

A decorative graphic on the left side of the slide, consisting of several overlapping circles made of small dots in various colors (blue, green, yellow, orange, red, pink, white).

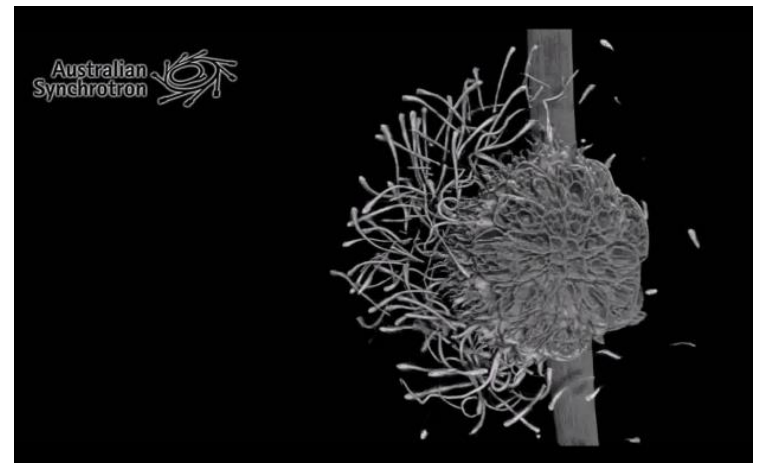
Imaging and Medical Beamline of the Australian Synchrotron **in and out of control.**

Anton Maksimenko

*Supported
by*

CONTENTS

- Beamline introduction
- Microbeam radiation therapy
- Imaging techniques
- Computed tomography
- Data management and processing
- Visualization



WIDEST SYNCHROTRON BEAM IN THE WORLD



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

IMBL INFRASTRUCTURE



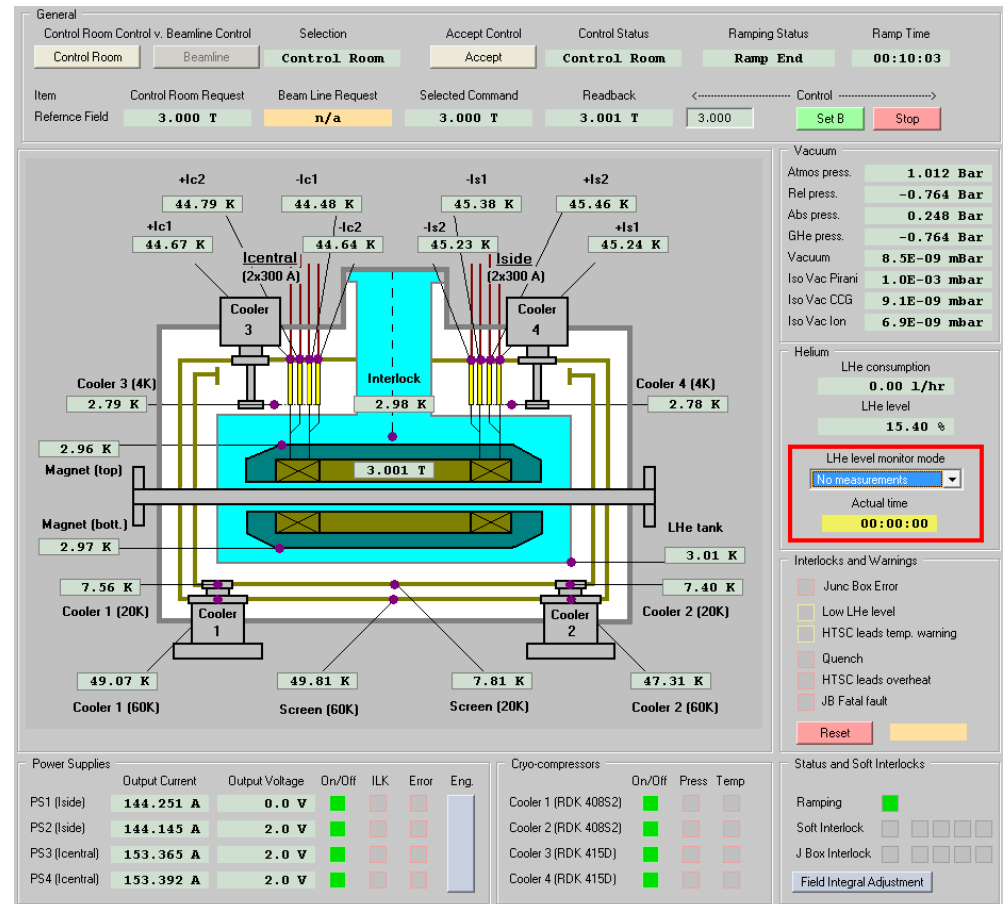
Animal facilities

On site surgeries and laboratories

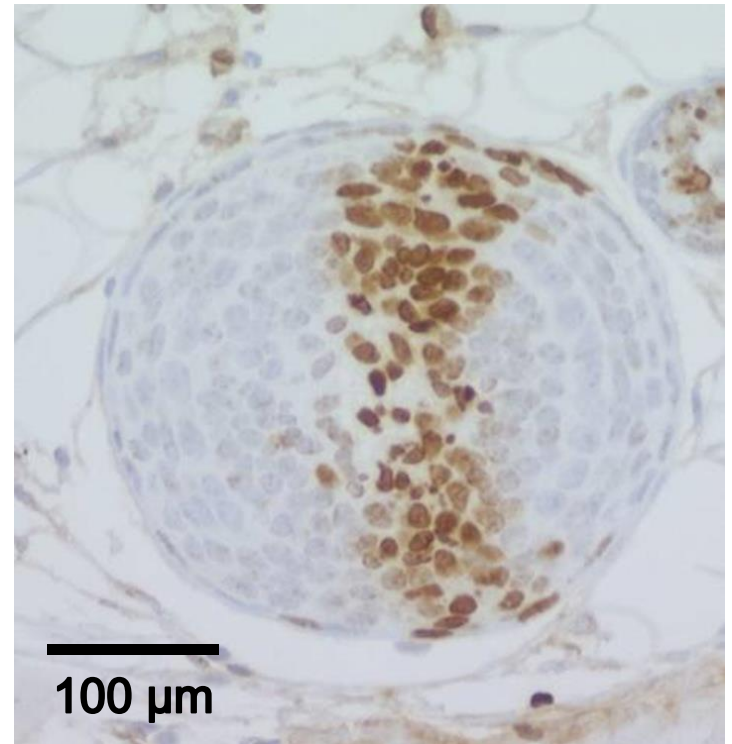
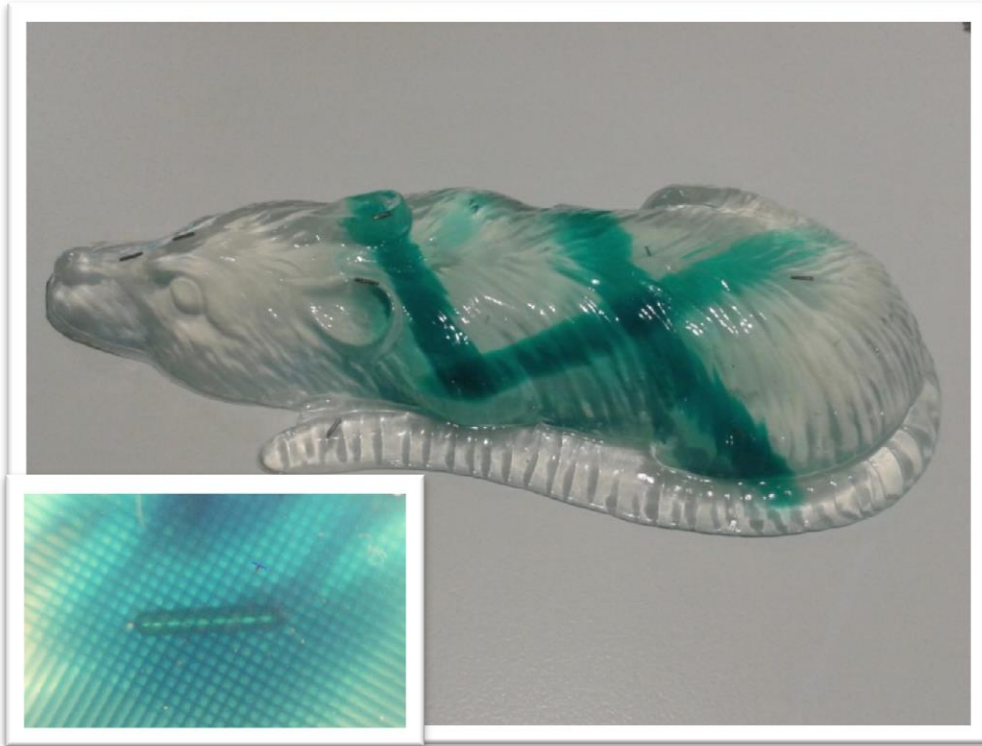
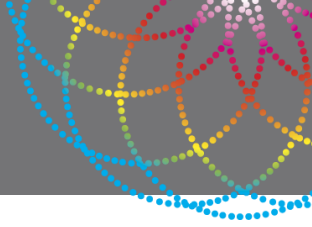


