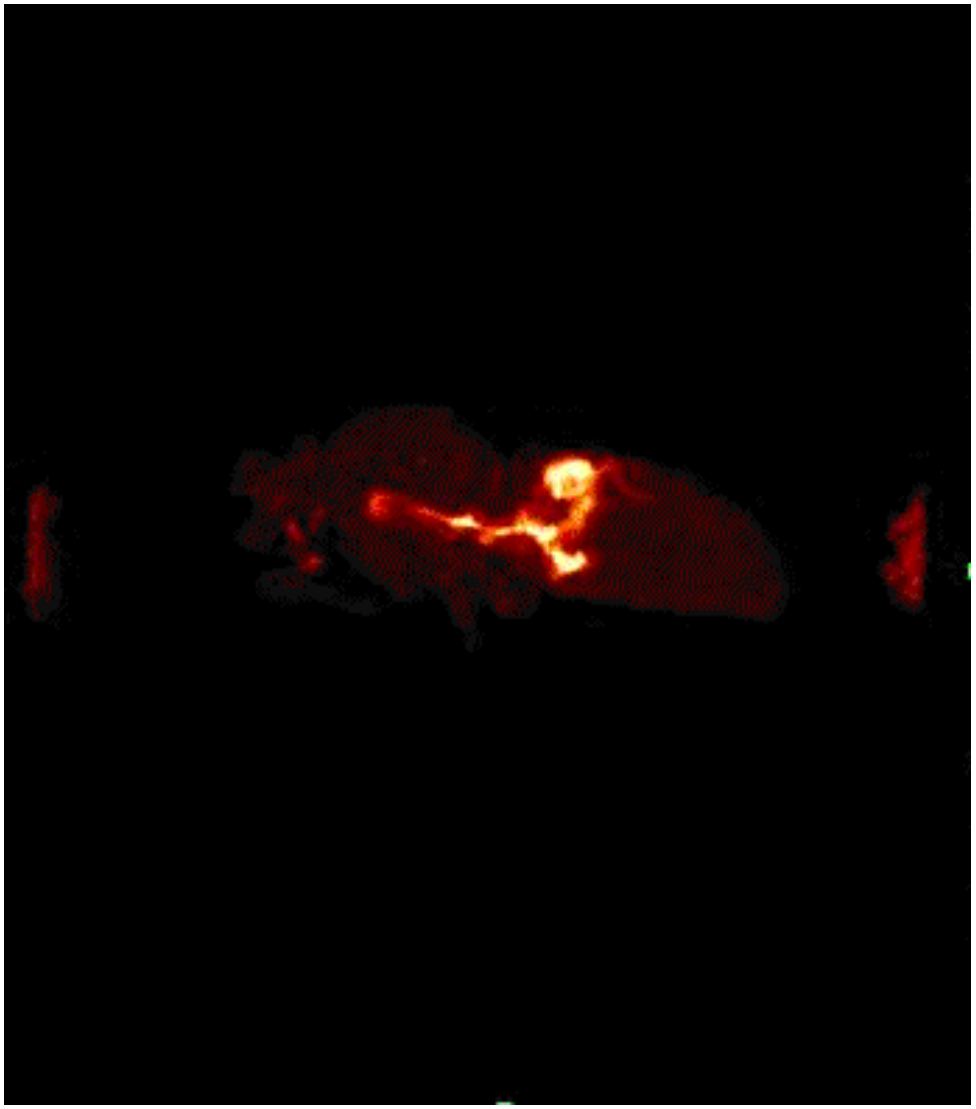
Courtesy of Christian Spenger, Johanna Öberg, Karolinska Institut, Stockholm
and Fiona Kerr, University Collage, London







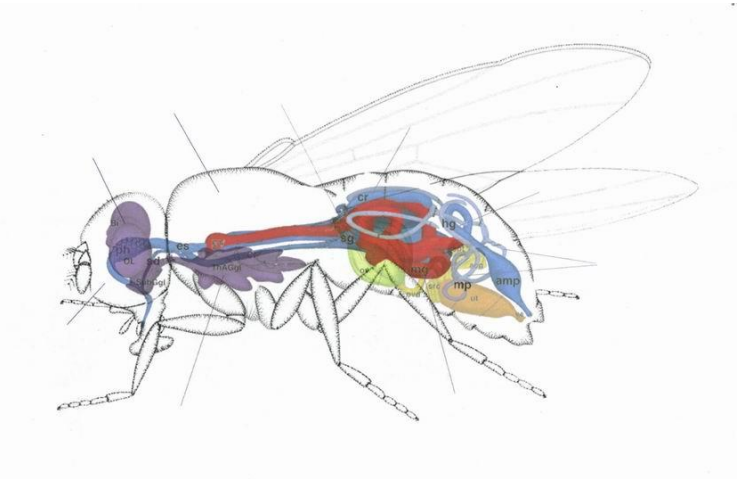
Drosophila Fly iv vivo



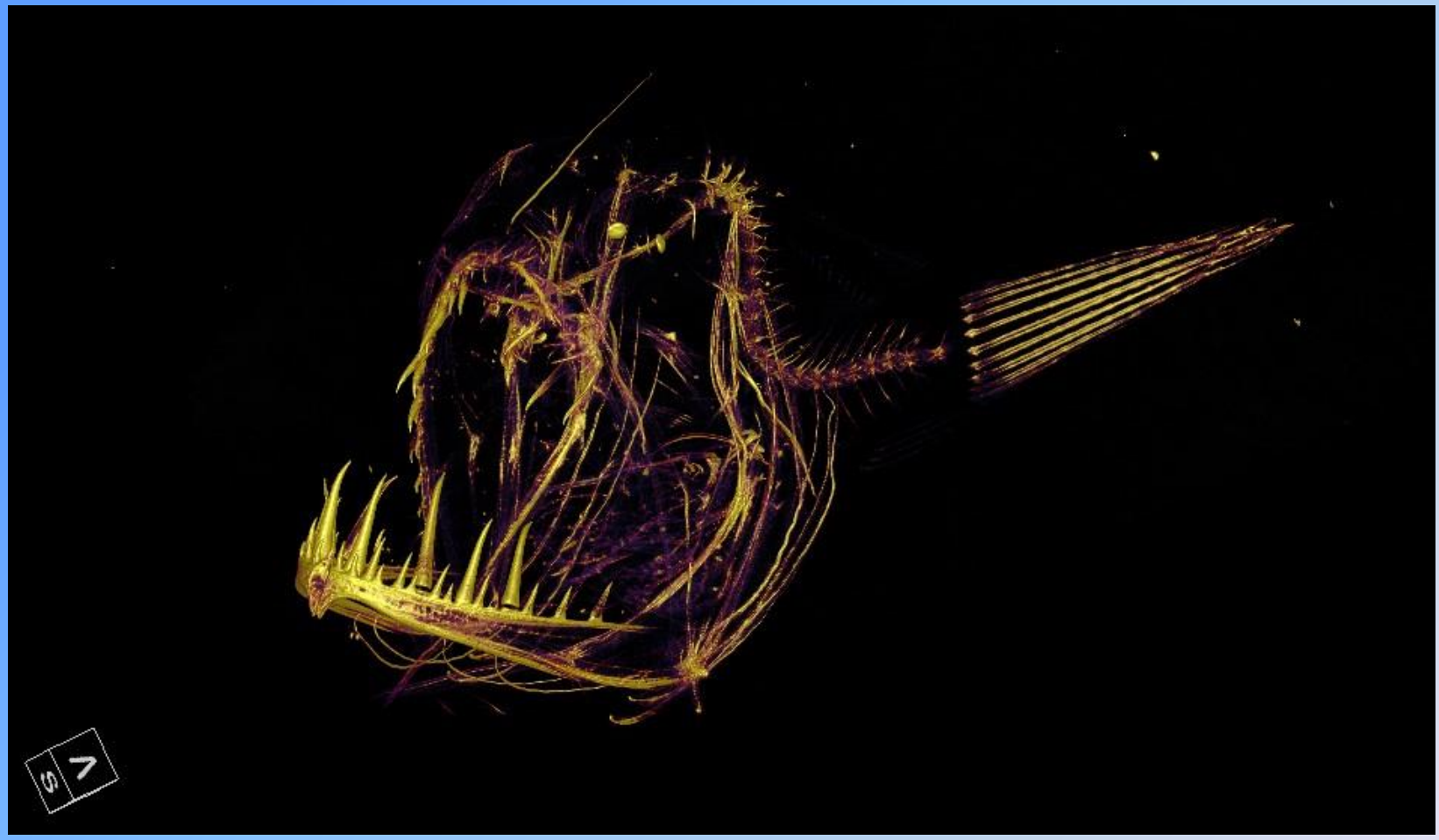
movie

Magnevist plus apple juice

Five 3D SpinEcho experiments,
Started after 70 minutes respectively,
Matrix: 128 x 96 x 96
FOV: 4.6 x 2.3 x 2.3 mm
Res: 36 x 24 x 24 mm, TR: 100 ms,
TE: 2.35 ms,
Averages: 4,
Time 60 min. for each 3D experiment



