

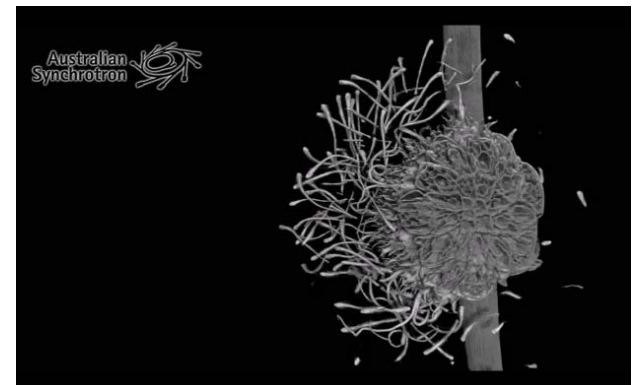
# Computed Tomography at the Australian Synchrotron: A new tool for your research

Anton Maksimenko

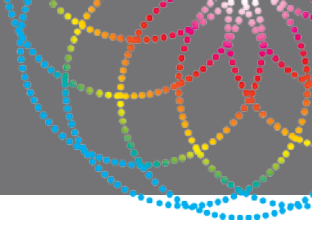
Supported  
by

# CONTENTS

- What is Synchrotron
- Introduction to the Imaging and Medical Beamline
- Imaging techniques and Computed Tomography
- Data processing and management
- Visualization
- Beam time access



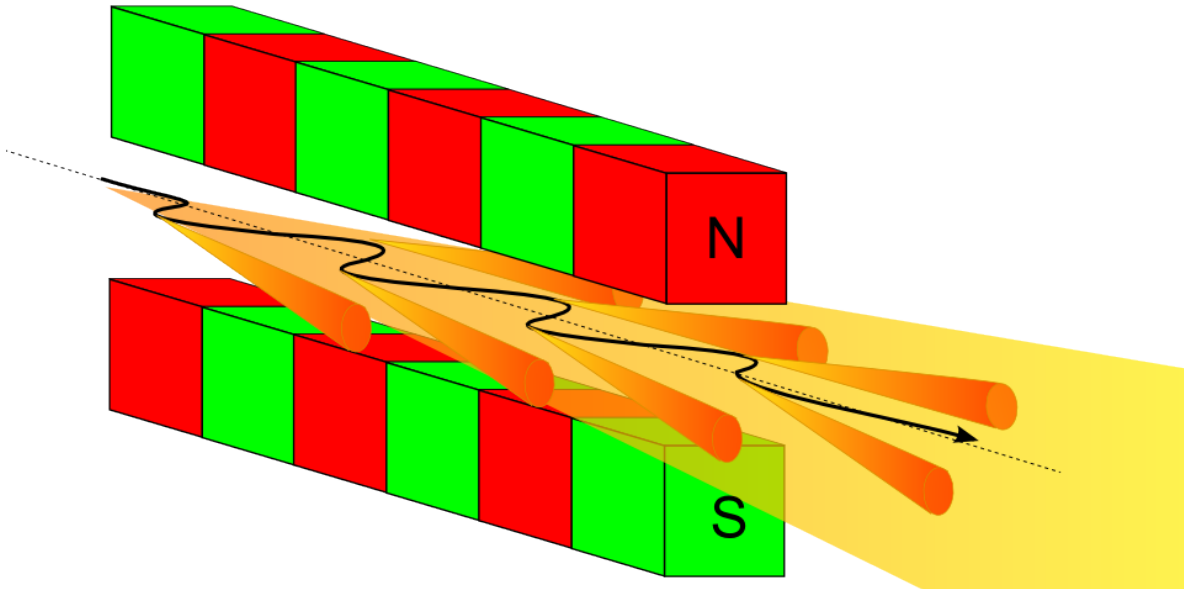
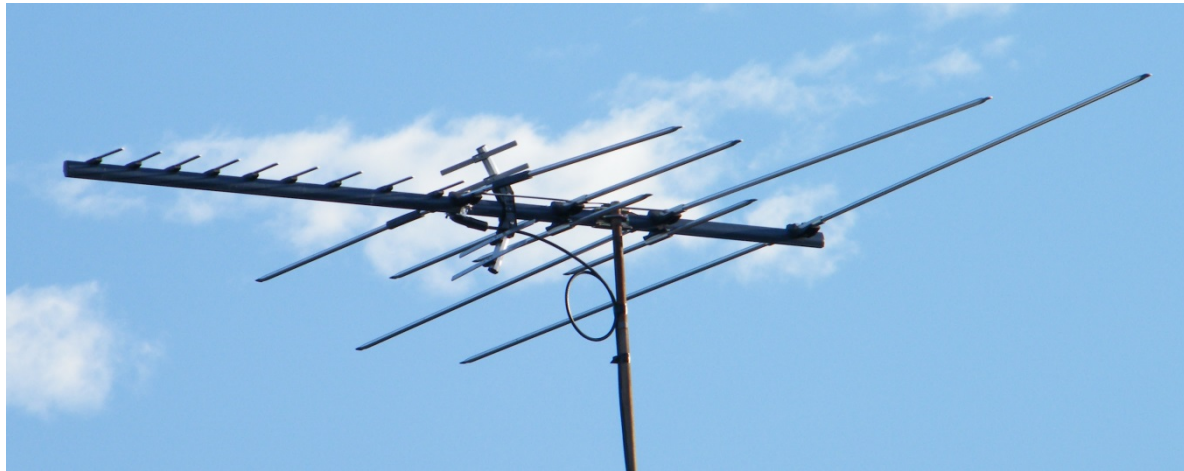
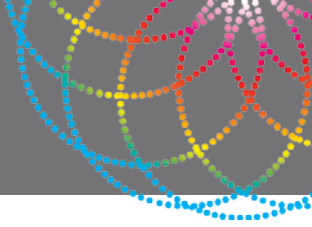
# What is Synchrotron?



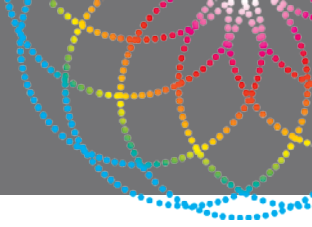
Quick answer:



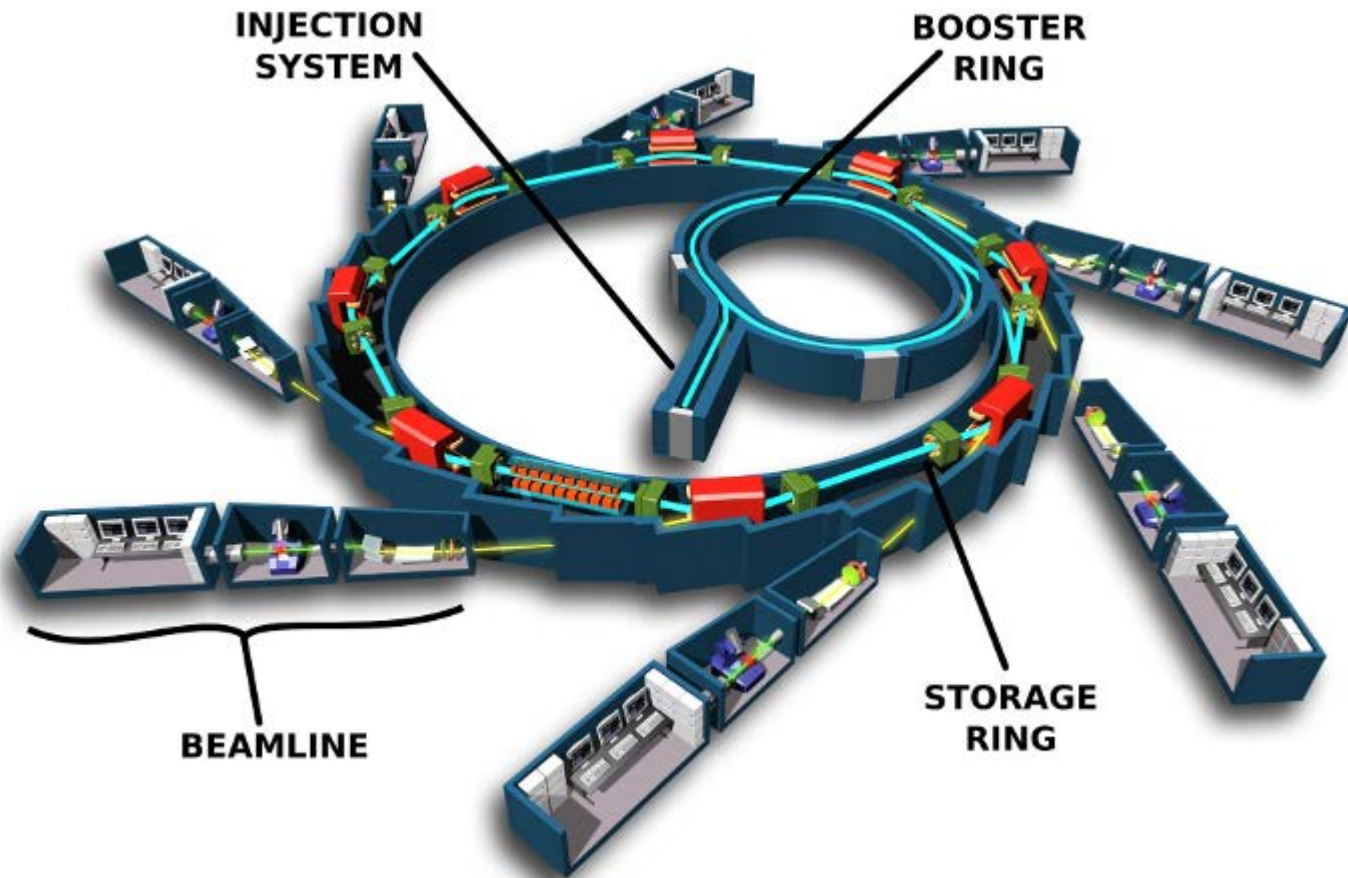
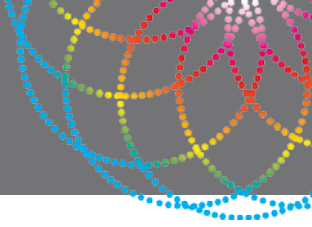
# How does it work?