SOURCE: SUPERCONDUCTING MAGNET

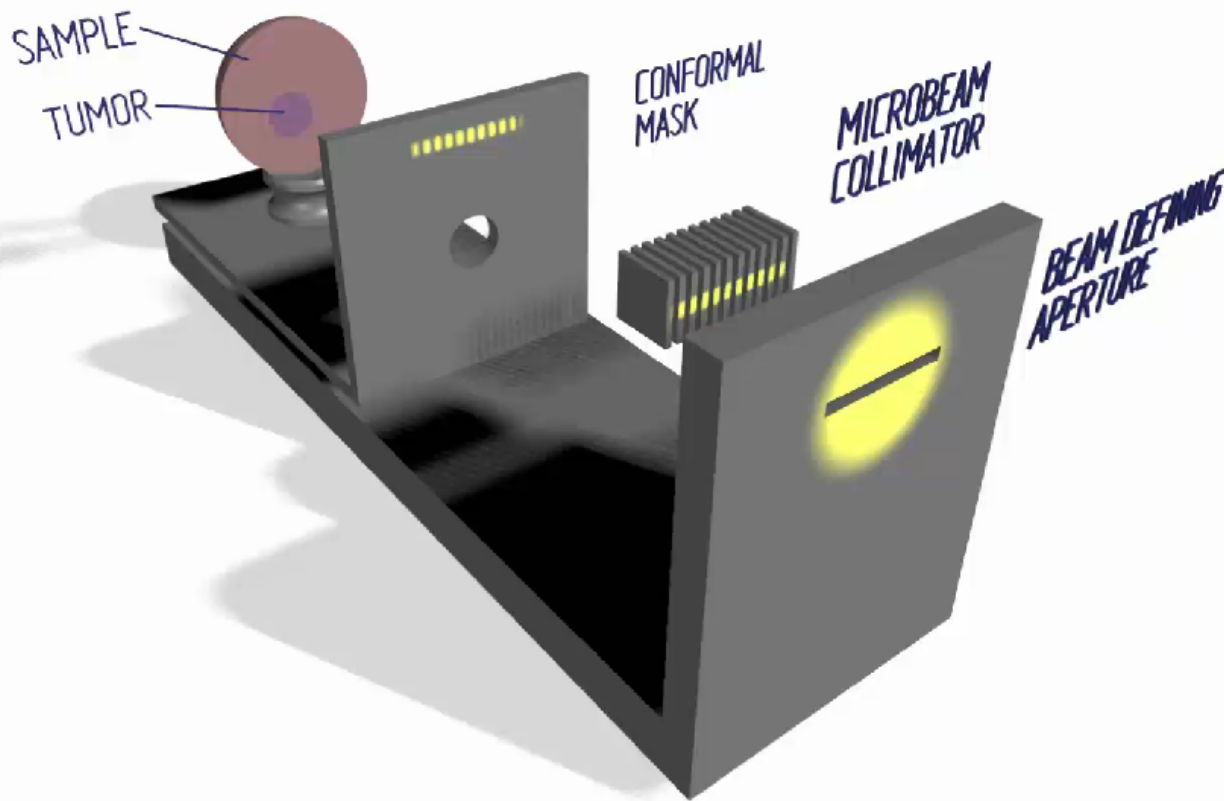
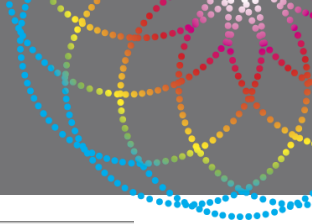
Up to 25kW of radiation power