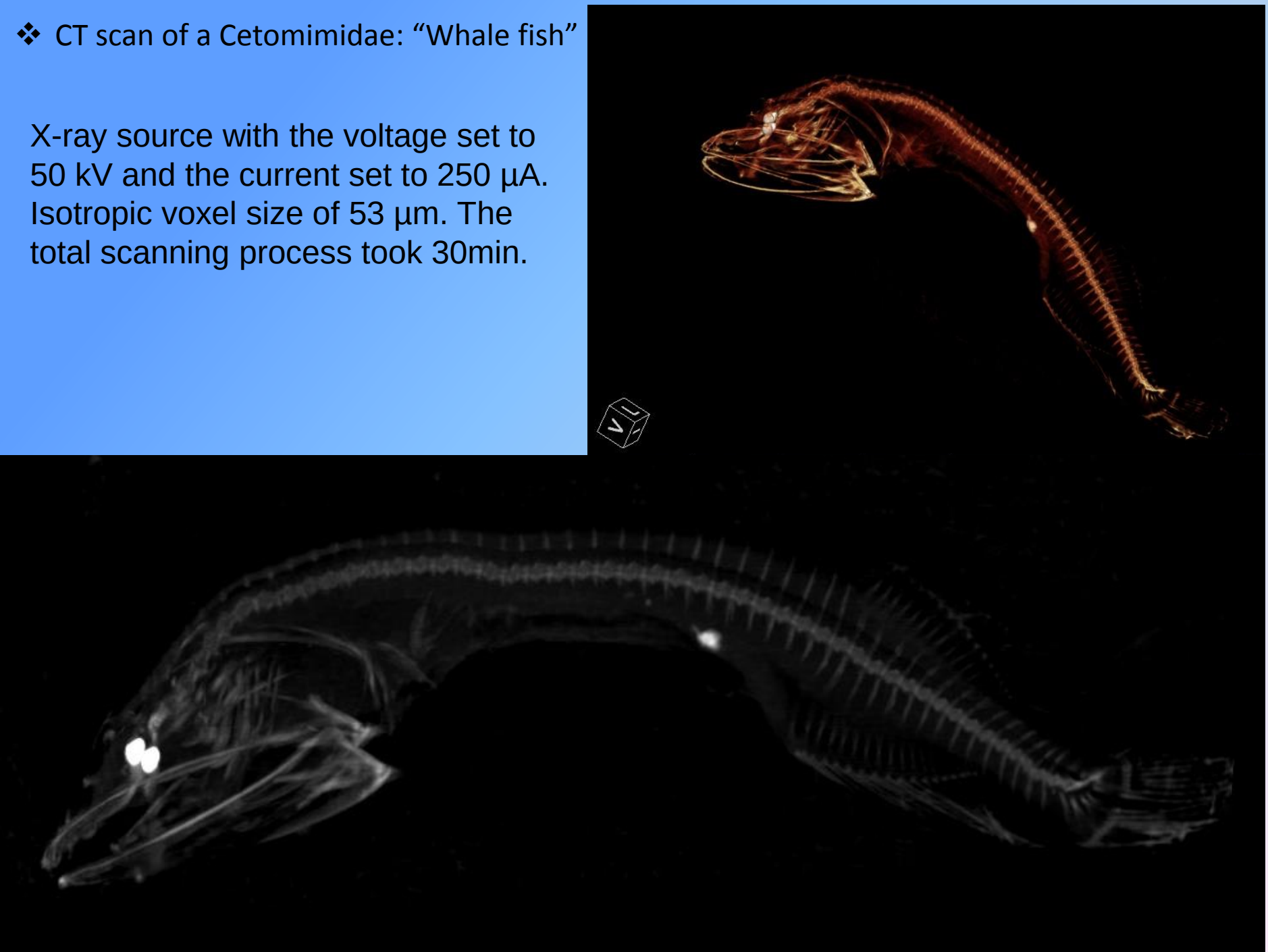
❖ CT scan of a deep sea fish: Melanocetus johnsoni, anglerfish “Black Devil”



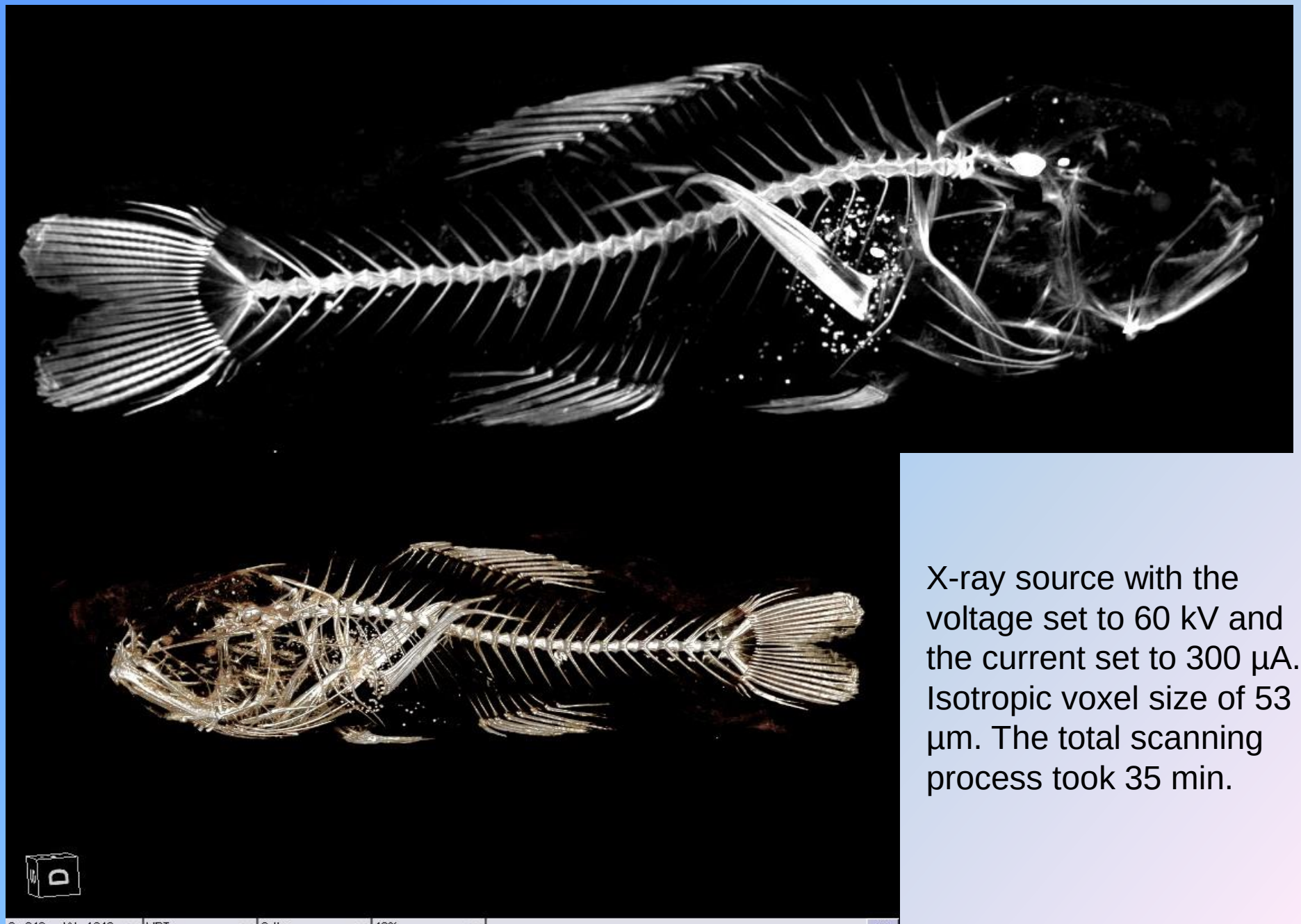
X-ray source with the voltage set to 50 kV and the current set to 150 µA. The scans were performed using 360° rotation with 360 rotation steps with a high magnification and a binning factor of 2. The exposure time was 2 x 3250 ms with an effective isotropic voxel size of 17 µm. The total scanning process took approximately 2hr30min.