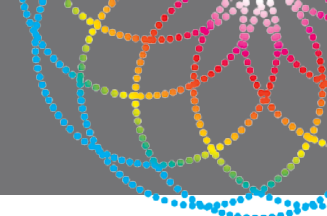
What does it look like?



# Big picture



# IMAGING AND MEDICAL BEAMLINE



IMBL

140m

High resolution  
imaging and CT  
Beam up to **50cm** wide

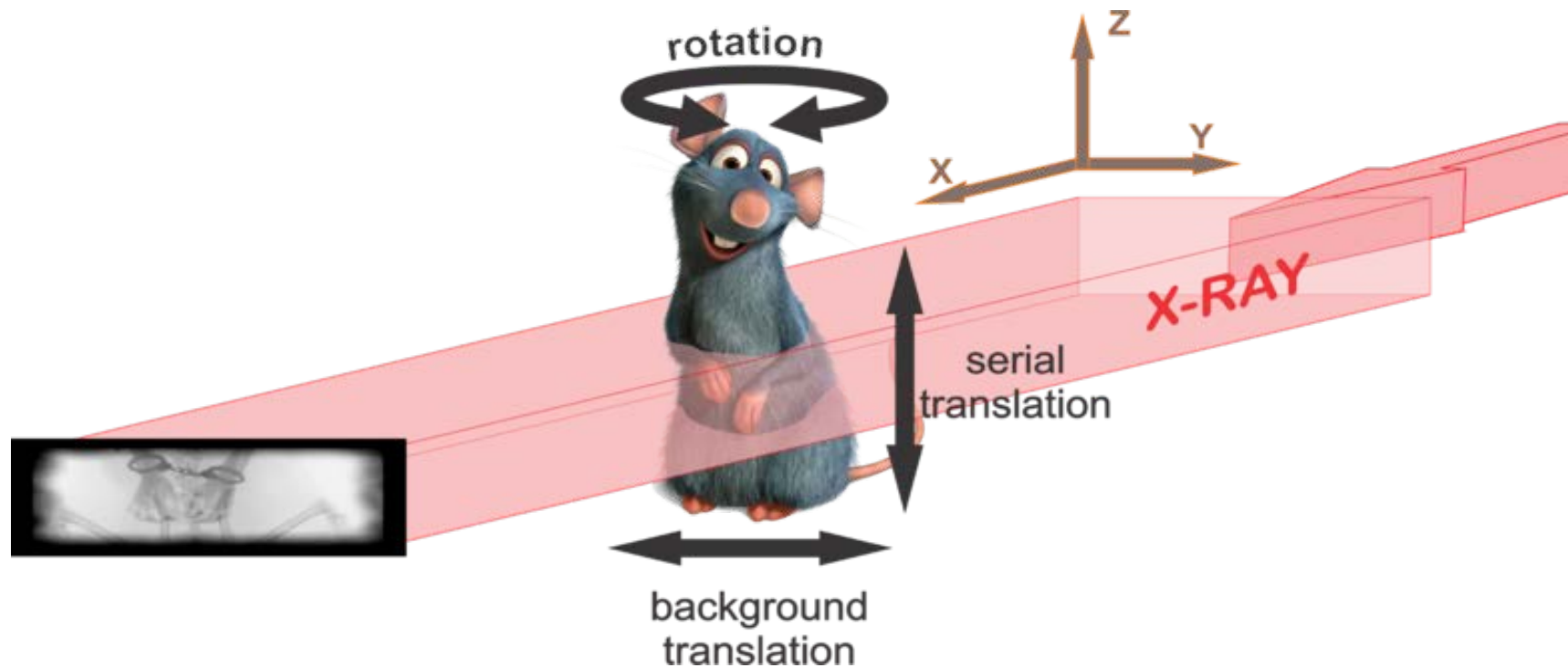
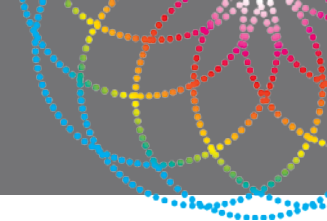
35m

**Fast** imaging and CT,  
DynMRT

20m

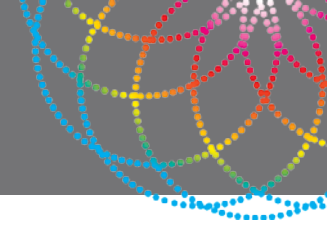
High dose **radiation**  
**therapy** using micro-beams

# IMAGING EXPERIMENT





# DETECTORS

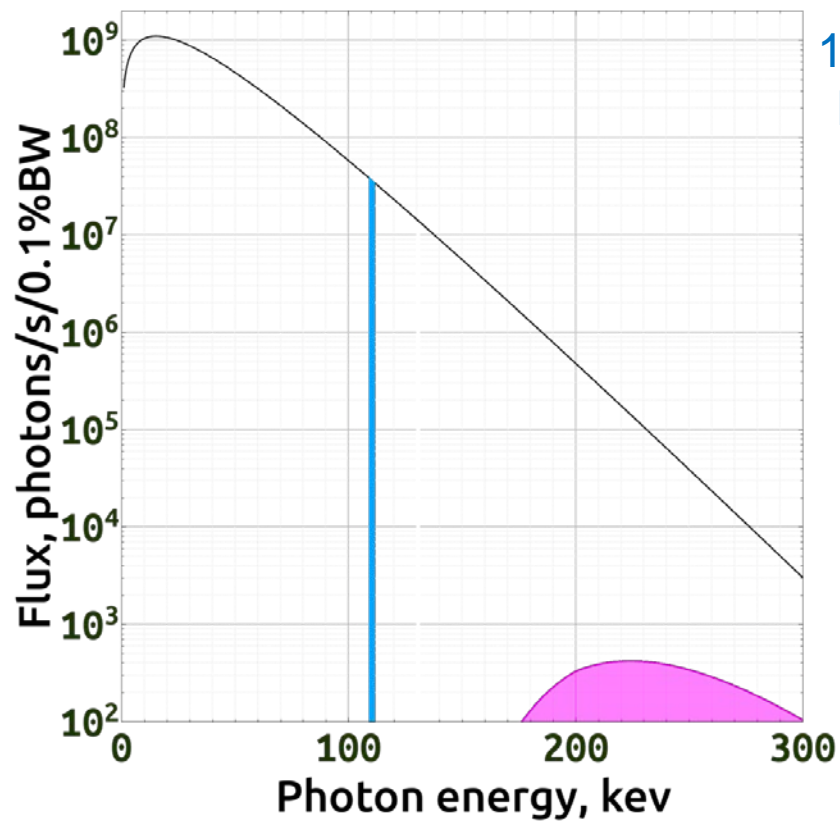


Detector name	Resolution (microns)	Speed (frame/s)
Diamond	0.6 - 30	100
Amethyst	22	3
Ruby	5.7 - 47	100
Amber	60	1.2
Quartz	200	146
Opal	27	3