MICROBEAM RADIATION THERAPY



MICROBEAM RADIATION THERAPY



More details in **MOPGF133** by Bryce Karnaghan

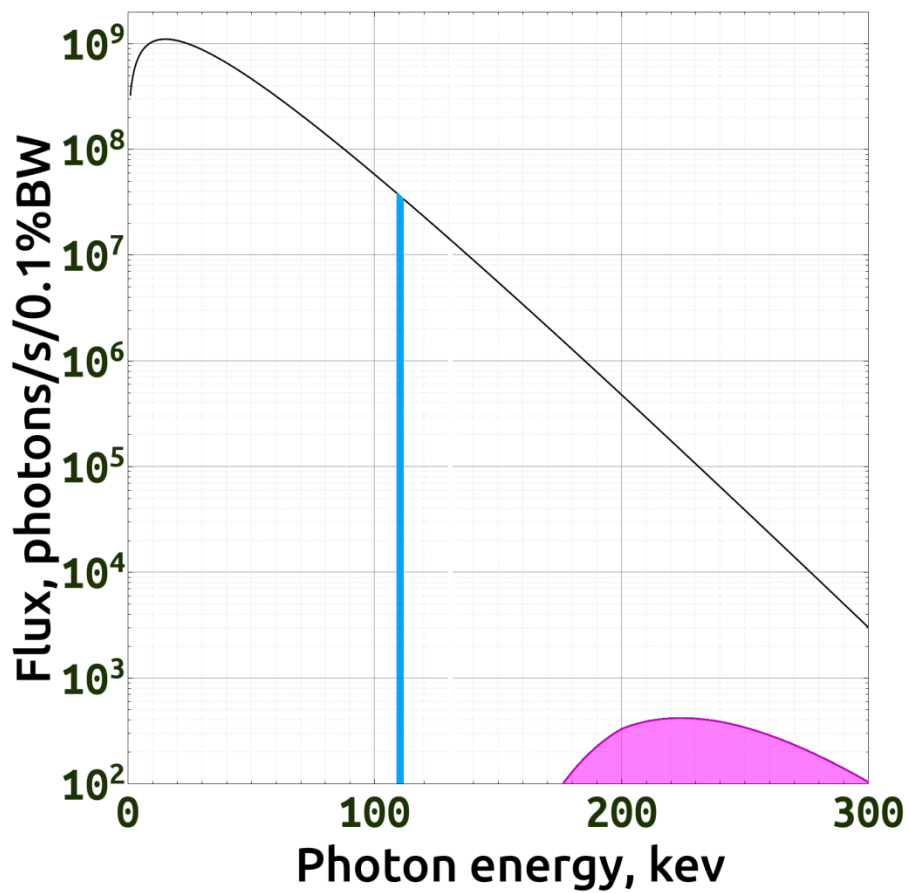
DETECTORS



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

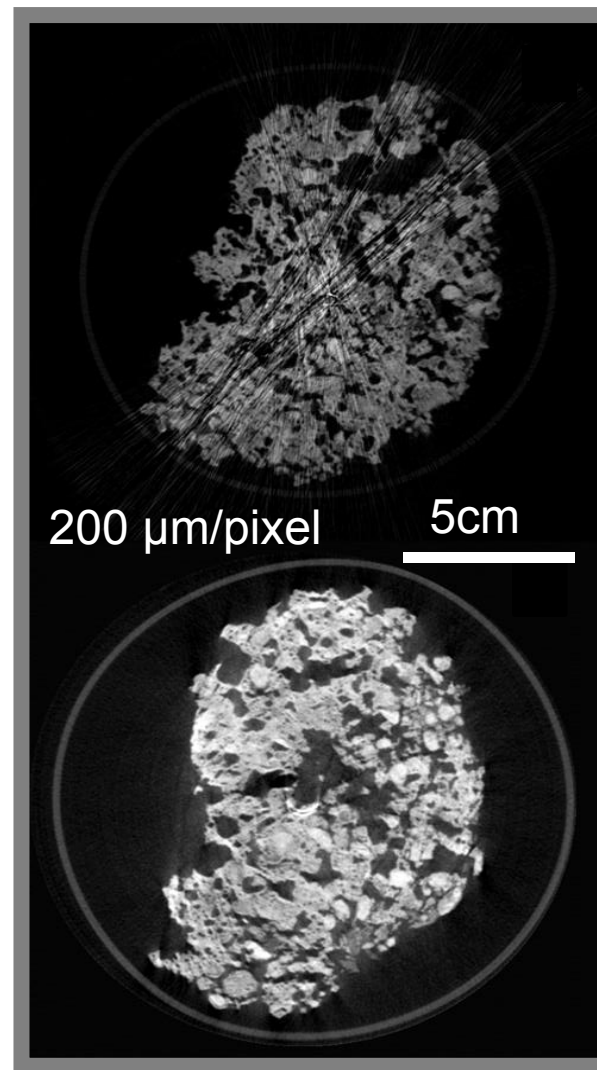
More details in **WEPGF140** by Paul Martin

PINK OR MONOCHROMATIC BEAM



110keV
Mono

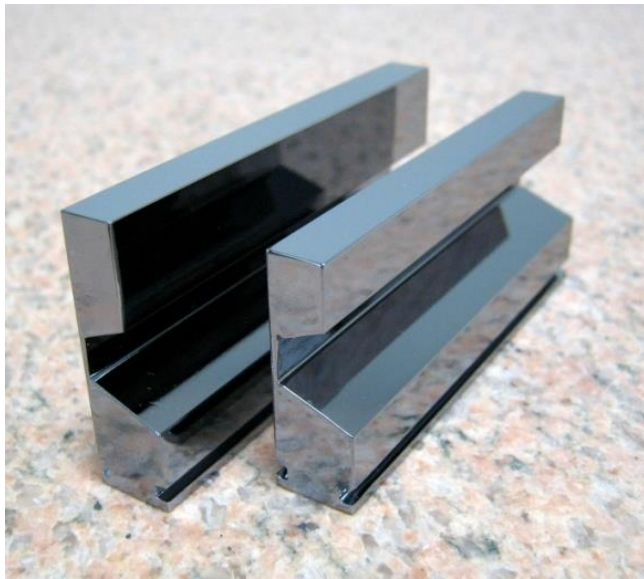
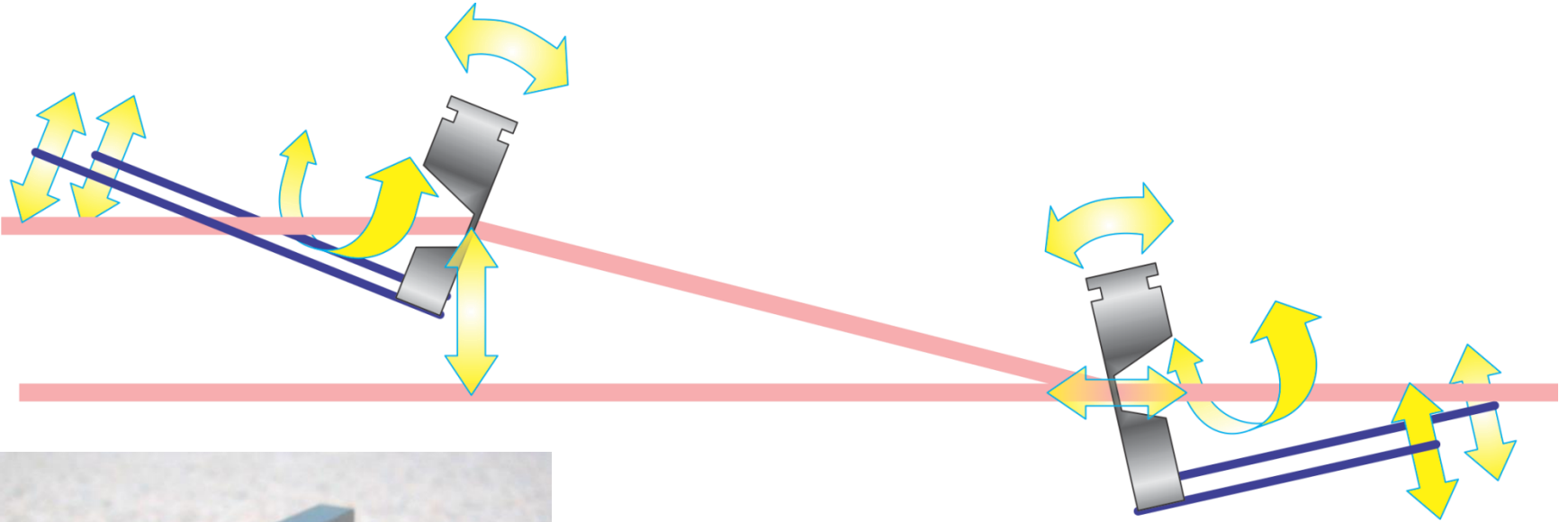
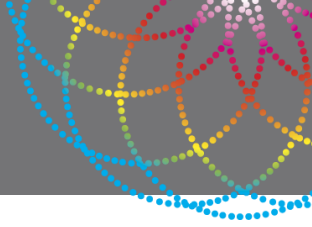
Pink
Beam