❖ CT scan of a Cetomimidae: “Whale fish”

X-ray source with the voltage set to 50 kV and the current set to 250 µA. Isotropic voxel size of 53 µm. The total scanning process took 30min.

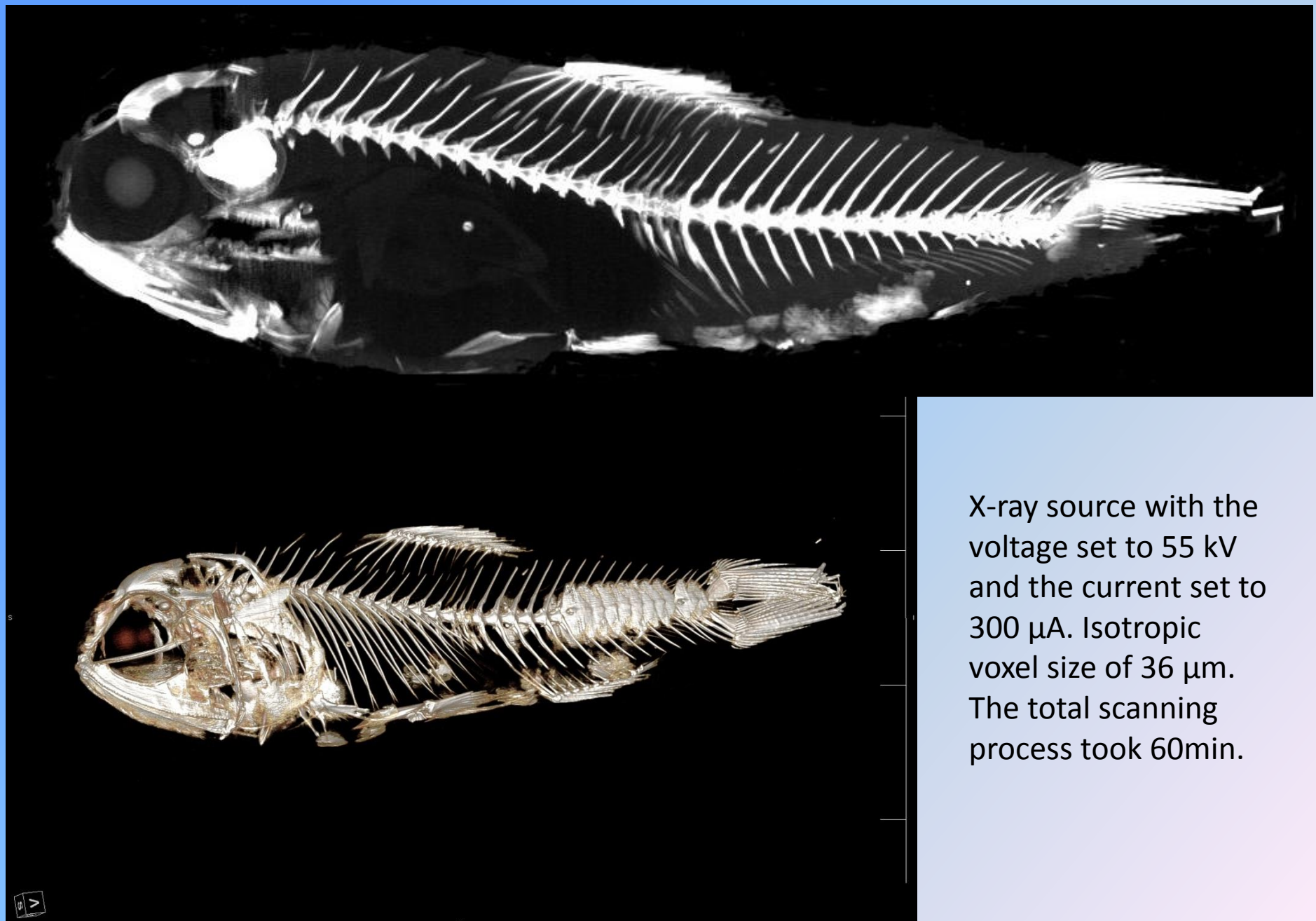


❖ CT scan of a Melamphaidae: “Big scale fish”

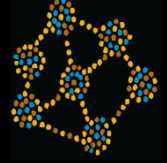


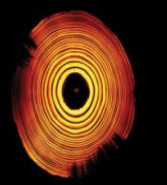
X-ray source with the voltage set to 60 kV and the current set to 300 µA. Isotropic voxel size of 53 µm. The total scanning process took 35 min.

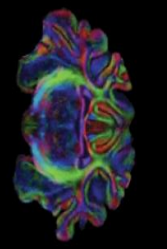
❖ CT scan of a Myctophid: “lantern fish”

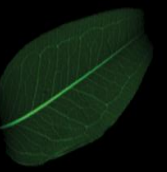


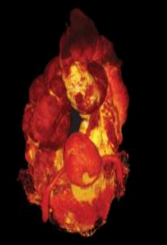
X-ray source with the voltage set to 55 kV and the current set to 300 µA. Isotropic voxel size of 36 µm. The total scanning process took 60min.

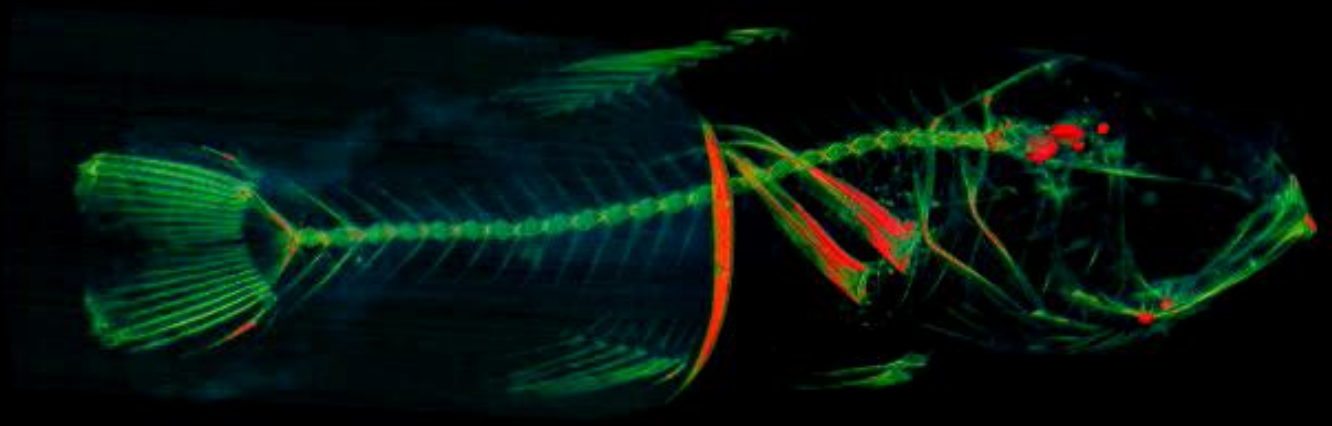












❖ Mouse spine

X-ray source with the voltage set to 80 kV and the current set to 270 µA. The scans were performed using 360° rotation with 360 rotation steps with a medium-high magnification and a binning factor of 2. The exposure time was 1400 ms with an effective isotropic voxel size of 27.9 µm. The total scanning process took approximately 20 minutes.

What sort of crocodile is it?

I don't know

Where does it come from?

I don't know

What time of year was it captured?

I don't know?

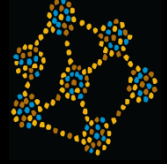
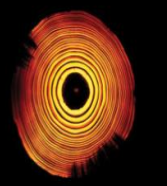
Is it any use to a collection?

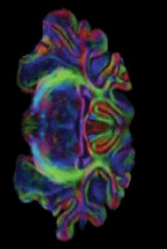
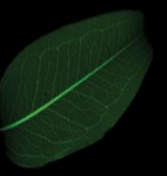
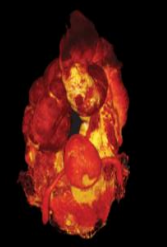
I DOUBT IT!!!