# PINK OR MONOCHROMATIC BEAM



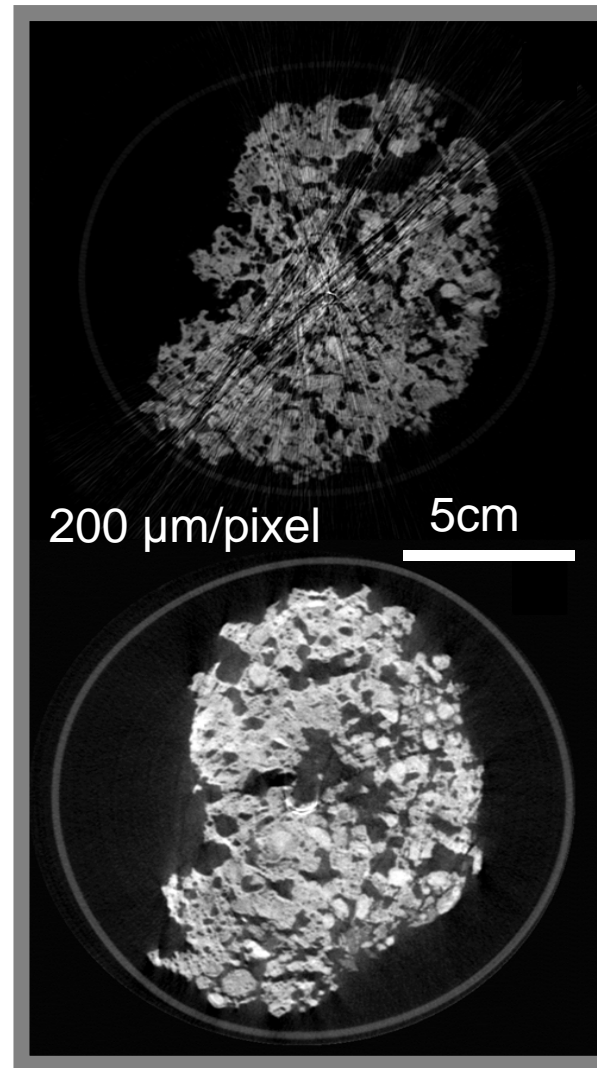
Measure of brightness



110keV  
Mono

Pink  
Beam

Measure of penetration ability



slower

faster

200  $\mu\text{m}/\text{pixel}$

5cm

# CONTRAST MECHANISMS



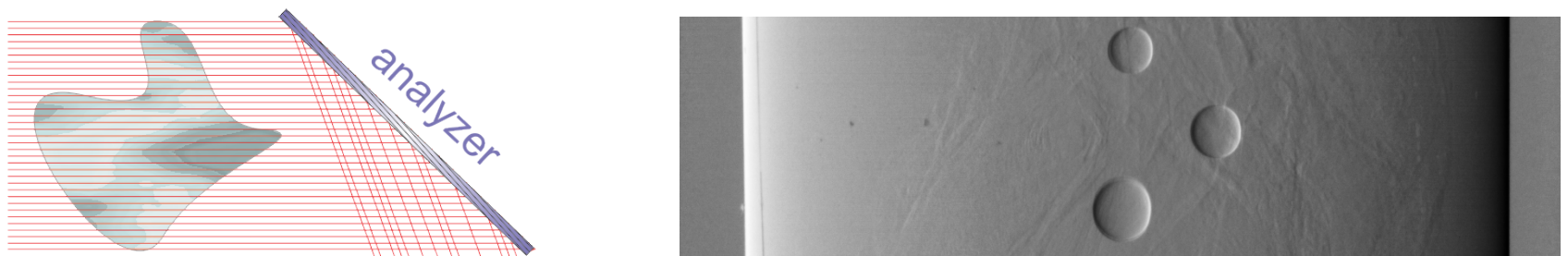
## Absorption



## Inline phase contrast



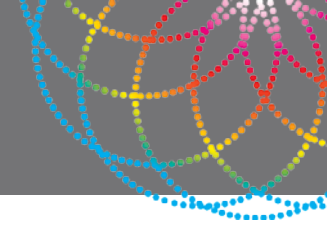
## Diffraction enhanced imaging



6  $\mu\text{m}/\text{pixel}$

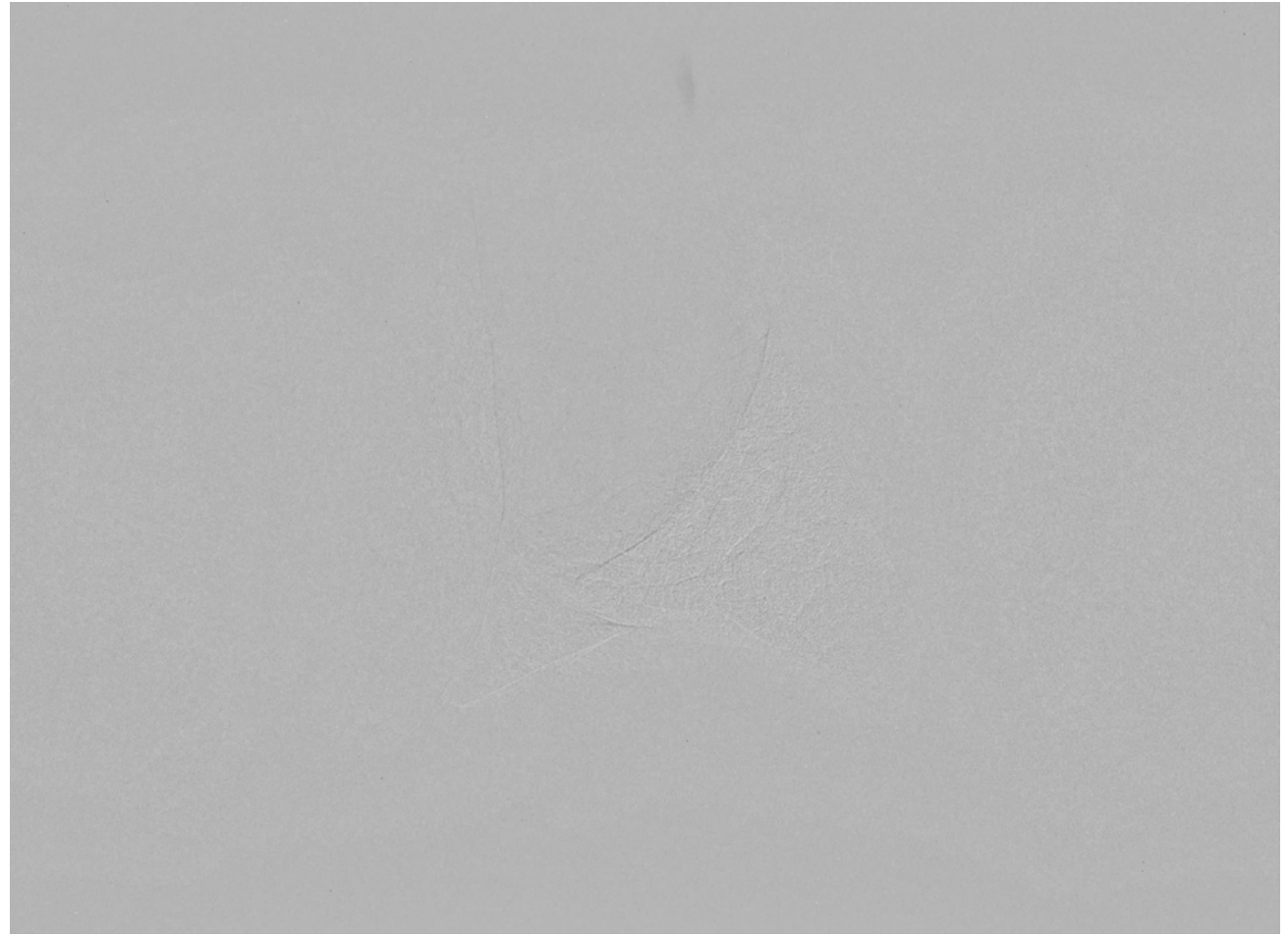
2mm

# FAST IMAGING



Mouse lung showing  
blood-gas exchange  
interface

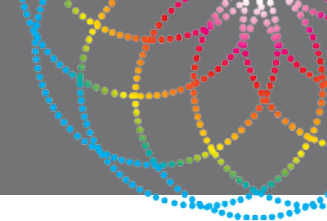
Rescue lung damage  
of the premature  
born babies -  
paediatric  
bronchopulmonary  
dysplasia