slower

faster

MONOCHROMATOR

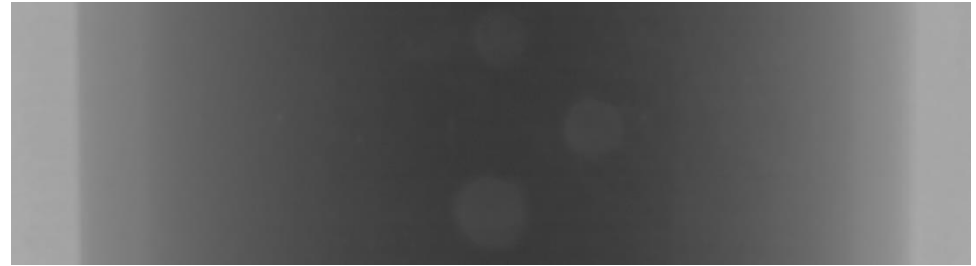
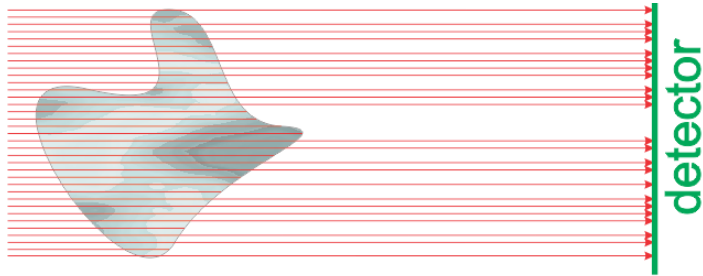


- Double bent Laue crystal geometrey
- Fast mono - pink switching
- Two diffraction types
- Eleven degrees of freedom

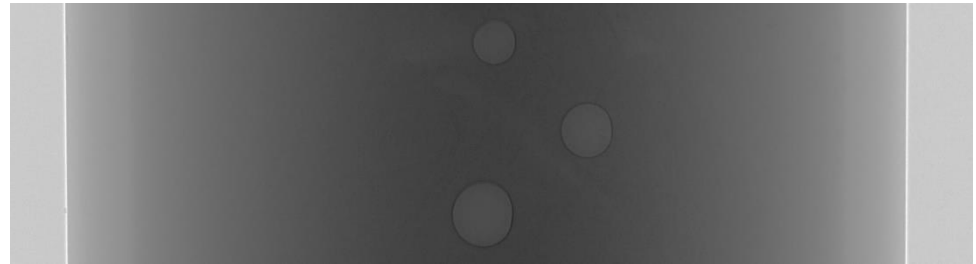
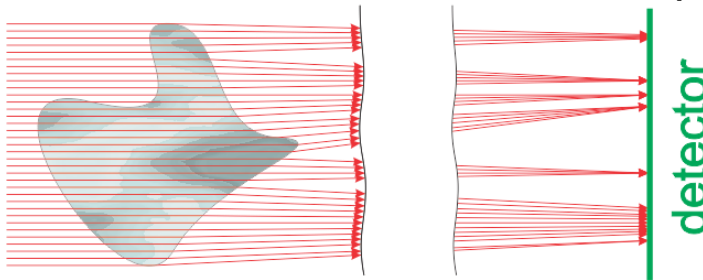
CONTRAST MECHANISMS



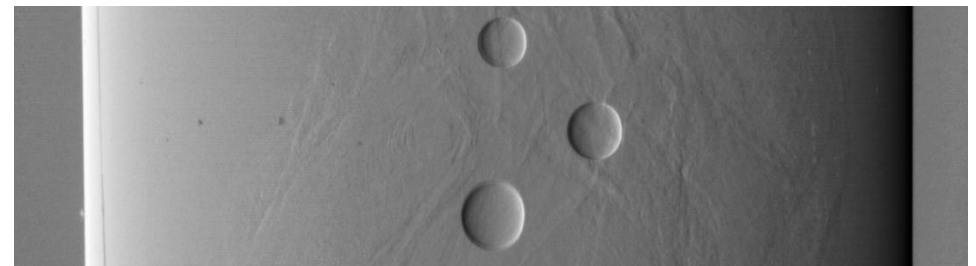
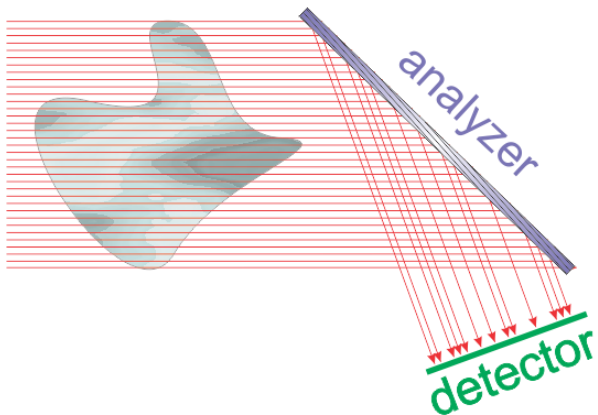
Absorption