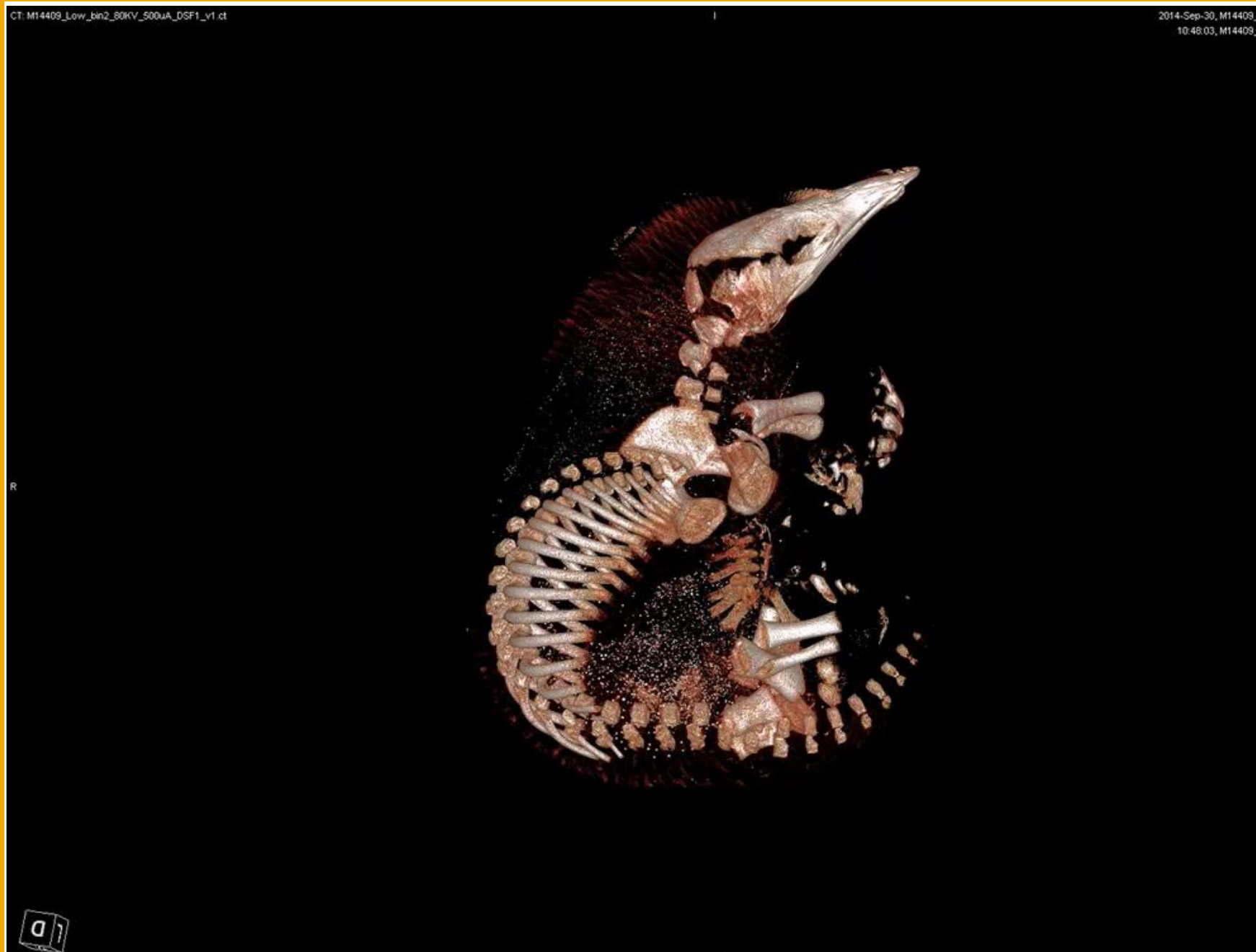
WHAT INFORMATION DO YOU NEED?

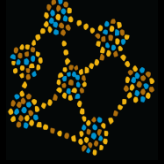
Echidna CT XRay

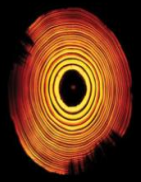
Exploring Inner Space

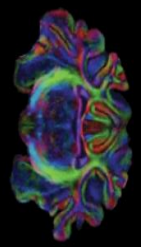



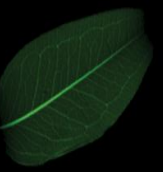




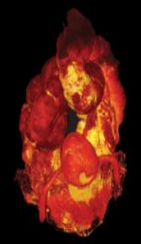


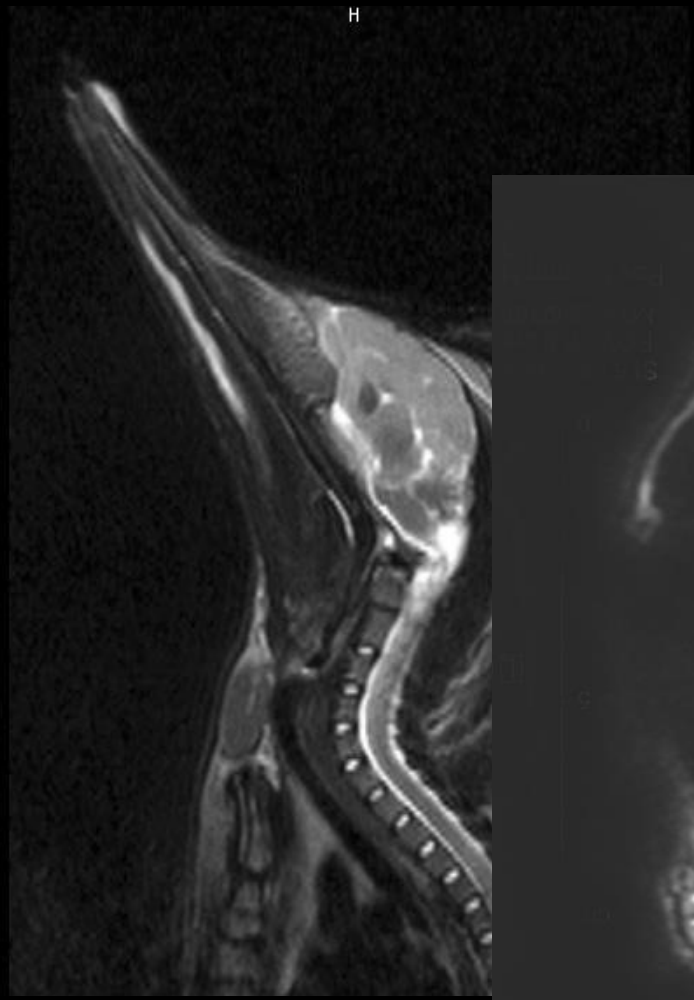








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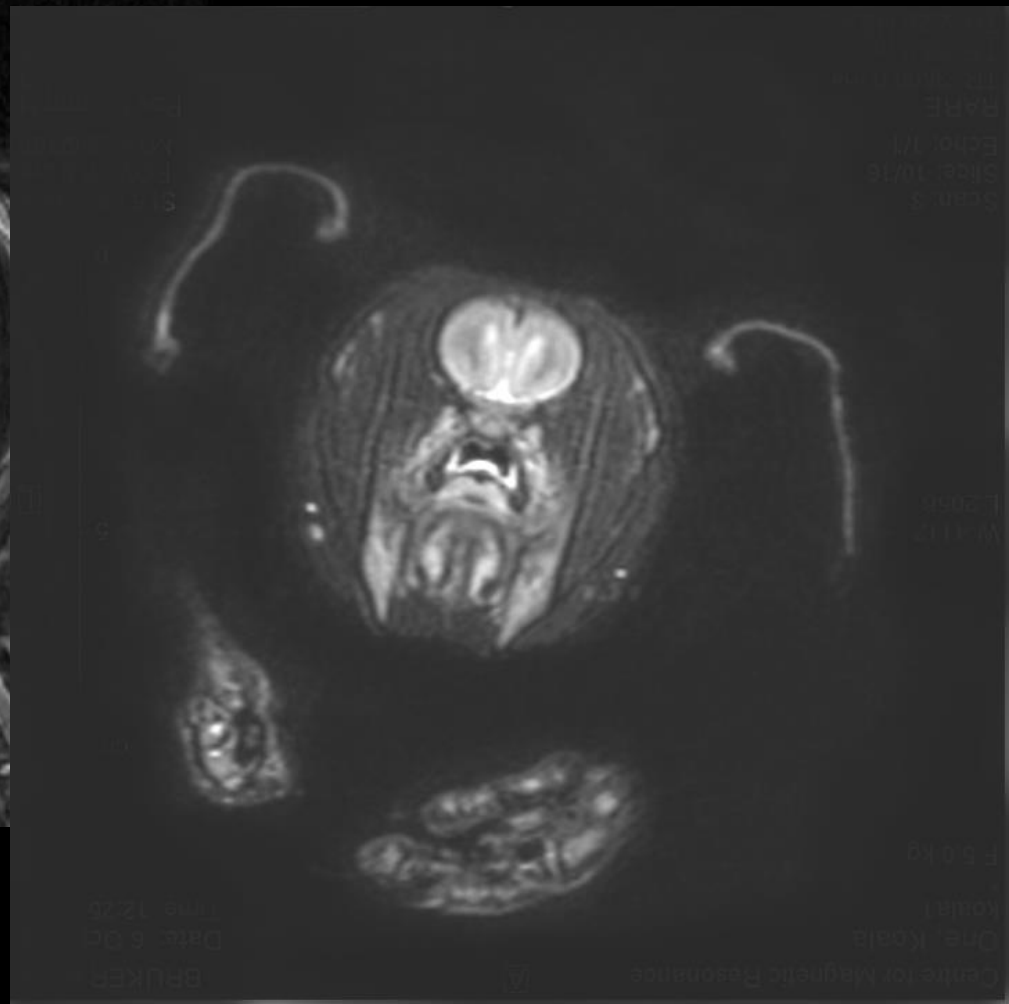