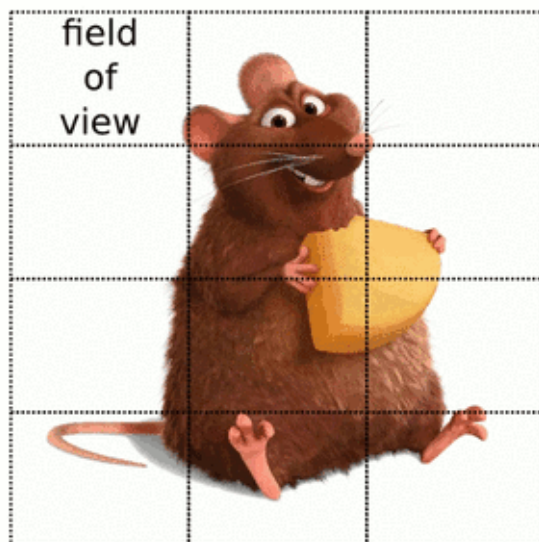
50  $\mu\text{m}/\text{pixel}$

2mm

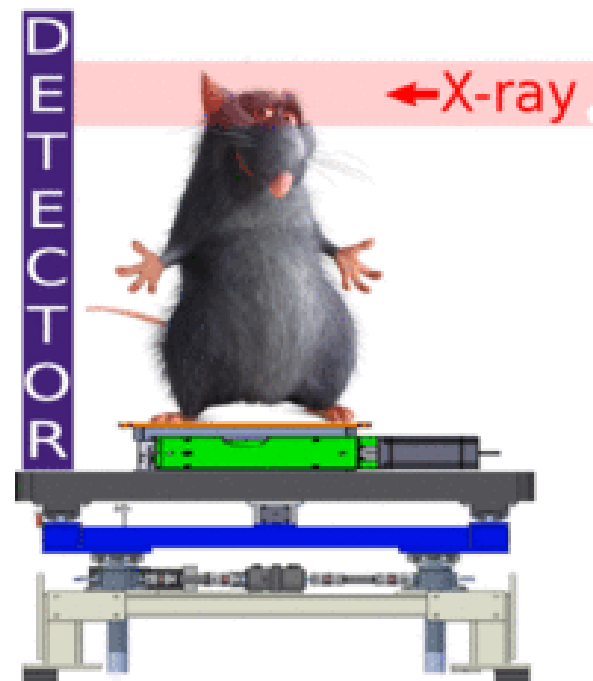
# LARGE OBJECTS IMAGING



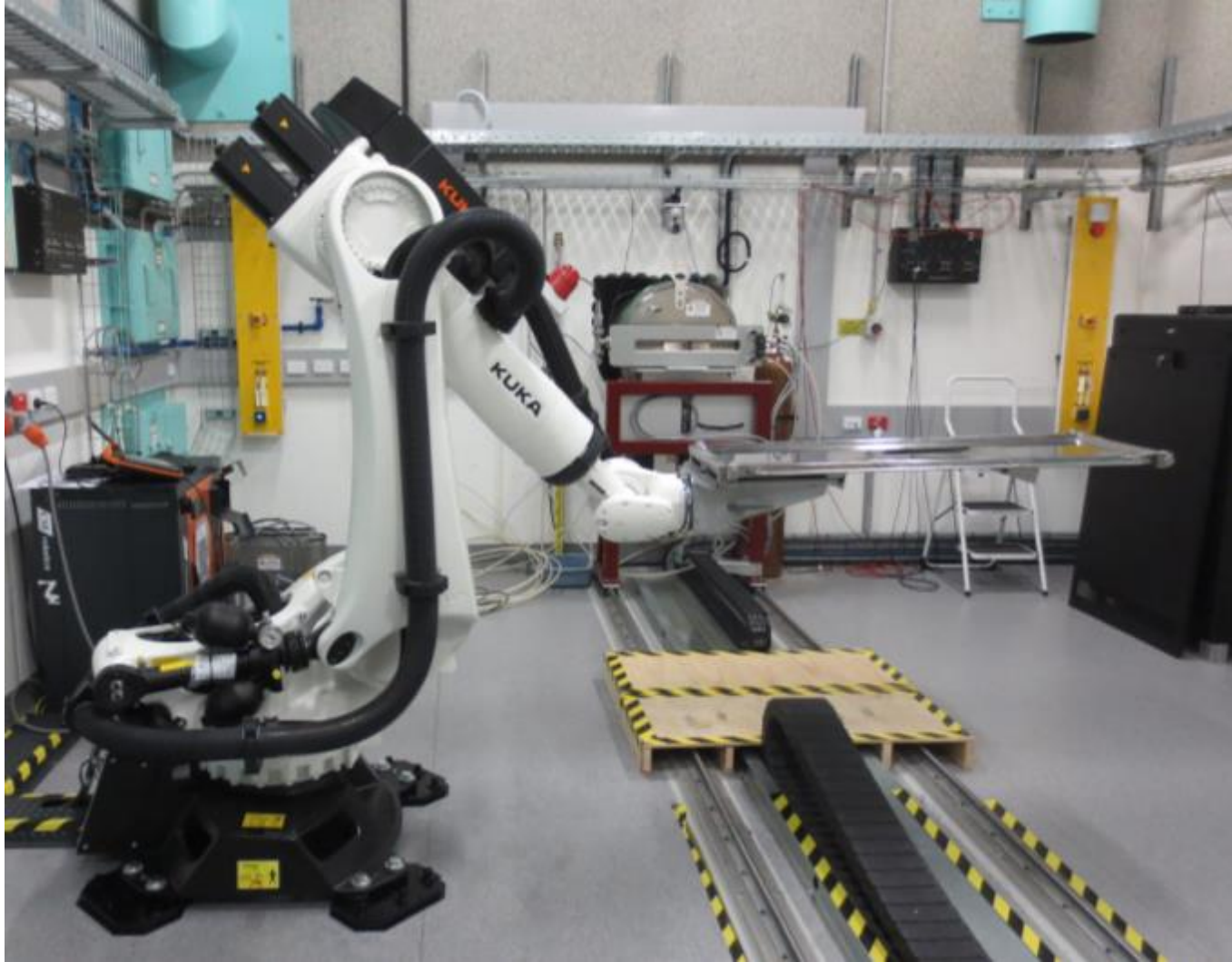
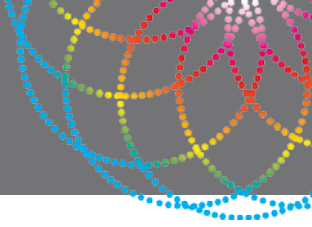
Tiled imaging



