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Biomedical engineering opportunities at CSIRO

Dr. Phil Gurney, CEO, Australian eHealth Research Centre

THE AUSTRALIAN
E•HEALTH
RESEARCH CENTRE

National Research
FLAGSHIPS
Preventative Health



Our purpose

By igniting
the creative
spirit of our
people...

Great people

...we deliver
great science
and innovative
solutions...

Great science

...for industry,
society and the
environment

Great impact



CSIRO today: a snapshot

Australia's national science agency

One of the largest & most diverse in the world

6500+ staff over 55 locations

Ranked in top 1% in 14 research fields

20+ spin-off companies in six years

160+ active licences of CSIRO innovation

Building national prosperity and wellbeing



THE AUSTRALIAN

E•HEALTH

RESEARCH CENTRE

National Research
FLAGSHIPS
Preventative Health



National Research Flagships



**Climate
Adaptation**



**Light
Metals**



**Sustainable
Agriculture**



**Energy
Transformed**



**Minerals
Down Under**



**Water for
a Healthy
Country**



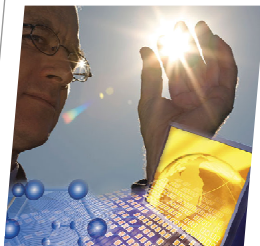
**Food
Futures**



**Preventative
Health**



**Wealth
from Oceans**



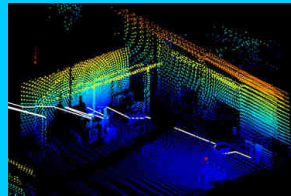
**Future
Manufacturing**

Divisions with Biomedical Engineering requirements

**Food and
Nutrition
Sciences**



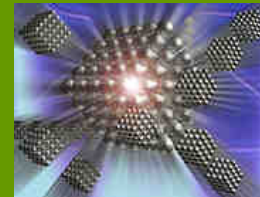
ICT Centre



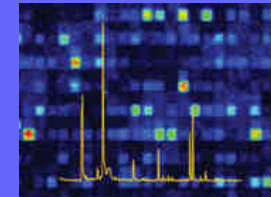
**Livestock
Industries**



**Materials
Science and
Engineering**



**Mathematics,
Informatics
and Statistics**



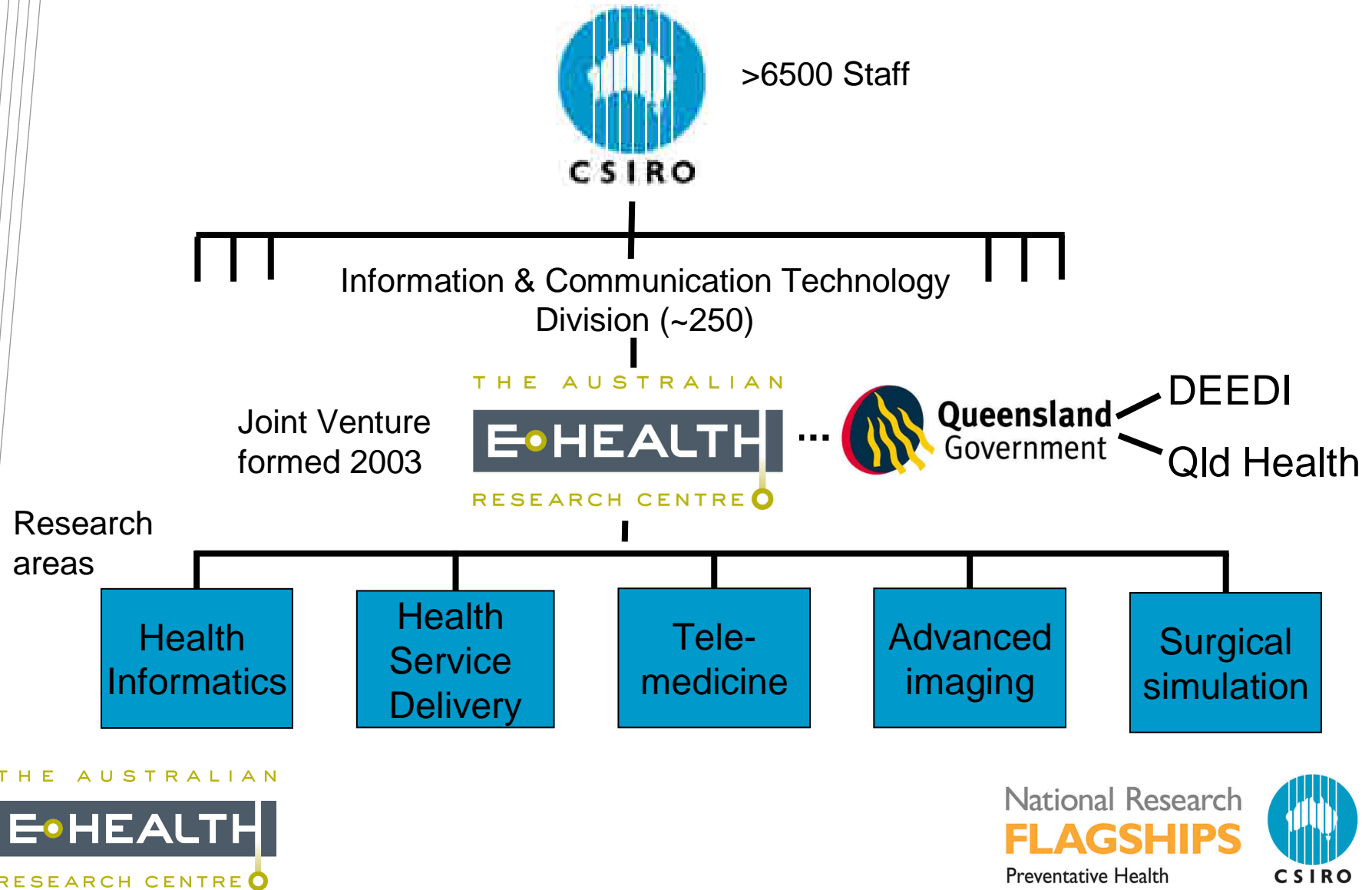
The joy of research

Can you imagine a world where everyone gets the best medical care, wherever they are....

and where hospitals and the health system runs efficiently..

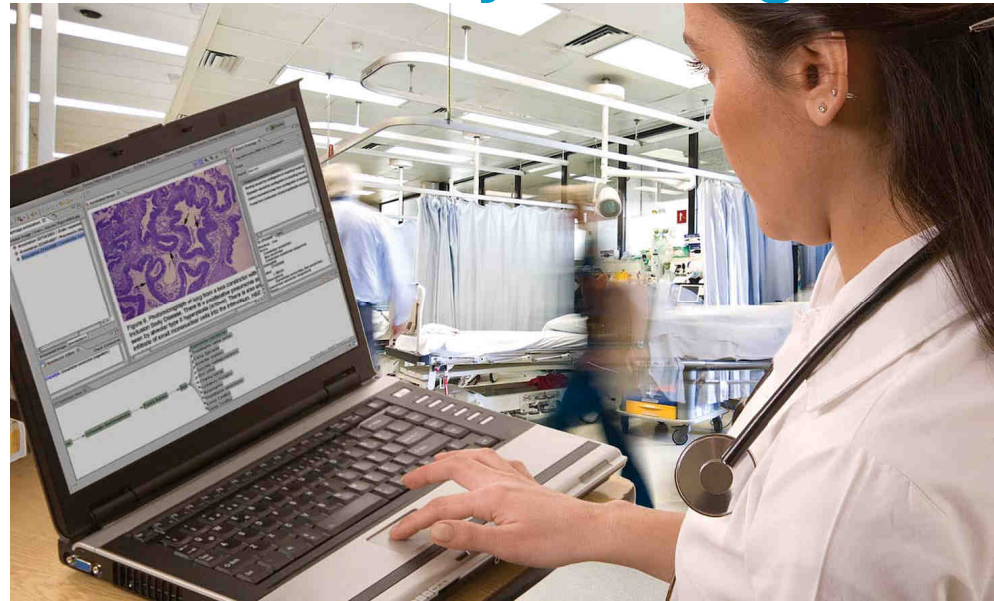
Then do something to make it happen!