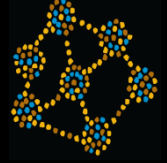

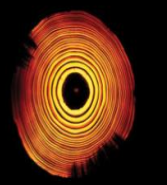

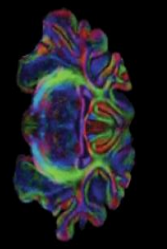

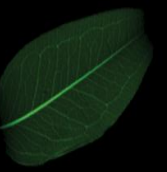

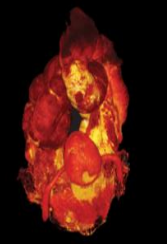


CT: JM6385_Low_bin2_80KV_500uA_2beds_DSF1_v1.ct
2014-Sep-29, JM6385_Low_bin2_
15:34:19, JM6385_Low_bin2_
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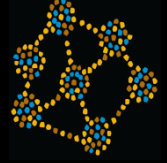
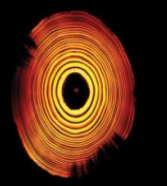
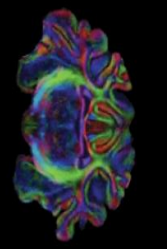
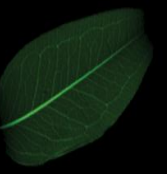
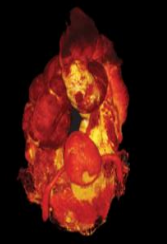
S