Scan-through imaging



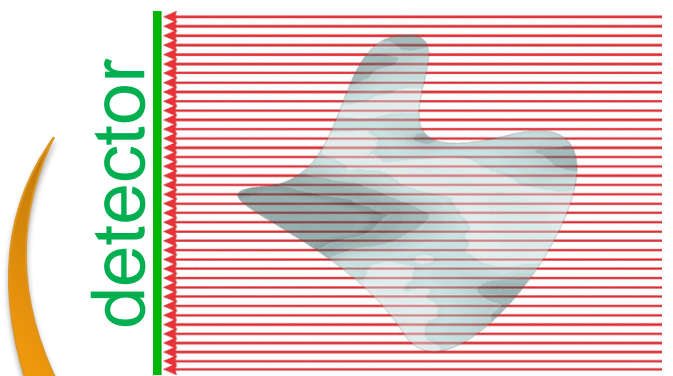
# LARGE ANIMAL *IN VIVO* IMAGING



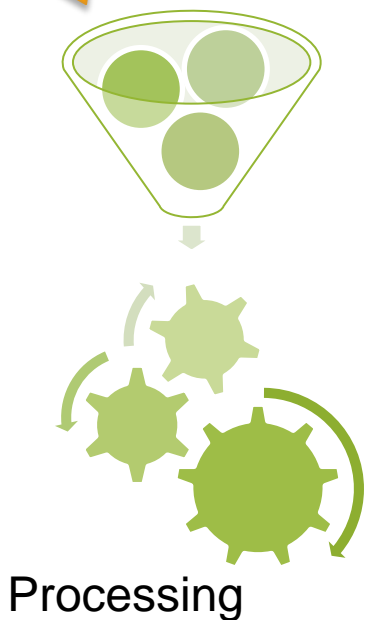
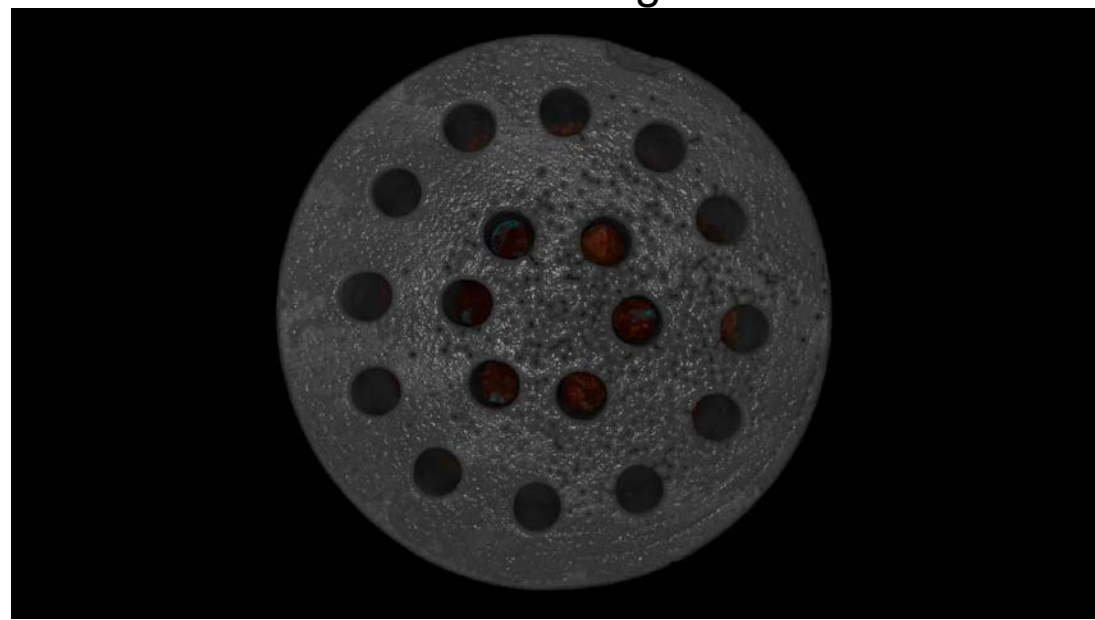
# COMPUTED TOMOGRAPHY



Acquisition



Rendering



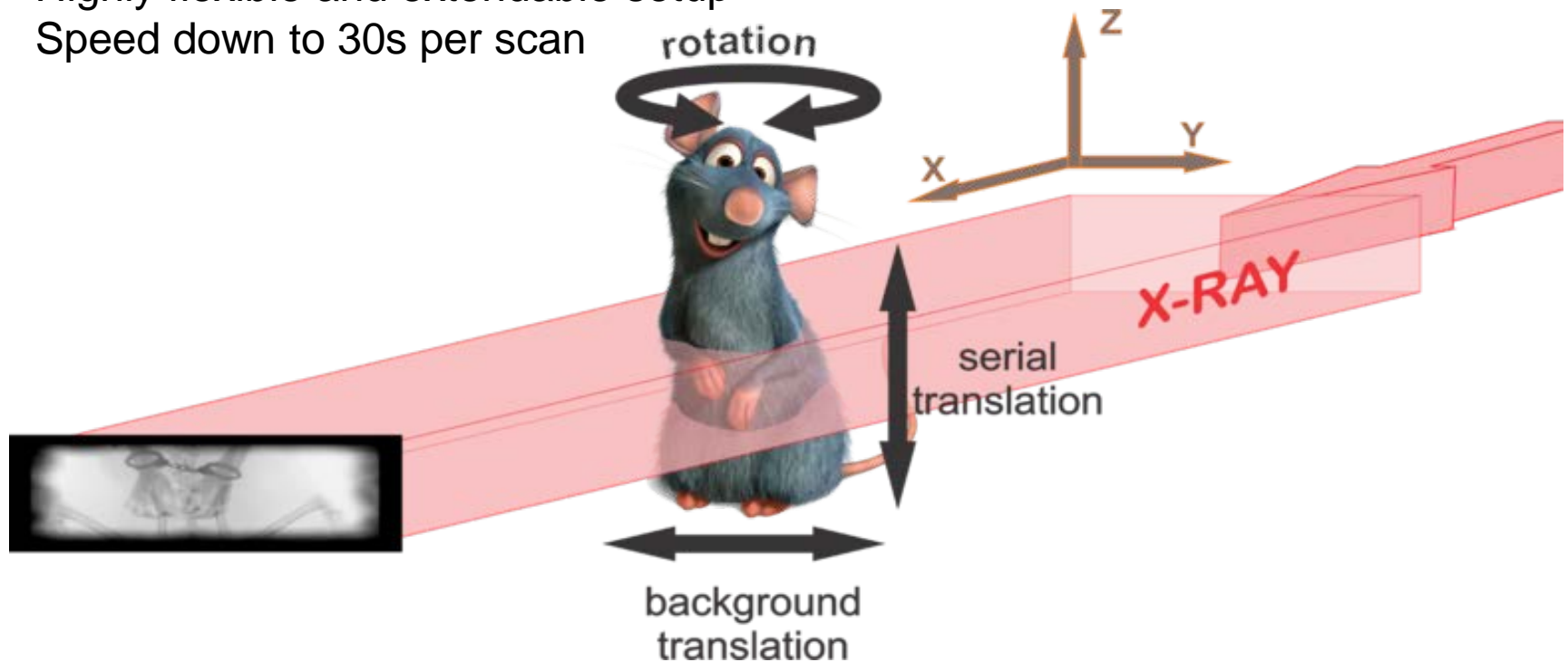
Slices



# CT AT THE IMBL

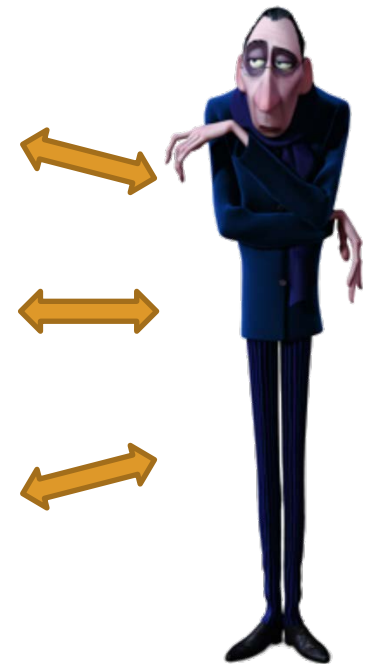
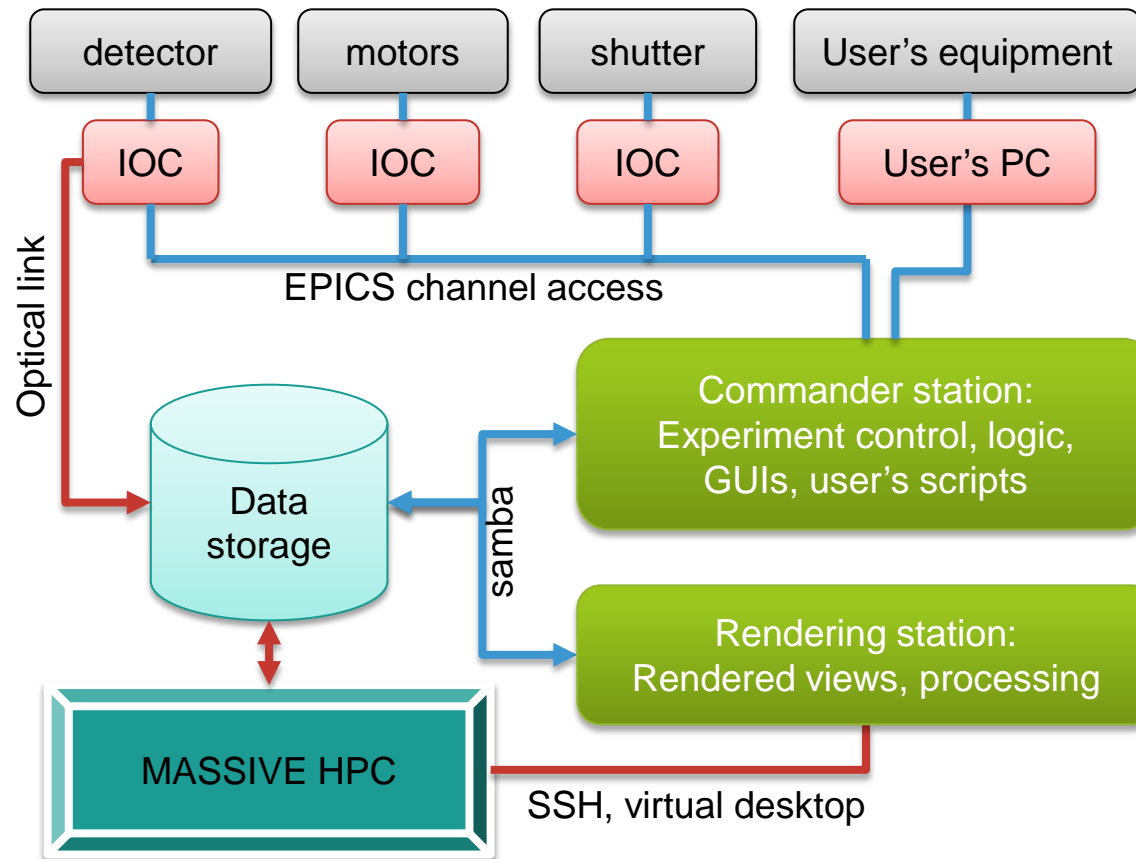