Organisational structure



Health Informatics

Making use of data by making data useful!



Selected partners, collaborators and commercialisations

IHTSDO, WA Health, Qld Health, QCAT, Cancer Australia, NEHTA, Royal Brisbane Hospital, Precedence Healthcare, Australian Cancer Grid, Flinders University, Royal Melbourne Hospital, and many more

Extracting Meaning from Data - Cancer Staging

Pathology Report

HISTORY

Left upper lobe and part

MACROSCOPIC

One specimen received. upper lobe and partial left upper lobe measured lateral aspect of the wall and ribs measuring sectioning, there is a 45 x 42 x 40 mm. Surrounding obstructive pneumonitis identified on sectioning will be decalcified and issued.

MICROSCOPIC

Sections show a poorly which in most areas covered with vesicular nuclei, moderate amounts of eosinophilic material within the tumour there are occasional cells of necrosis are present overlying thickened pleura. Lymphatic invasion is seen in the parenchyma. However no peribronchial lymph node seen, although thrombus space towards the inferior. Tumour does not appear to involve bronchovascular structures, but a further sectioning of these are shown. The parenchyma shows mild

Staging Guidelines

Cancer Stage Interpretation System (CSIS) - Mozilla Firefox

Cancer Stage Interpretation System

File Edit View Go Bookmarks Tools Help

114	31,243	47,555	89,291	10,244	107.89
111	36,711	28,217	58,032	10,789	98.97
107	33,507	17,271	45,624	10,901	90.42
105	34,611	2,674	5,352	10,901	10.88

Back to contents

Patient Id: HIST000002

Stage	TNM	Group
Pathological	T2 N2 MX	N/A
Expert 1	T2 N2 MX	N/A
Expert 2	T2 N2 MX	N/A
Automatic	T2 N2 MX	N/A

Automatic	Summary
	<p>BASELINE CLASSIFIER OUTPUT (T2)</p> <p>ADDITIONAL FACTORS:</p> <ul style="list-style-type: none"> ✓ PRIMARY TUMOUR MAX DIMENSION >3CM <ul style="list-style-type: none"> Y UNDERLYING THIS THERE IS A FIRM SCLEROTIC MASS MEASURING _MAXDIM_GT_30MM_ (REP01) Y RIGHT MIDDLE AND LOWER LOBE LUNG AND LYMPH NODES MODERATELY DIFFERENTIATED ADENOSQUAMOUS CARCINOMA _MAXDIM_GT_30MM_ (REP01) ✓ VISCERAL PLEURAL INVASION <ul style="list-style-type: none"> Y THE LESION IS SUBPLEURAL AND THERE APPEARS TO BE FOCAL INVASION INTO THE PLEURA BUT NOT ONTO THE PLEURAL SURFACE (REP01) Y PLEURAL INVASION IDENTIFIED CLEAR OF BRONCHIAL MARGIN (REP01)
T2	
	<p>BASELINE CLASSIFIER OUTPUT (N2)</p> <p>ADDITIONAL FACTORS:</p> <ul style="list-style-type: none"> ✓ HILAR LYMPH NODE METASTASES <ul style="list-style-type: none"> Y HILAR AND NUMBER _LN_7_ LYMPH NODE METASTASES (REP01) ✓ SUBCARINAL LYMPH NODE METASTASES <ul style="list-style-type: none"> Y HILAR AND NUMBER _LN_7_ LYMPH NODE METASTASES (REP01)
N2	
	<p>BASELINE CLASSIFIER OUTPUT (MX)</p> <p>ADDITIONAL FACTORS:</p> <ul style="list-style-type: none"> ✓ HILAR LYMPH NODE METASTASES <ul style="list-style-type: none"> Y HILAR AND NUMBER _LN_7_ LYMPH NODE METASTASES (REP01)
MX	N/A