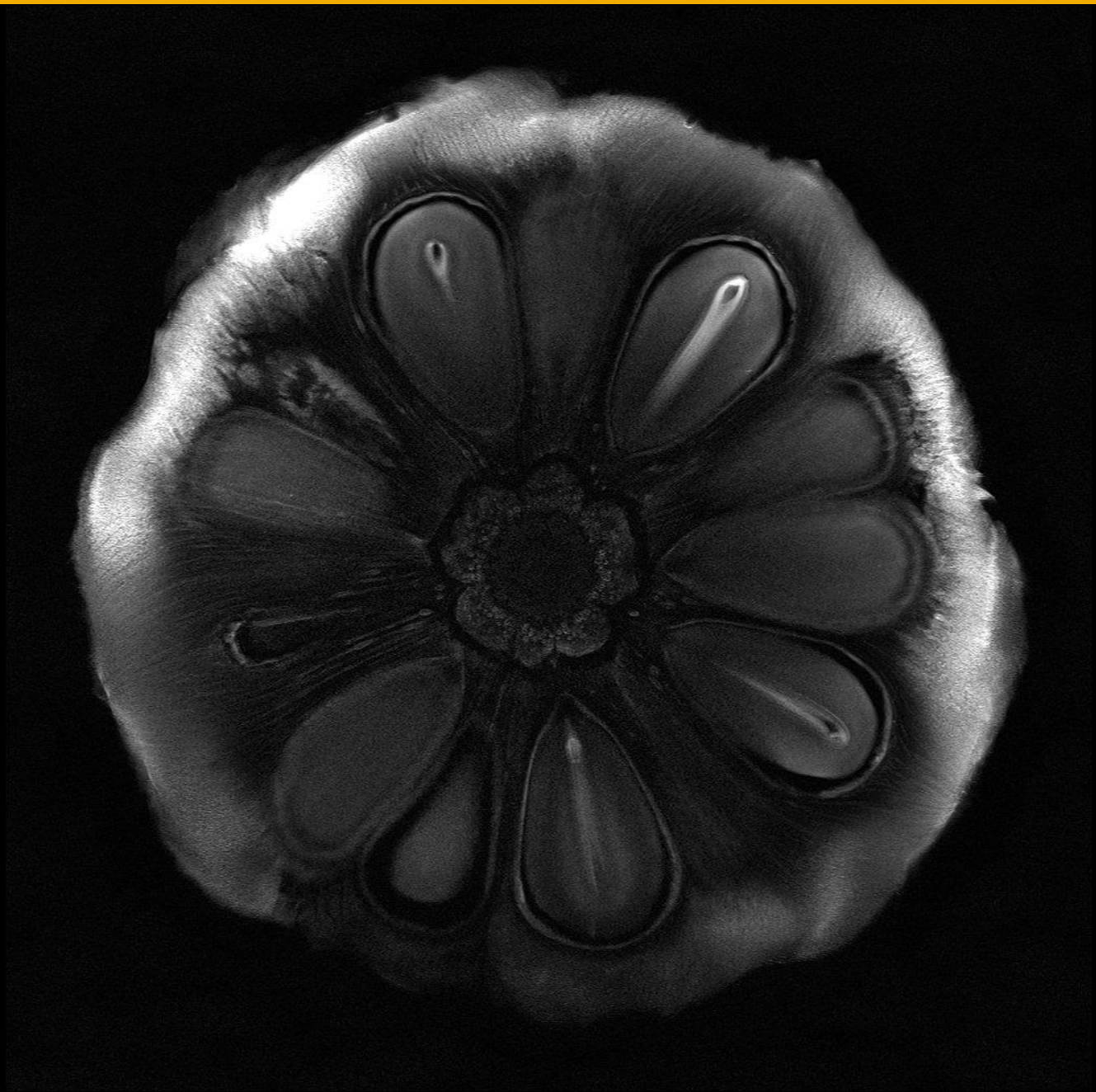




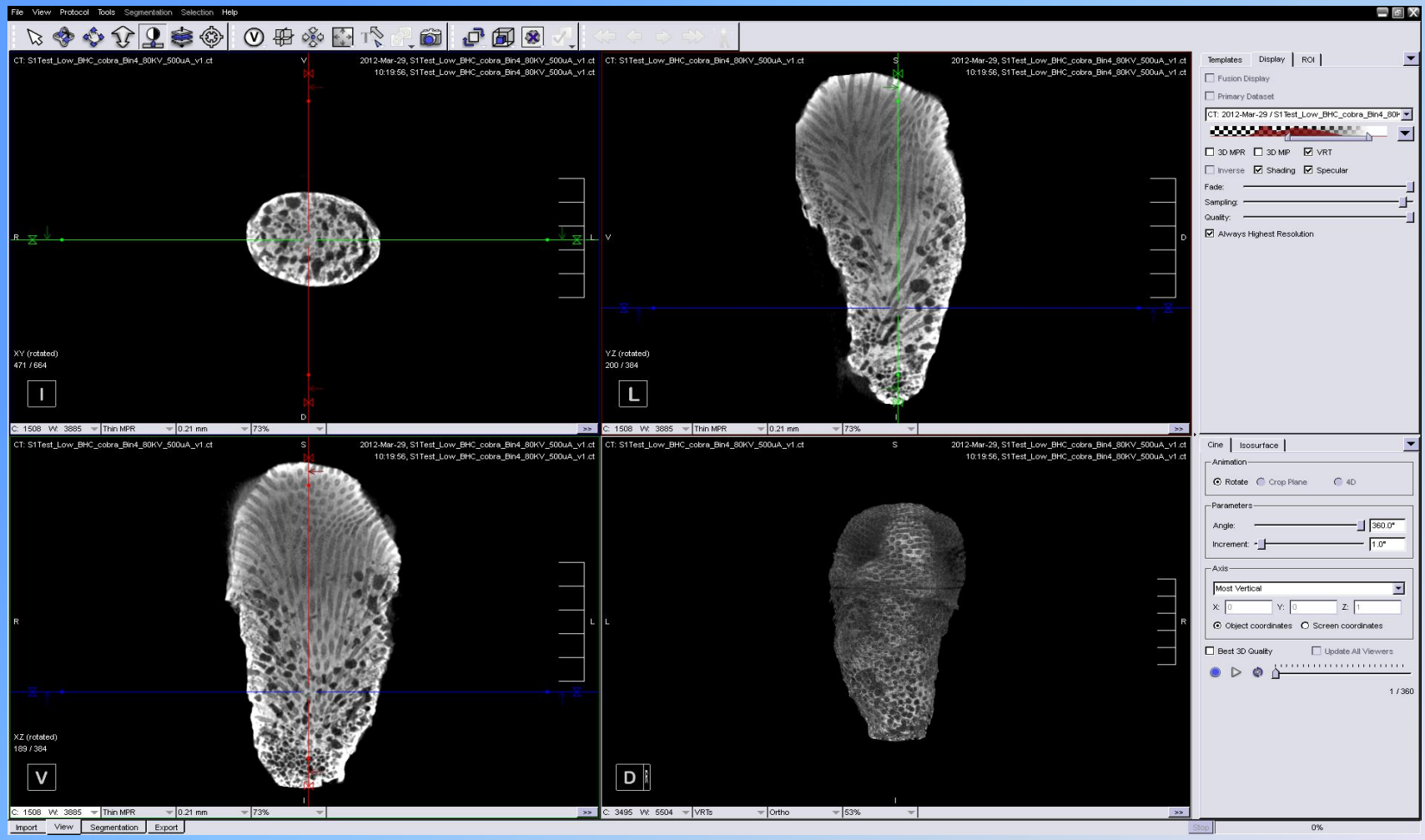






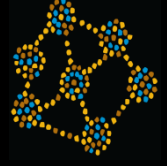
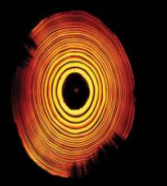


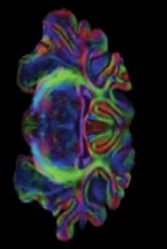
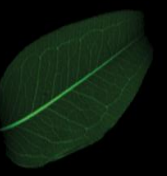
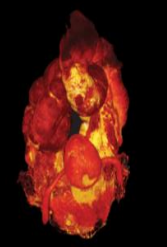
❖ Growth rates and erosion of Montastraea corals from Belize



X-ray source with the voltage set to 80 kV and the current set to 500 µA. The scans were performed using 360° rotation with 180 rotation steps with a low magnification and a binning factor of 4 with beam hardening correction. The exposure time was 170 ms with an effective isotropic voxel size of 106 µm. The total scanning process took approximately 10 minutes.

Exploring Inner Space

Tissue Stack – Desktop | Tissue Stack – Desktop

q0013-webdav.qcloud.qcif.edu.au/desktop.html

Data | Admin | About

Extent/Zoom

Coordinates

0.009

0.024

0.01

Center Data Set 1

Center Data Set 2

Data/Meta Info

Connect

Data Sets

- ambmc c57bl6 symme
  - ambmc-c57bl6-mo
- AMBMC labels
- ABI Histo model 5
- shrew-model-high
- ABI-histo-high

1.500 mm

GREY | CONTRAST | URL

655

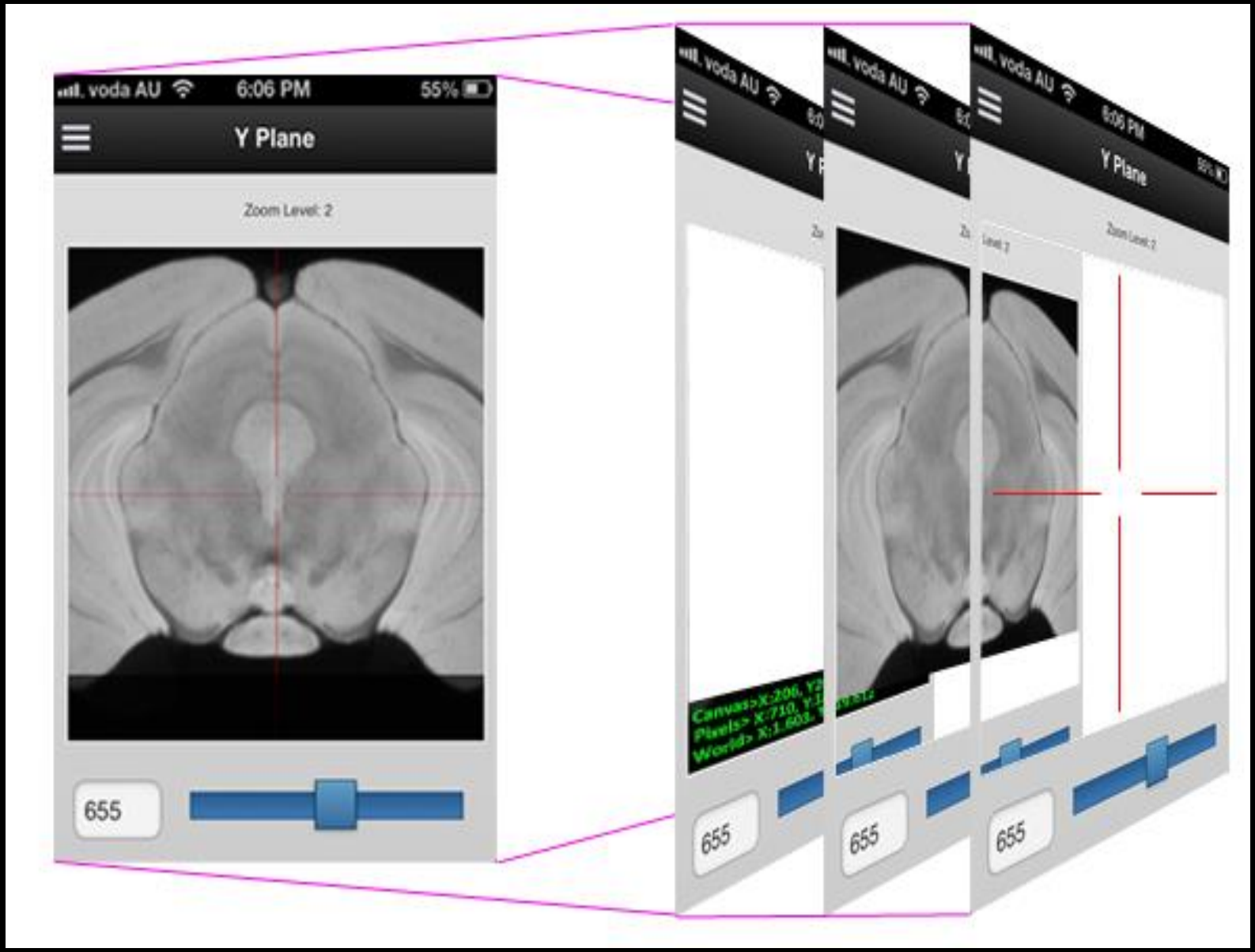
100% 100% 100%

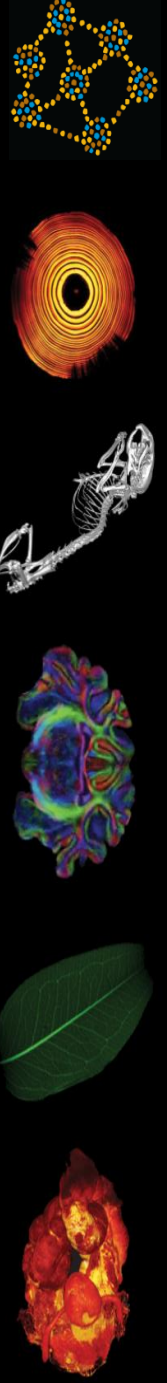
50 mm

GREY | CONTRAST | URL

462

100% 100% 100%


voda AU
6:06 PM
55%
Y Plane
Zoom Level: 2
655
Canvas>X:206, Y:
Pixels> X:710, Y:1
World> X:1.603,
655
655
655



-Getting data to Compute

(from scanners and to clusters/cloud)
1 run == 2TB temporary data, 400GB output

- Long term archiving/retrieval

(keeping things in sync)

- Capturing Meta Data
  -Research Data Australia

-Re-analysing data

CharacterisationVL

Research Environments for Exploring Inner Space

CVL | Characterisation Virtual Laboratory

MONASH University · ammrf · ansto · Australian Synchrotron · National Imaging Facility · ANU · Sydney · The University of Queensland · nectar