- Step-and-shoot acquisition or on-the-fly acquisition
- Tiled imaging
- Scan-through imaging
- 360deg scans
- Any of the contrast types
- (Almost) automatic reconstruction
- Highly flexible and extendable setup
- Speed down to 30s per scan



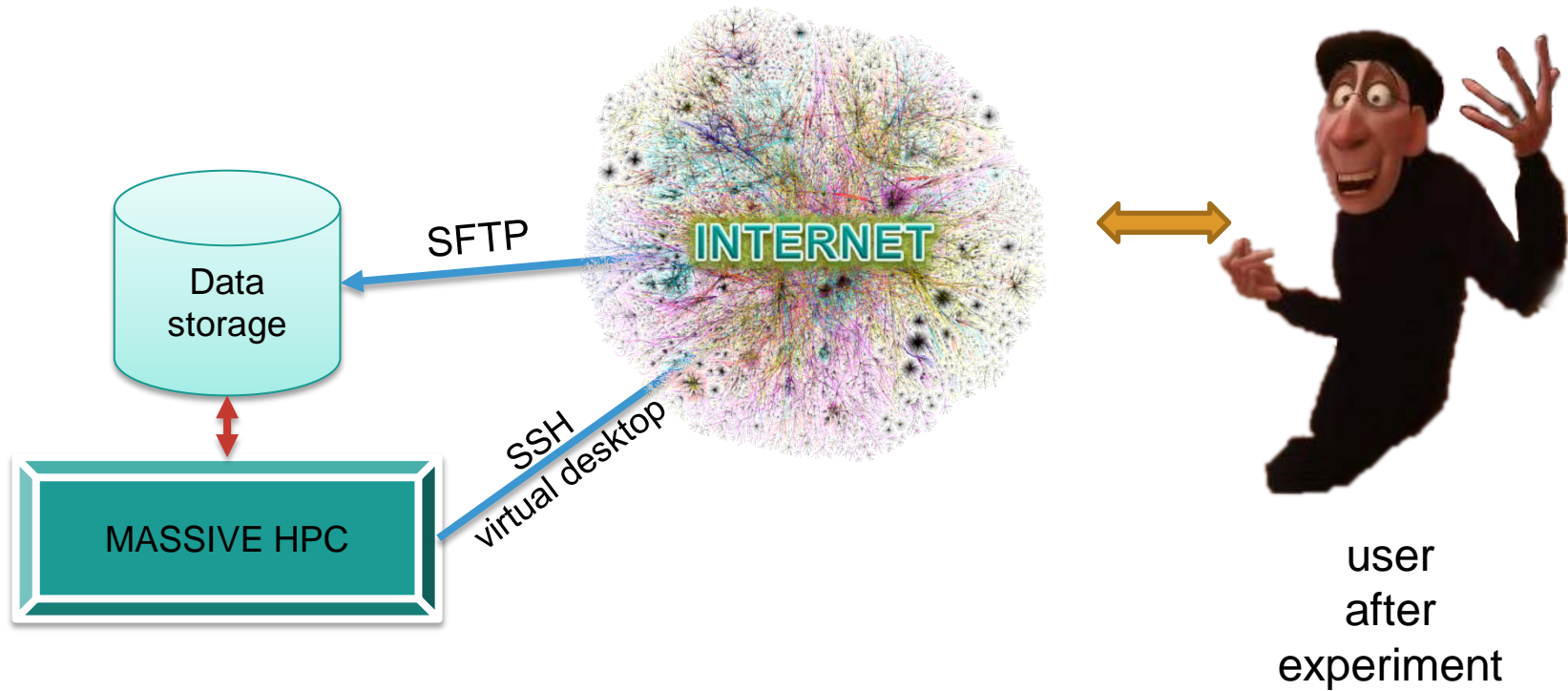
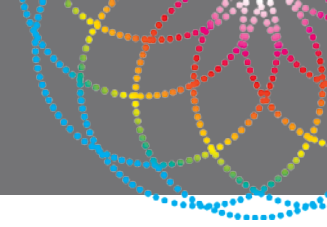


# EXPERIMENT EXECUTION

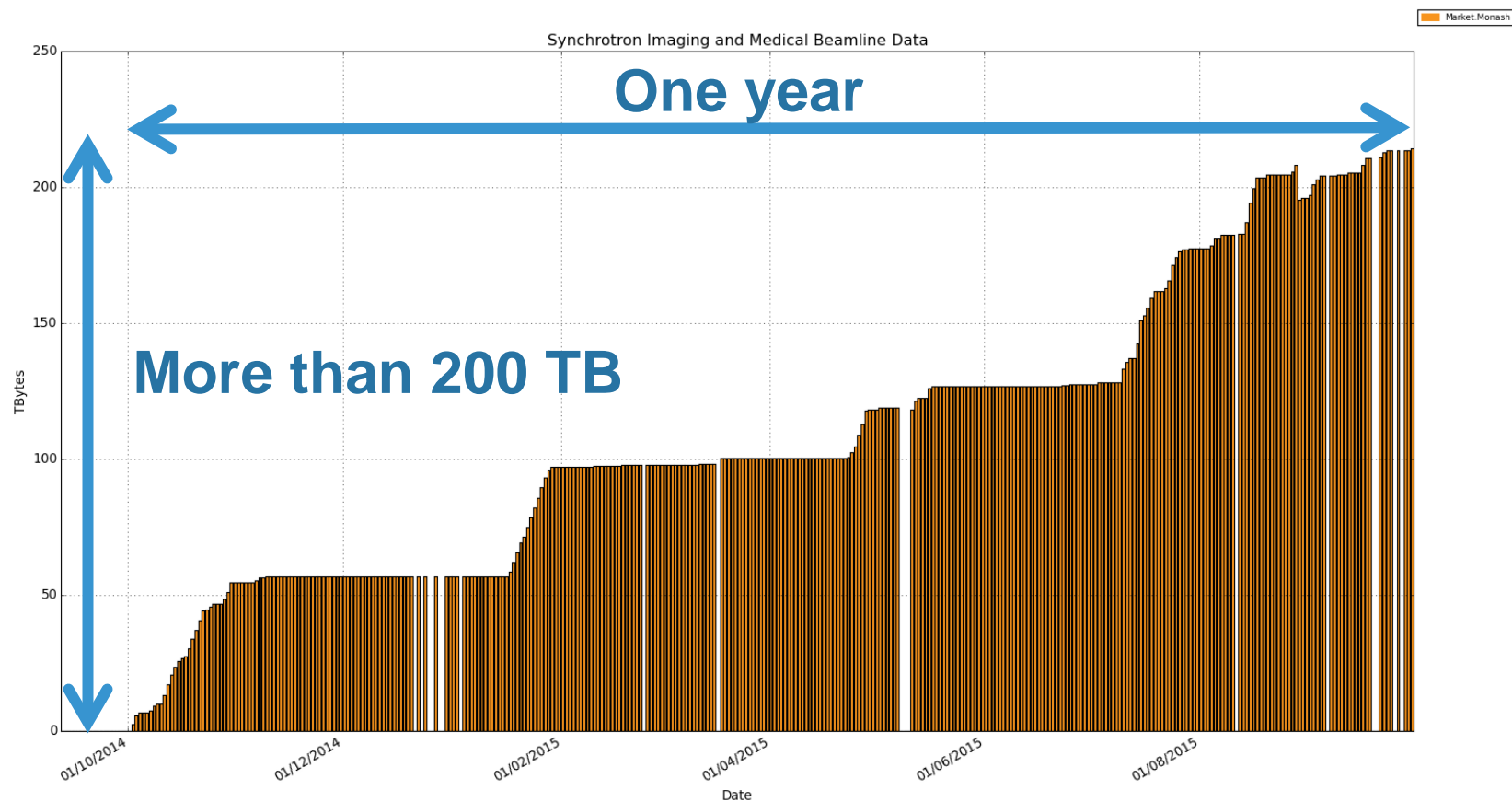
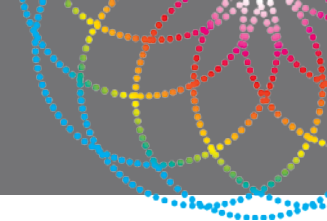