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



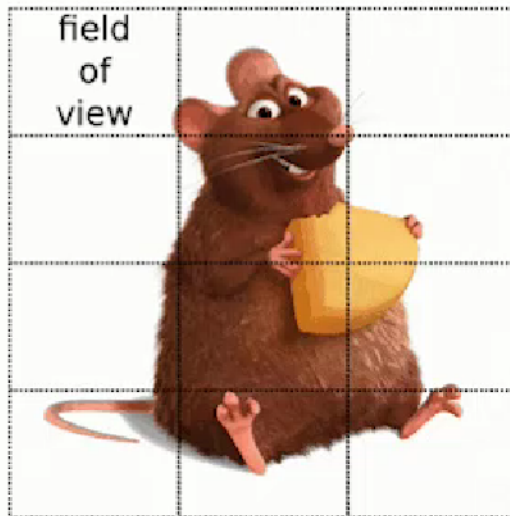
50 $\mu\text{m}/\text{pixel}$

2mm

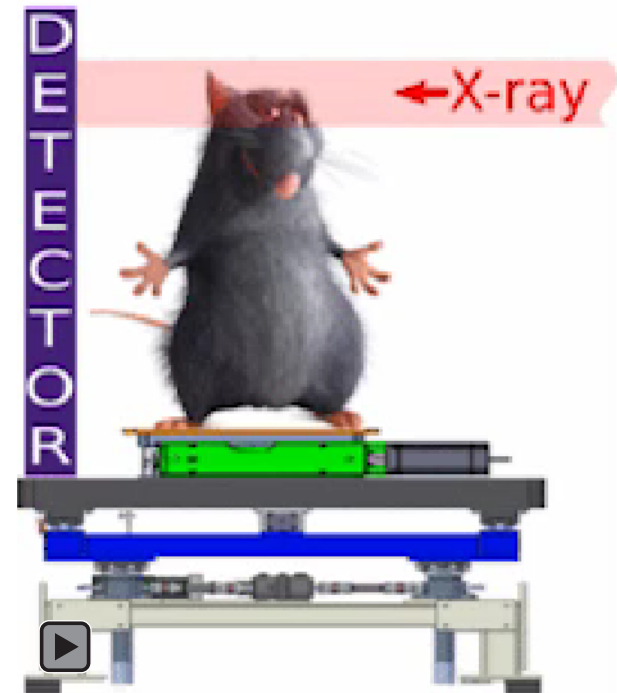
LARGE OBJECTS IMAGING



Tiled imaging

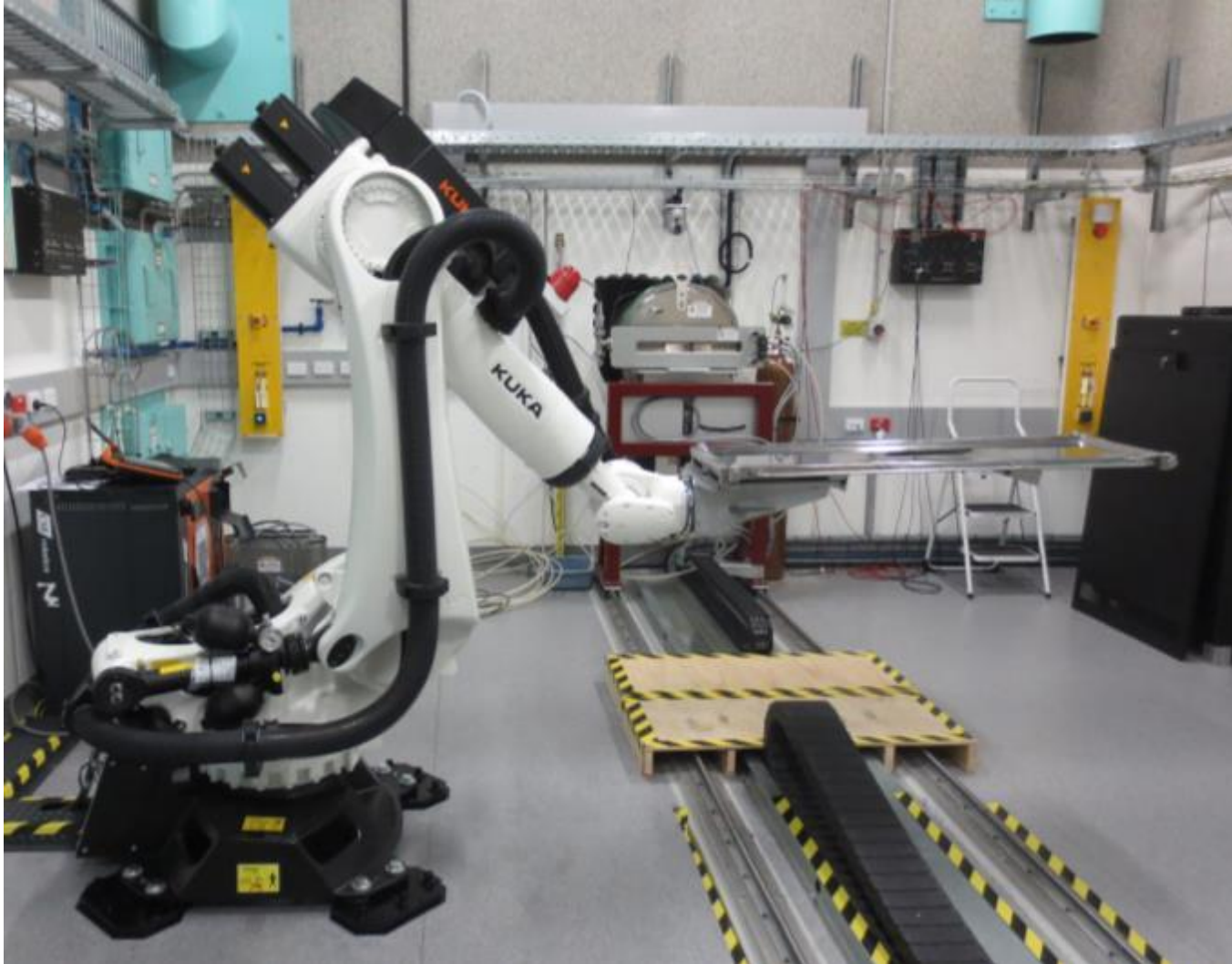


Scan-through imaging



More details in **MOM312** by Nader Afshar and **MOPGF010** by Mark Clift.