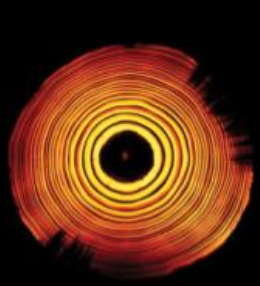
FUNDED BY

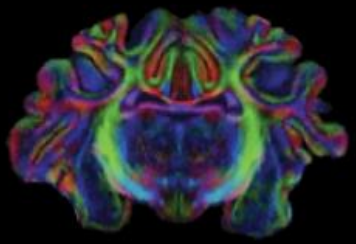
STORAGE BY

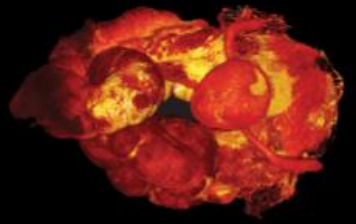
HOSTED BY

National Imaging Facility

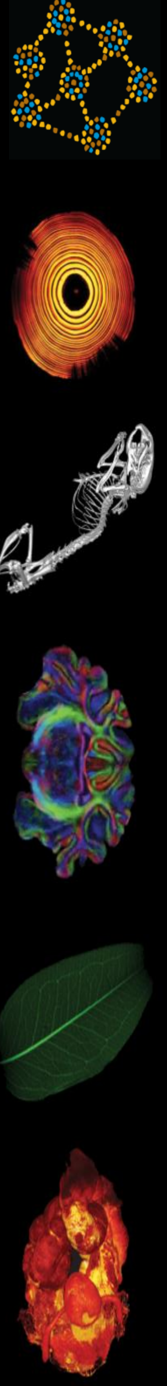
'Exploring Inner Space'

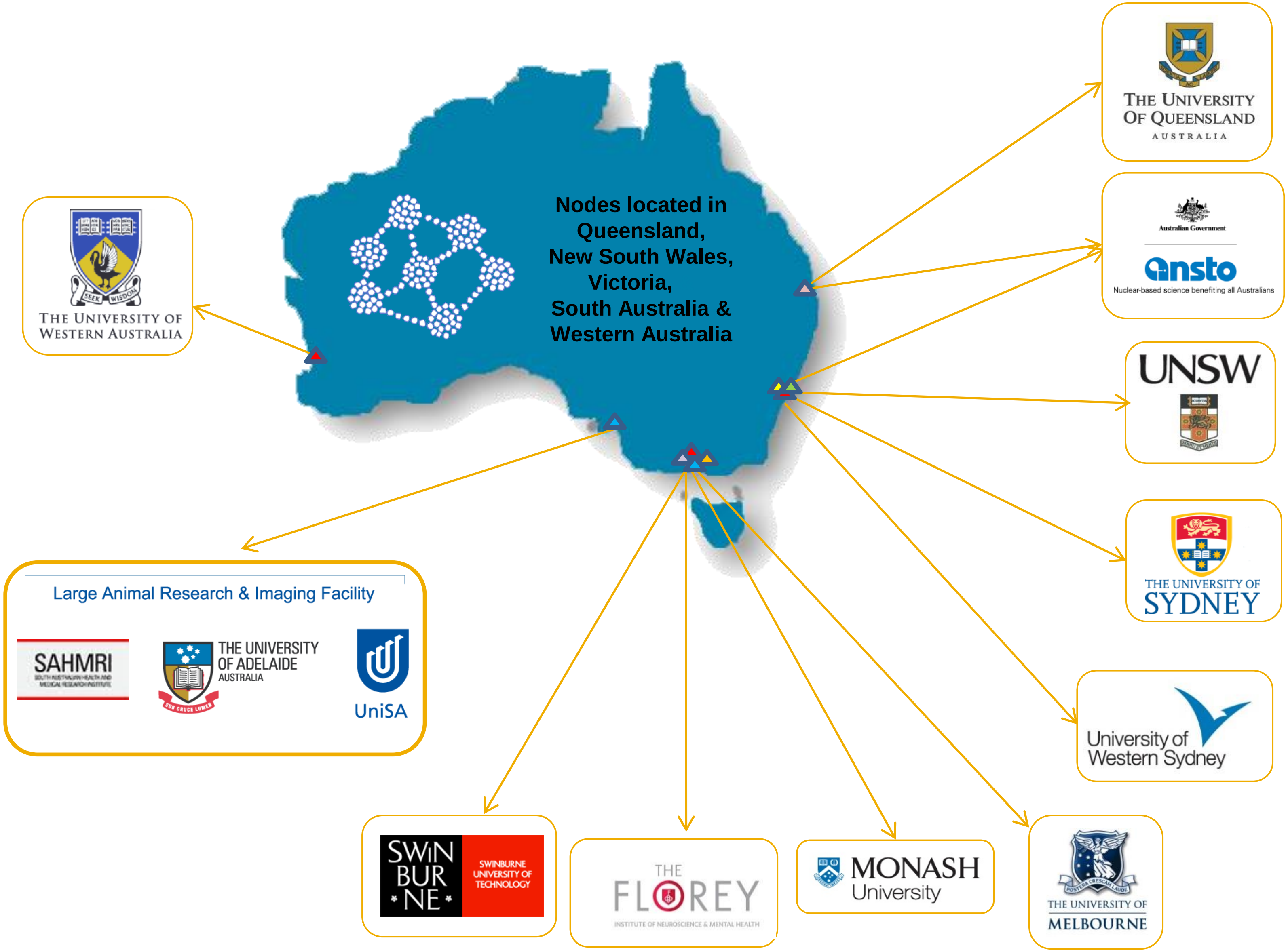






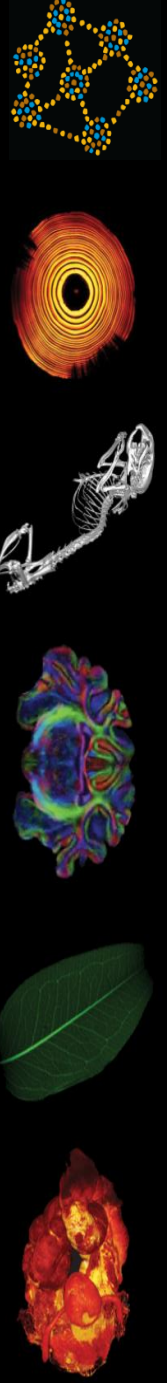
The National Imaging Facility: Exploring Inner Space





NIF Infrastructure

Exploring Inner Space



The University Of Queensland
AUSTRALIA

- Wholebody 7T MRI
- Preclinical comb. MR/PET
- 9.4T MRI animal system
- Small animal PET/CT
- Small animal 16.4T MRI
- Wholebody 3T MRI

- Research Cyclotron
- Radiochemistry hotcells & synthesis units
- Small animal PET/SPECT/CT, PET/CT & CT
- Small animal & primate brain PET
- 3T MRI

The University of Sydney | **Ansto** (Australian Government) — Nuclear-based science benefiting all Australians

UNSW

- 9.4T MRI animal system
- Wholebody 3T MRI
- Siemens CT & PET scanners
- Biolum/fluroescence imaging
- Faxitron X-ray system
- Small animal ultrasound

- 11.7T MRI scanner
- 7T MRI scanner

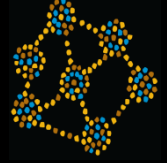
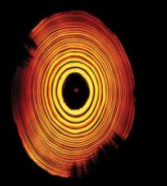
University of Western Sydney

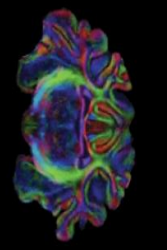
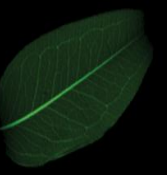
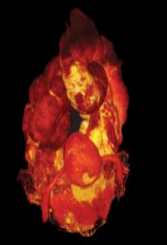
The Florey — Institute of Neuroscience & Mental Health

- 4.7T MRI scanner
- 3TMRI
- Informatics capability

NIF Infrastructure

Exploring Inner Space

Large Animal Research & Imaging Facility

SAHMRI | THE UNIVERSITY OF ADELAIDE AUSTRALIA | UniSA

Specialises in Large Animals
Angiography suite/image intensifer
Hologic Dual X-Ray Absorptiometer
Wholebody 1.5T MRI

316 channel MEG system
Wholebody 3T MRI

SWINBURNE UNIVERSITY OF TECHNOLOGY

MONASH University

Small Animal PET/SPECT/CT
3T MRI
Informatics capability

Wholebody 7T MRI
Human PET/CT

THE UNIVERSITY OF MELBOURNE

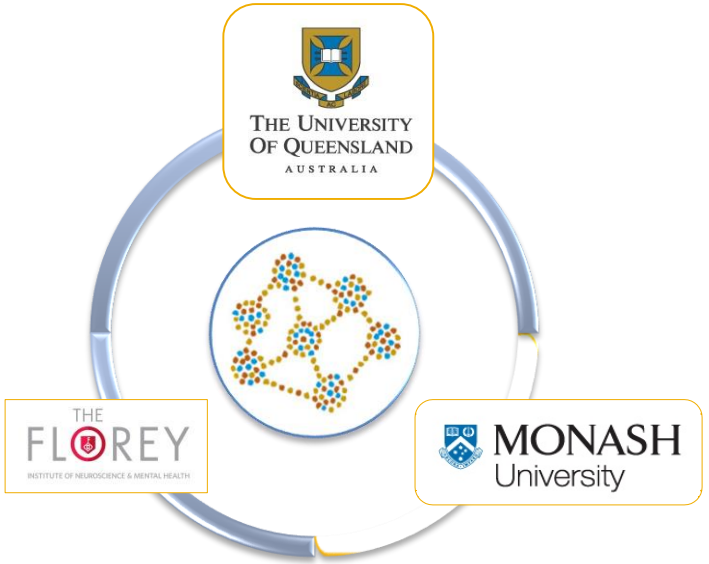
THE UNIVERSITY OF WESTERN AUSTRALIA

9.4T MRI animal system
IVIS lumina II multispectral imager
Skyscan 1176 *in vivo* X-ray micro-CT system
CRI Maestro 2 multispec imager