user during experiment

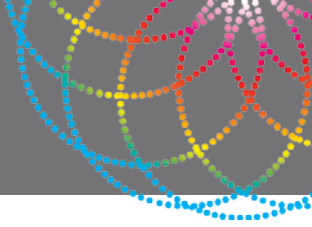
# POST-EXPERIMENT PROCESSING



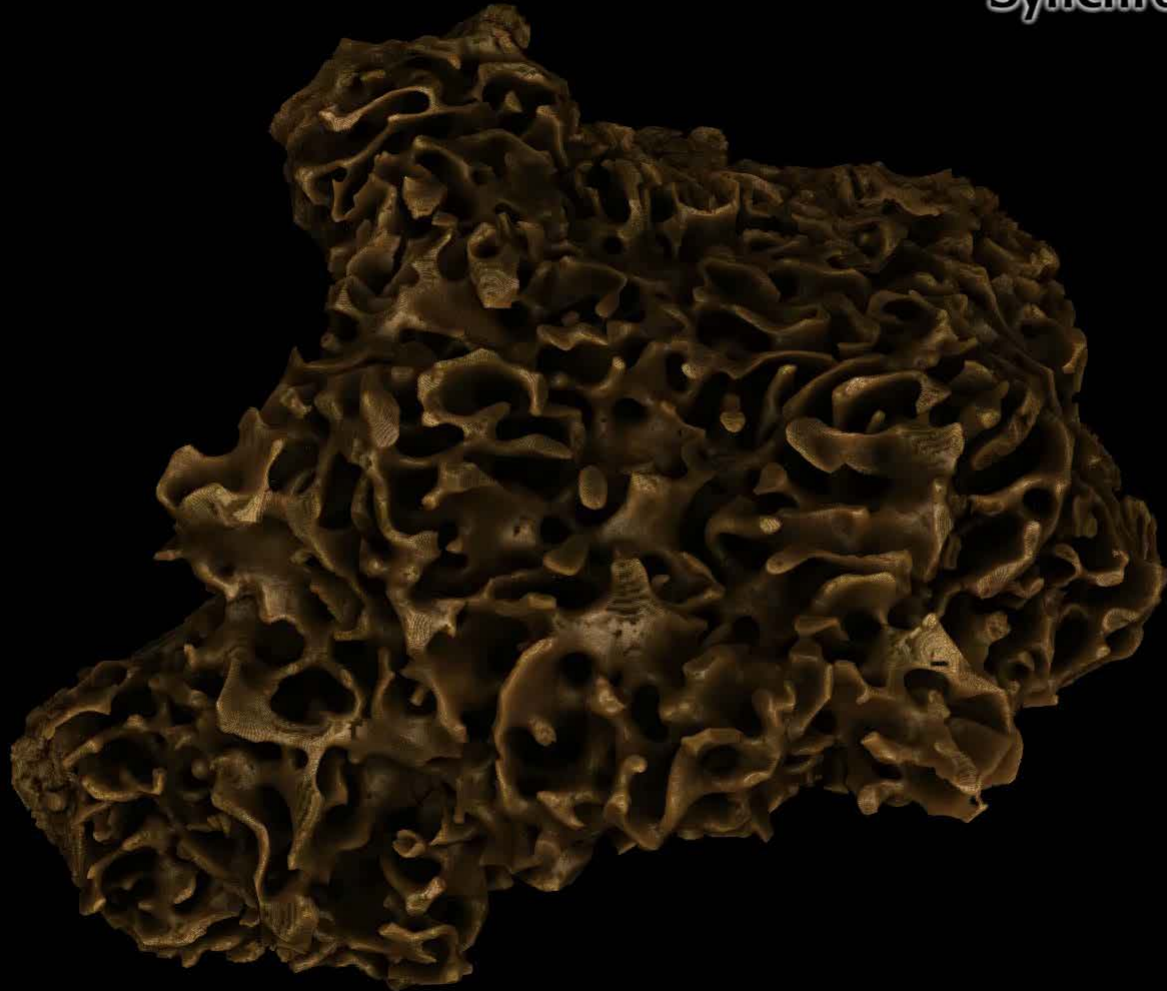
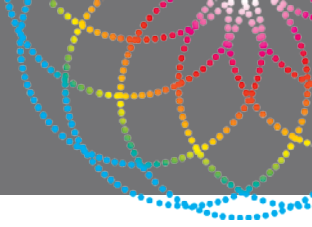
# CT DATA ACCUMULATION



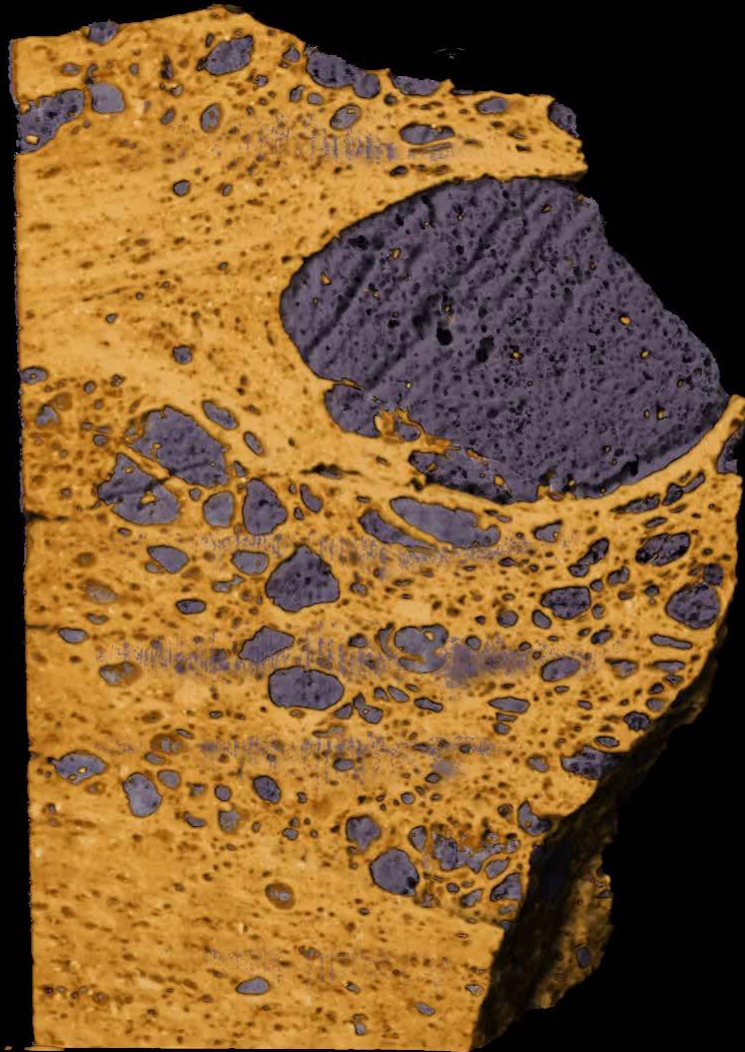
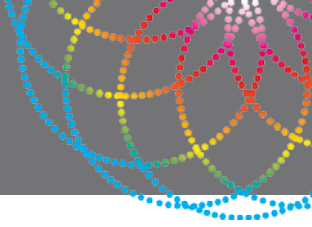
*Chorisandra enodis*