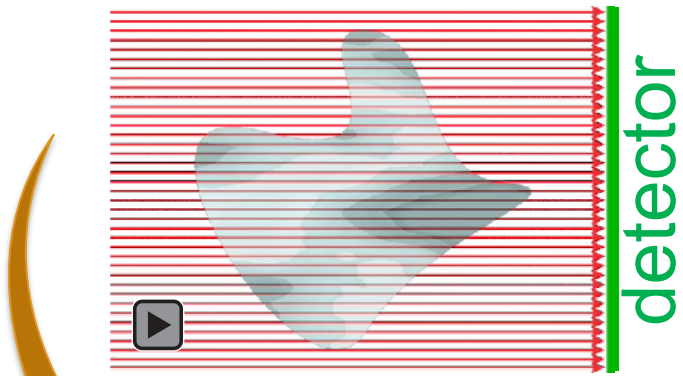
LARGE ANIMAL *IN VIVO* IMAGING



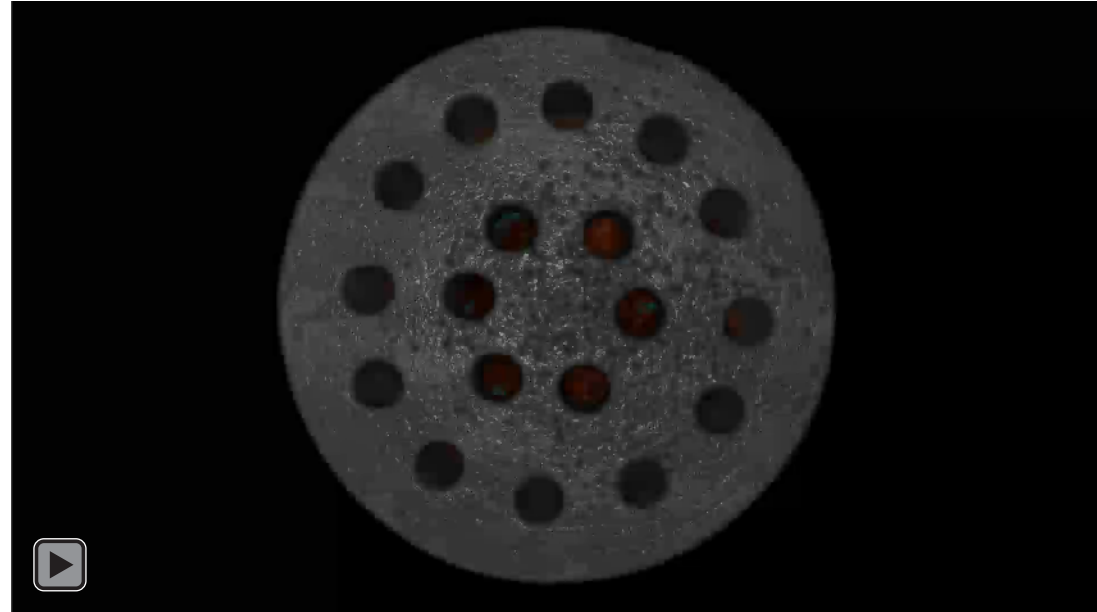
COMPUTED TOMOGRAPHY



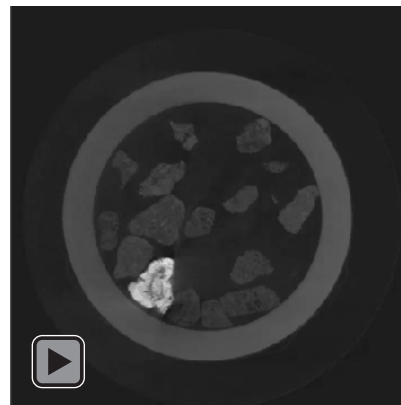
Acquisition



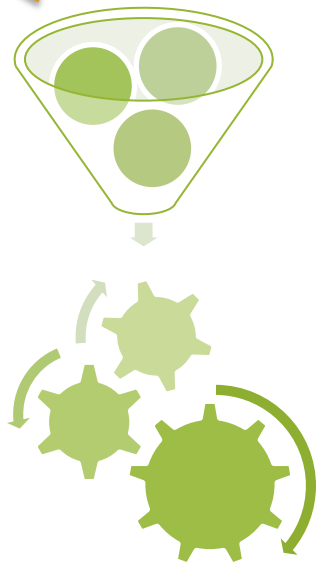
Rendering



Slices

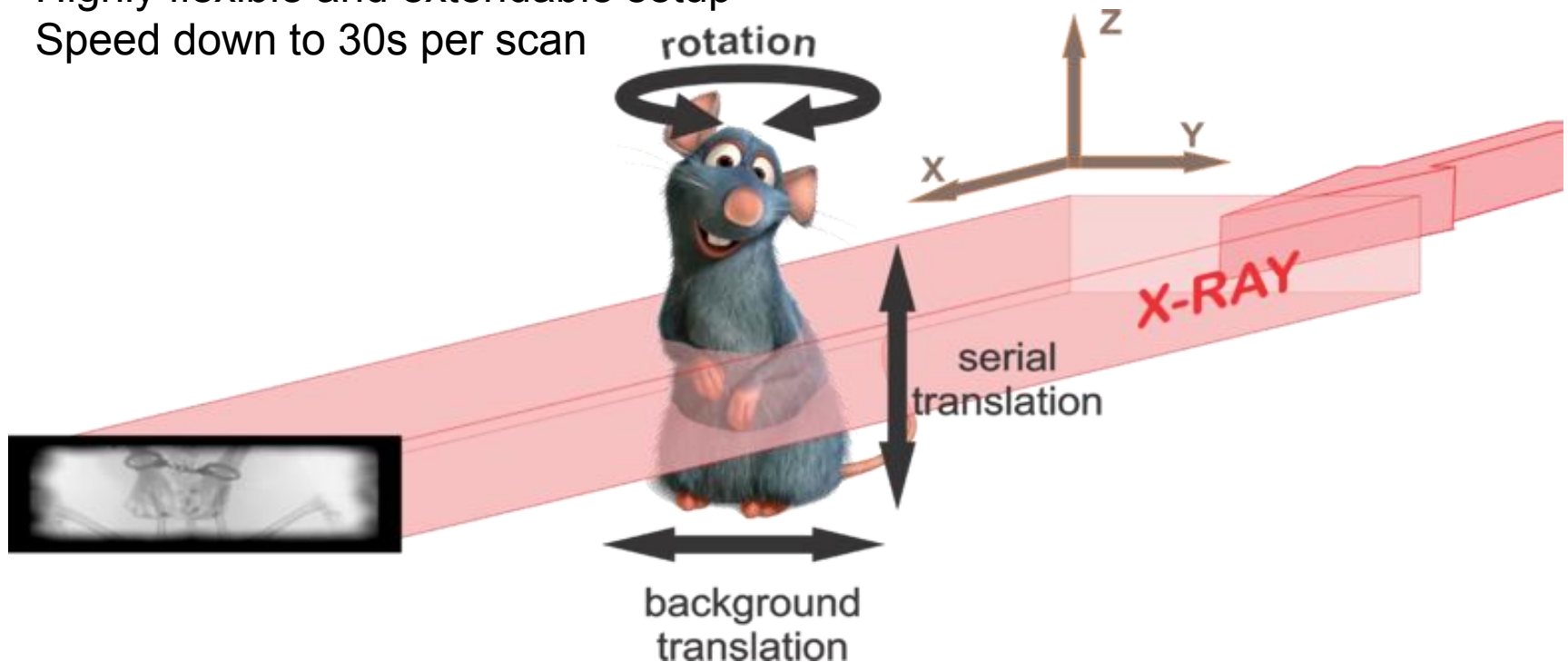


Processing

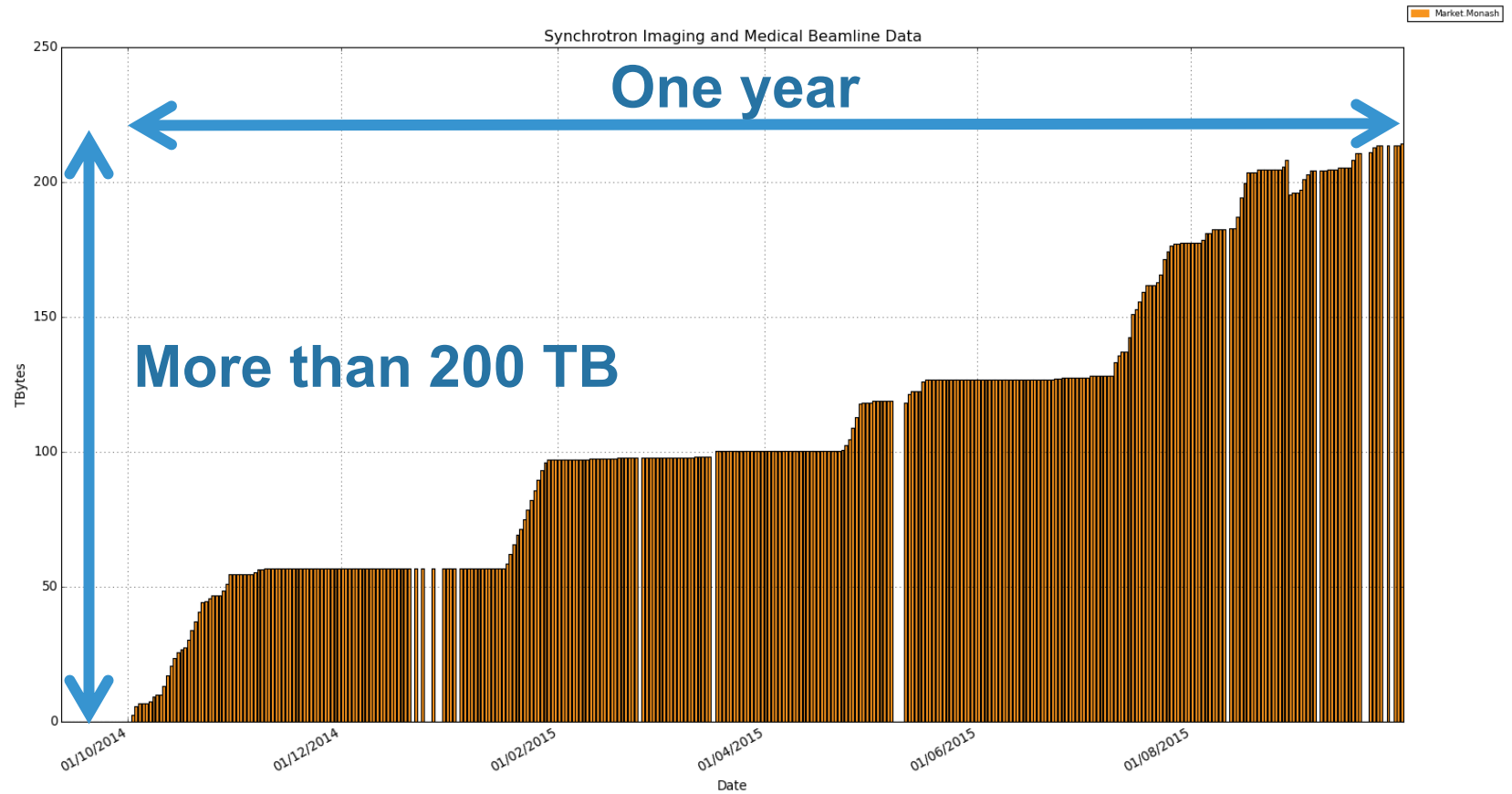