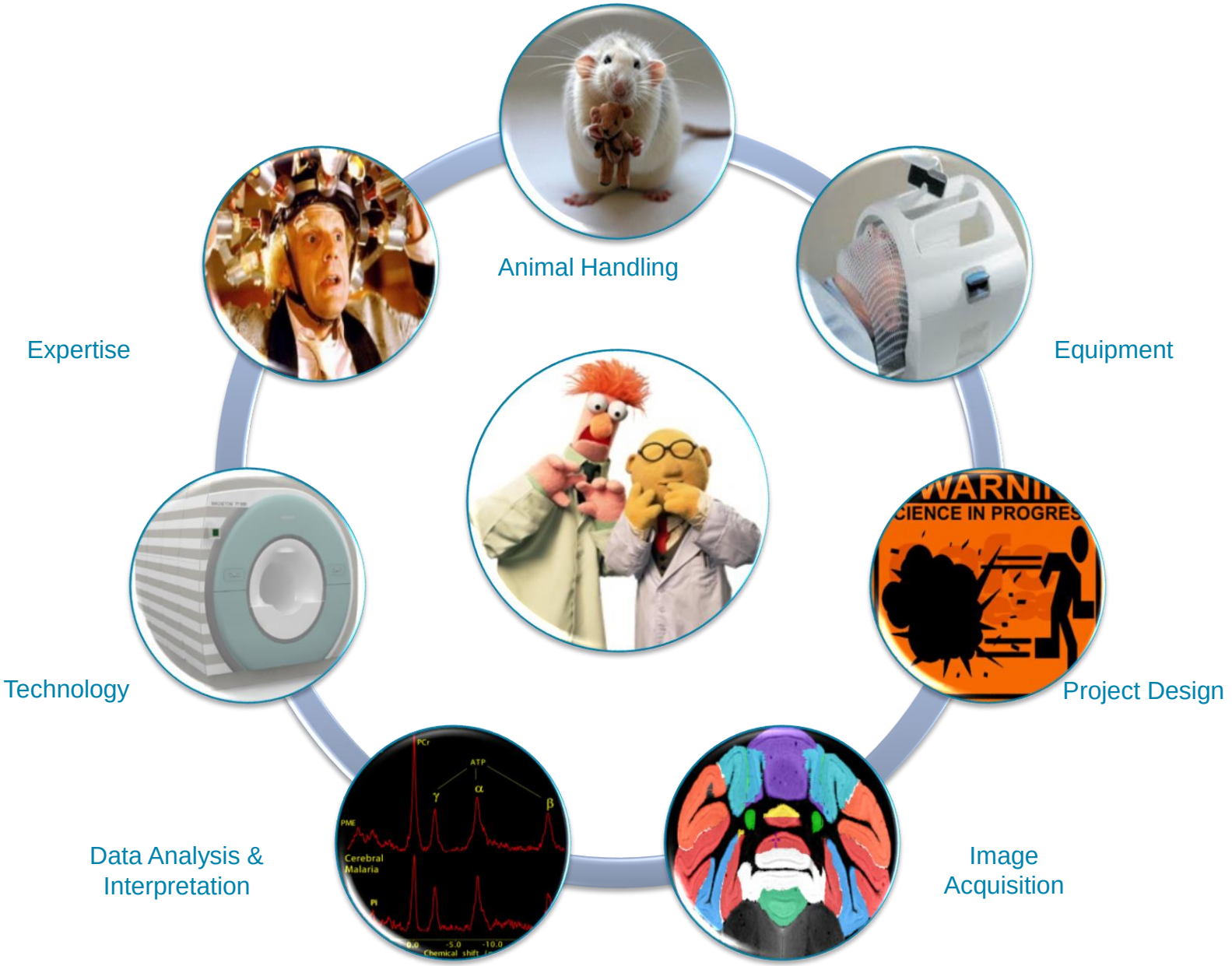
THE UNIVERSITY OF QUEENSLAND AUSTRALIA
UNSW
THE UNIVERSITY OF WESTERN AUSTRALIA
MONASH University
University of Western Sydney
SWINBURNE UNIVERSITY OF TECHNOLOGY
THE FLOREY INSTITUTE OF NEUROSCIENCE & MENTAL HEALTH
THE UNIVERSITY OF MELBOURNE

- Provide *expertise* in the area of technology supported by the node;
- Ensure appropriate ethical, radiological & biological clearances;
- Organise education/training programs for potential end-users;
- Facilitate Access & provide advice of research structure & protocols.

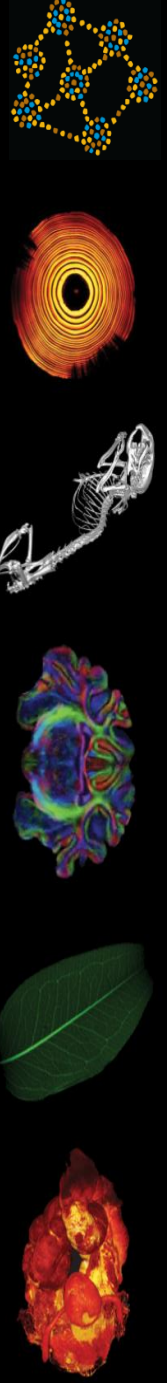
- Support the specific technologies;
- Undertake the roles of the Facility Fellows;
- Responsible – rolling out enabling technologies to the wider research community;
- Facilitate the collaborative development of technology, thus ensuring that max. benefit is achieved by this opportunity for national collaborative research.



- Developing common platforms & databases of normative data to enable imaging research nationally;
- Responsible for the roll out of an Informatics system to other NIF sites;
- Integration of the NIF with ANDS;
- Databasing & atlasing of large cohorts (n=10,000+);


Animal Handling
Equipment
Project Design
Image Acquisition
Data Analysis & Interpretation
Technology
Expertise
PCr
ATP
γ
α
β
PME
Cerebral Malaria
Pi
Chemical shift

Exploring Inner Space



Lead Institution

THE UNIVERSITY OF QUEENSLAND
AUSTRALIA

NCRIS
National Research Infrastructure for Australia
An Australian Government Initiative

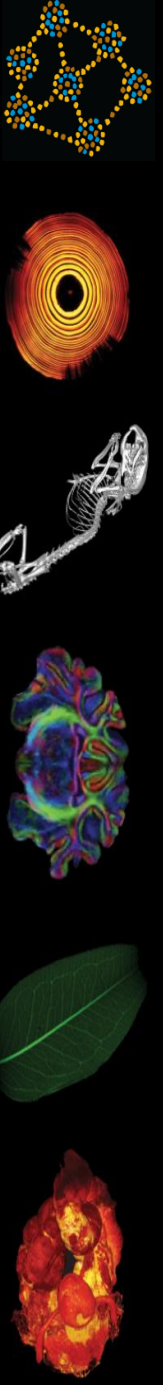
Unincorporated Joint Venture Agreement (UJVA)

Large Animal Research & Imaging Facility

THE FLOREY INSTITUTE OF NEUROSCIENCE & MENTAL HEALTH
MONASH University
THE UNIVERSITY OF SYDNEY
University of Western Sydney
UNSW
SAHMRI
THE UNIVERSITY OF ADELAIDE AUSTRALIA
UniSA
THE UNIVERSITY OF MELBOURNE
THE UNIVERSITY OF WESTERN AUSTRALIA
Australian Government
ansto
Nuclear-based science benefiting all Australians
SWINBURNE UNIVERSITY OF TECHNOLOGY

State Funding Agreement

Queensland Government
New South Wales Government
Government of South Australia
WESTERN AUSTRALIA



ACKNOWLEDGEMENTS

Far too many to mention

CAI – UQ

NIF nodes

Monash – MASSIVE

ANDS

NeCTAR

National Imaging Facility

To find out more about NIF: www.anif.org.au

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