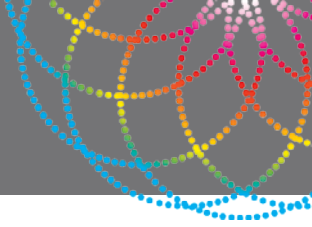
# TERMITE BREAKFAST



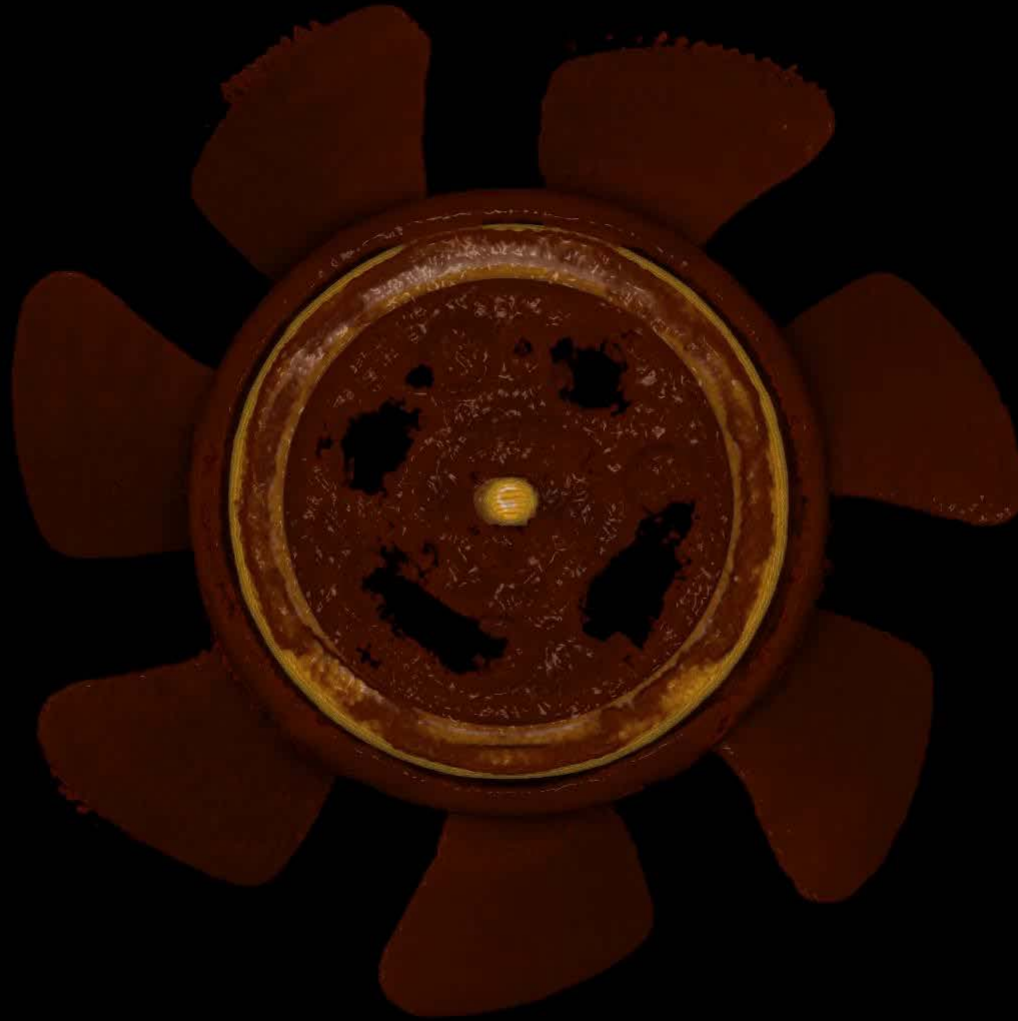
# VOLCANIC BOMB



# Mouse



# Turbo pump







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antonmxx

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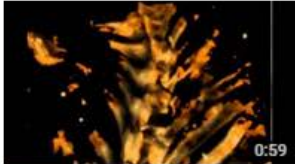
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Date added (newest - oldest) Grid

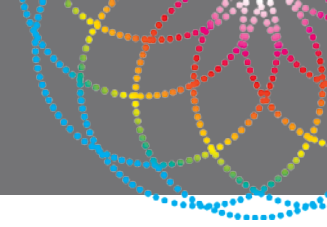
 2:25  
termite breakfast  
37 views • 1 month ago

 3:06  
Snail shell (guess what's wrong in here)  
57 views • 5 months ago

 0:59  
Louis-head-chopped  
81 views • 1 year ago

 2:57  
Same three flowers with music  
217 views • 1 year ago

# Access to the Australian Synchrotron



## Merit program

- Academic researcher
- Proposals submitted and reviewed by expert panels, three times each year.

## Commercial program

- Timely access
- Intellectual property fully protected
- Sample preparation, experiment, analysis and reporting may be conducted by a team of specialist scientists

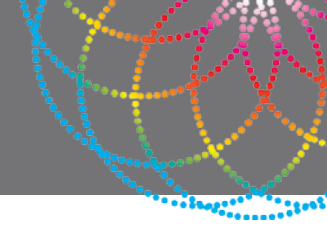
### ▪ **New South Wales (NSW) Industry Synchrotron Access scheme**

Commercial program for businesses in NSW, funded by NSW Government

Use of Australian Synchrotron free of charge; no matched funds required

Sample preparation, experiment, analysis and reporting may be conducted by a team of specialist scientists

# Key dates and further information

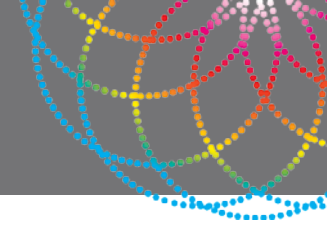


## 2016 Round 3, September - December

Submissions deadline: **24 May 2016**

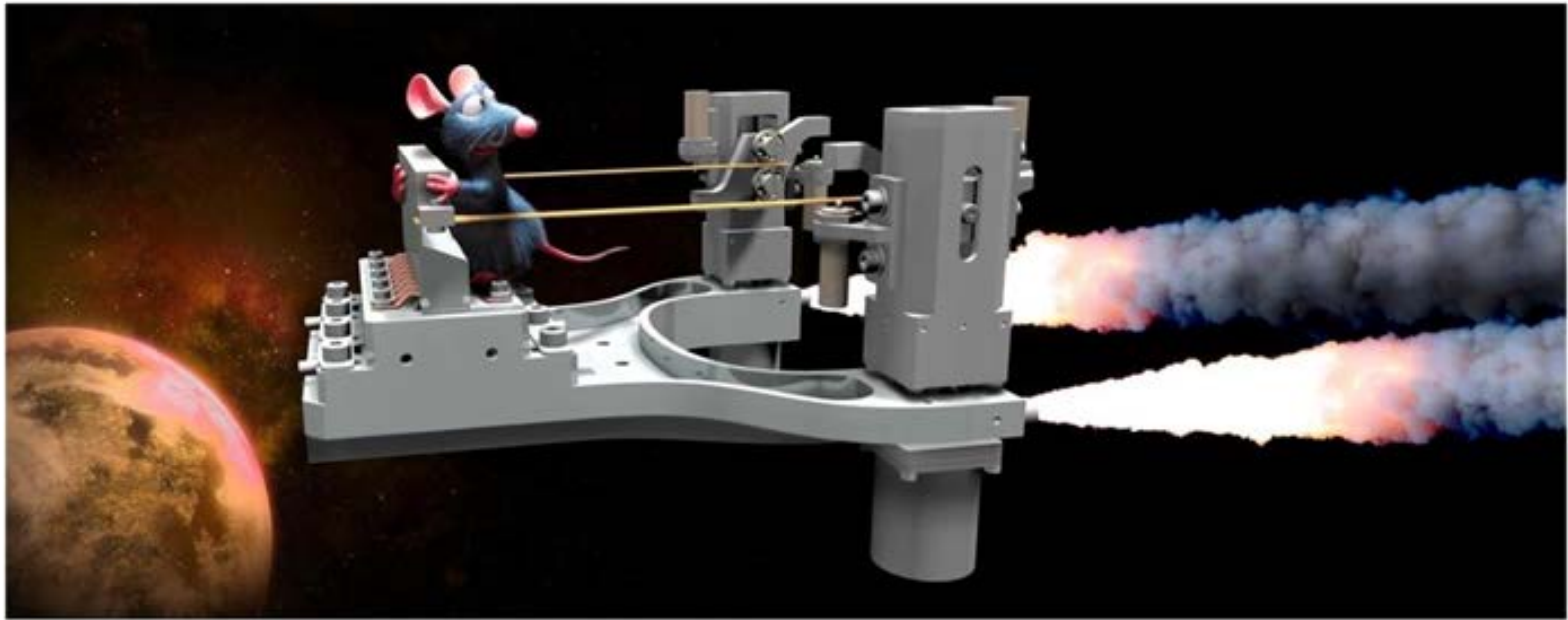
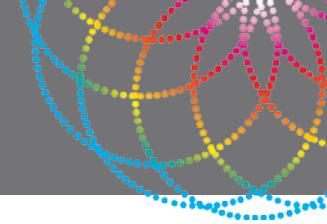
- For merit program access, visit: [www.synchrotron.org.au](http://www.synchrotron.org.au) and 'User Information' to find out more
- For commercial program access, visit: [www.industry.synchrotron.org.au](http://www.industry.synchrotron.org.au) to find out more

# Experiment planning



- Consult with the IMBL staff before applying.
- Contact IMBL staff at least 1 month prior to the scheduled experiment.
- Consider sample handling and mounting.
- Build the team (ideally 2 persons per 8 hour shift).
- Include people with good IT skills

THANK YOU



*IMBL - Boldly sending rats where no rat has gone before*

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