CT AT THE IMBL

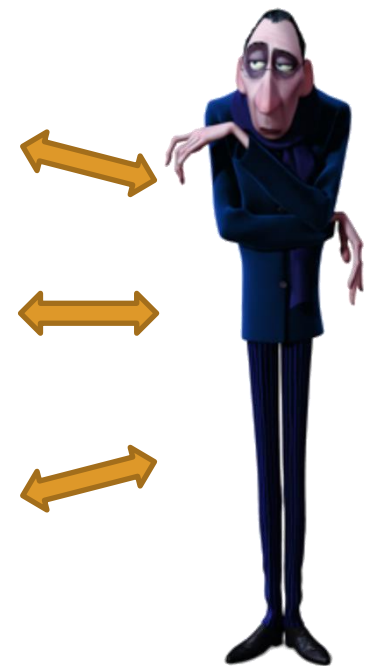
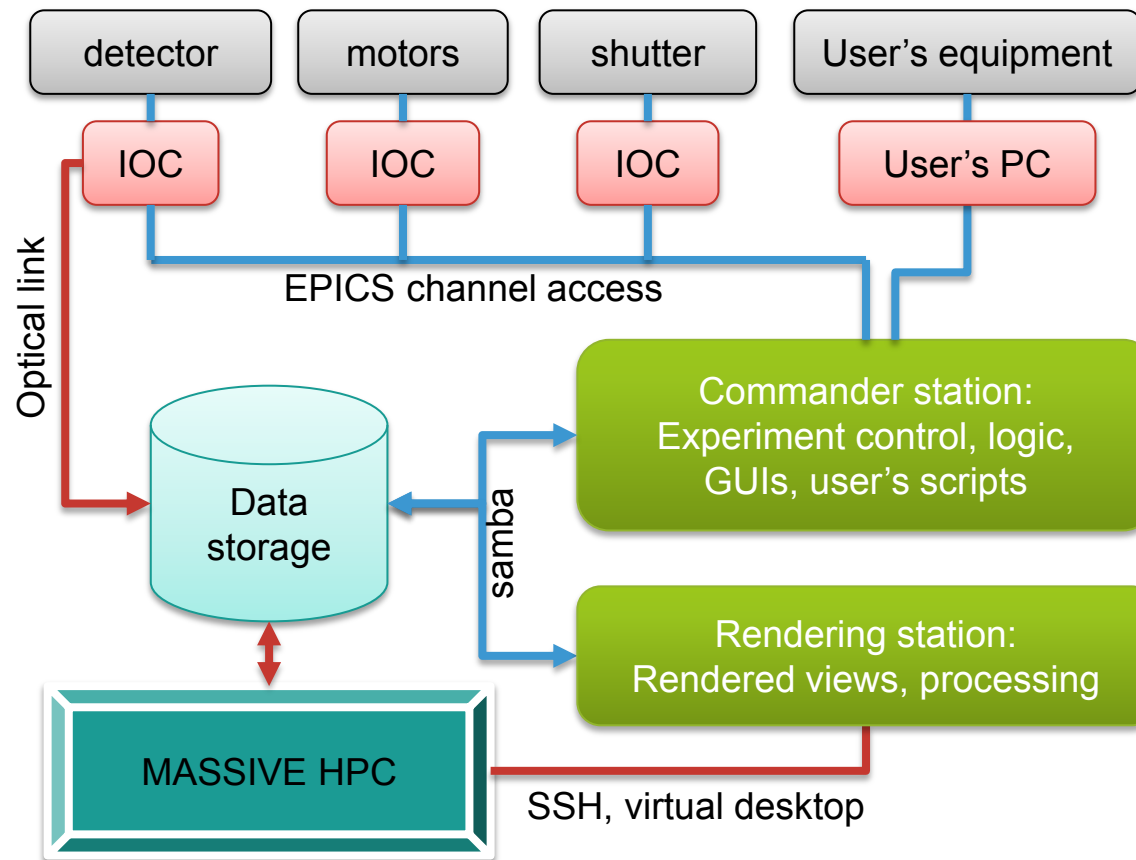
- Step-and-shoot acquisition or on-the-fly acquisition
- Tiled
- Scan-through
- 360deg scans
- Any of the contrast types
- (Almost) automatic reconstruction
- Highly flexible and extendable setup
- Speed down to 30s per scan



CT DATA ACCUMULATION

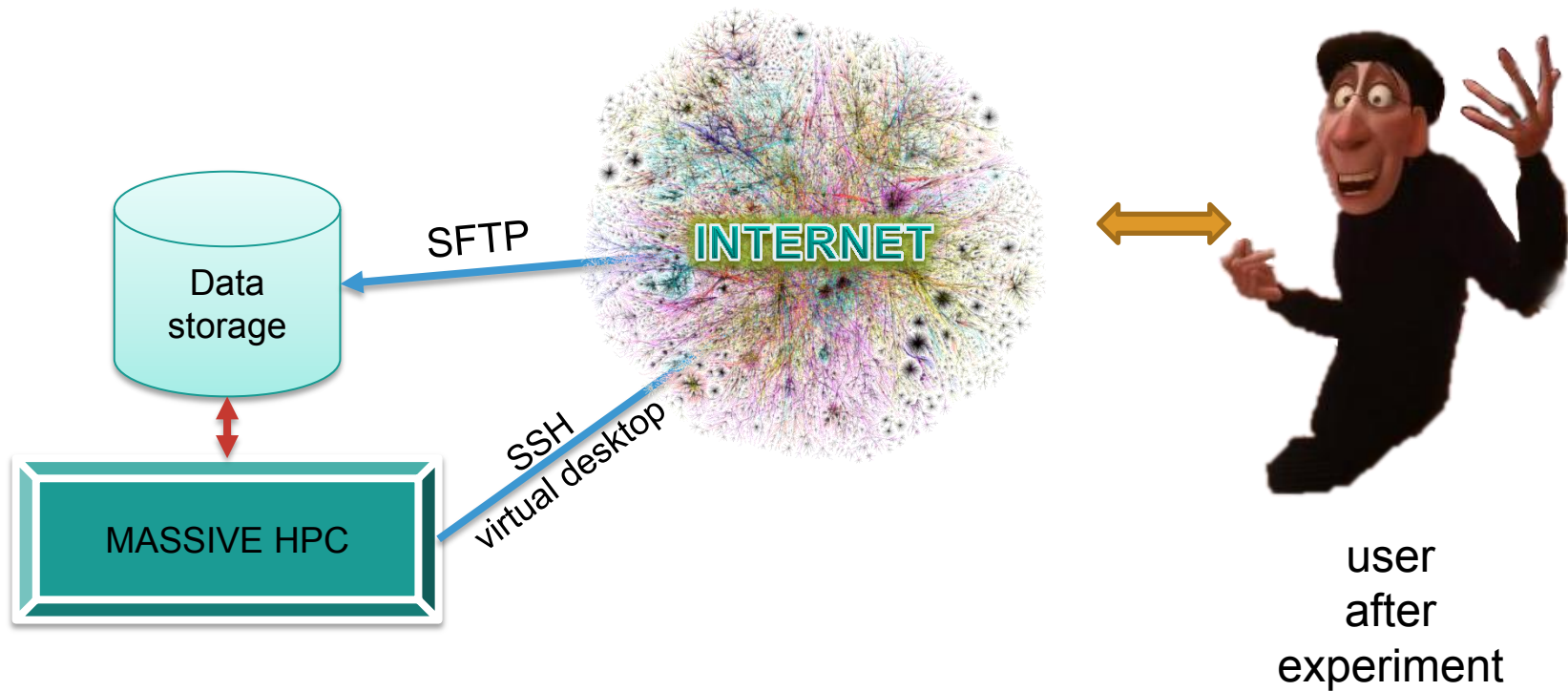


EXPERIMENT EXECUTION



user
during
experiment

POST-EXPERIMENT PROCESSING



More details in **WED3001** by Wojtek Goscinski

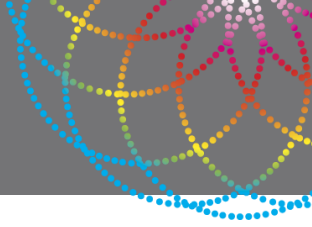
FLOWER



RAT



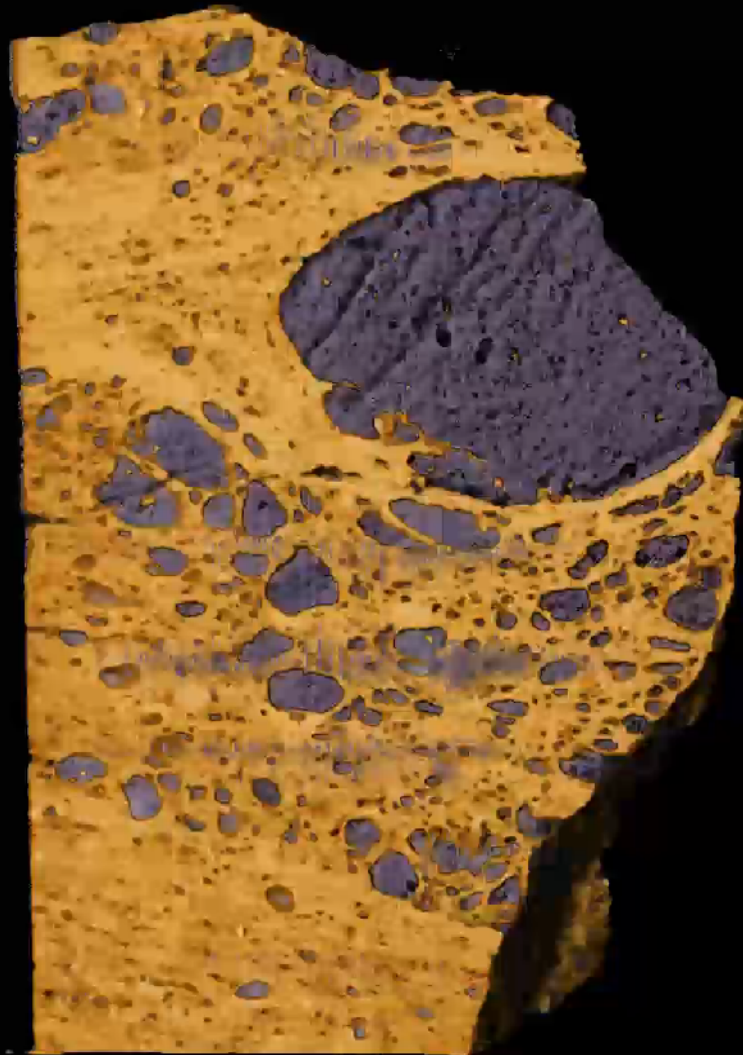
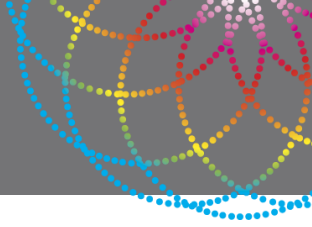
TERMITE BREAKFAST



Australian
Synchrotron 



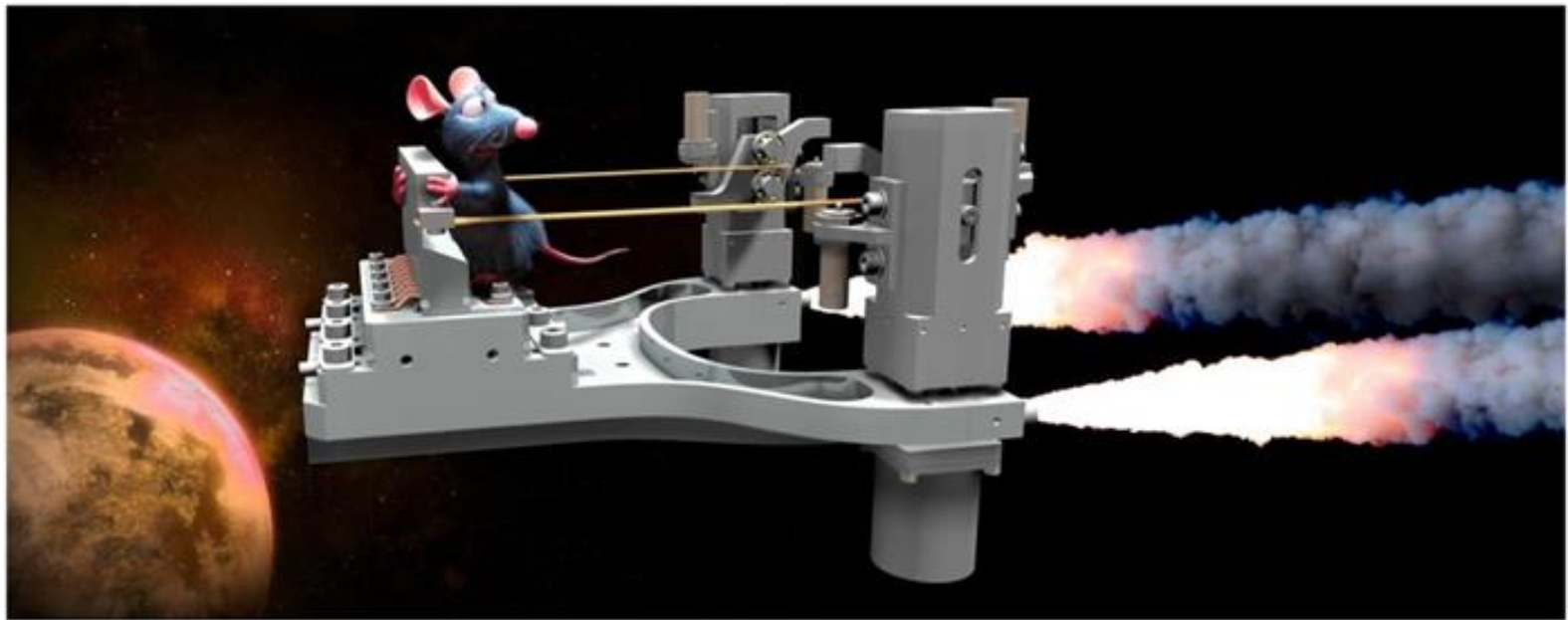
VOLCANIC BOMB



ROLLER SKATE



THANK YOU



IMBL - Boldly sending rats where no rat has gone before

© J. McKinlay 2011