Histology Report (REP01) Full Text

Extract

- ✓ UNDERLYING THIS THERE IS A FIRM SCLEROTIC MASS MEASURING _MAXDIM_GT_30MM_
- ✓ THE LESION IS SUBPLEURAL AND THERE APPEARS TO BE FOCAL INVASION INTO THE PLEURA BUT NOT ONTO THE PLEURAL SURFACE
- ✓ RIGHT MIDDLE AND LOWER LOBE LUNG AND LYMPH NODES MODERATELY DIFFERENTIATED ADENOSQUAMOUS CARCINOMA _MAXDIM_GT_30MM_
- ✓ PLEURAL INVASION IDENTIFIED CLEAR OF BRONCHIAL MARGIN
- ✓ HILAR AND NUMBER _LN_7_ LYMPH NODE METASTASES

Information

Histopathologic Type

Laterality: Bilateral Left Right

Notes

- The uncommon supradia- phragm of any size with its inva- sive component limited to the bronchial wall, which may extend proximal to the main bronchus, is also classified T1.
- Most pleural effusions associ- ated with lung cancer are due to tumor. However, there are a few patients in whom multiple cyto- pathologic examinations of pleural fluid are negative for tumor. In these cases, fluid is non-turbid and is not exudate. Such patients may be fur- ther evaluated by videothoraco- scopy (VATS) and direct pleural biopsy. When these elements and clinical judgment dictate that the effusion is non-related to the tumor, the effusion should be excluded as a staging element and the patient should be staged T1, T2 or T3.
- M1 includes separate tumor nodules in a different lobe (contralateral ipsilateral).

used, or tumor proven by the sputum or bronchial washings but bronchoscopy

dimension, surrounded by lung or microscopic evidence of invasion more than 1 (i.e., not in the main bronchus) ing features of size or extent: dimension or more distal to the carina

obstructive pneumonitis that extends to involve the entire lung invades any of the following: chest tumors), diaphragm, mediastinal tumor in the main bronchus less than 1 cm but without involvement of the or obstructive pneumonitis of the any of the following: mediastinum, diaphragm, vertebral body, carina, or same lobe, or tumor with malignant

be assessed

stasis

bronchial and/or ipsilateral hilar lymph nodes including involvement by direct or distal and/or subcarinal lymph

mediastinal, contralateral hilar, ipsilateral and/or subcarinal lymph nodes(s)

assessed

med ... Y ... N

specimen

(continued on reverse side)

T H

The Snapper Mapping Tool

The screenshot displays the Snapper Mapping Tool interface within the Eclipse Platform. The main window is titled "Snapper - demonstration/anzics10.mapping - Eclipse Platform".

Mapping table: A table with columns: Source Term, Rel..., Snomed Expression, Status, and Comments. It lists various medical terms and their corresponding SNOMED CT expressions.

Source Term	Rel...	Snomed Expression	Status	Comments
Head/ pelvis trau...	Equ...	410771003 Surgical ...	Incomp...	
Head/ pelvis trau...	Equ...	82271004 Injury of h...	Finished	
Hyperthermia	Equ...	50177009 Body tem...	Incomp...	
GI obstruction	Equ...	126765001 Gastroin...	Incomp...	
Diabetic ketoaci...	Equ...	420422005 Ketoacide...	Automap	
Aneurysm repair...	Equ...	71388002 Procedure...	Incomp...	
Arthritis, rheuma...	Equ...	69896004 Rheumato...	Incomp...	
Sepsis with sho...	Equ...	76571007 Septic sh...	Incomp...	

Search view: A search interface for the ontology. The search term is "gastrointestinal ob...". The results list various terms, with "Gastrointestinal obstruction (disorder)" selected. The details for this term are shown below:

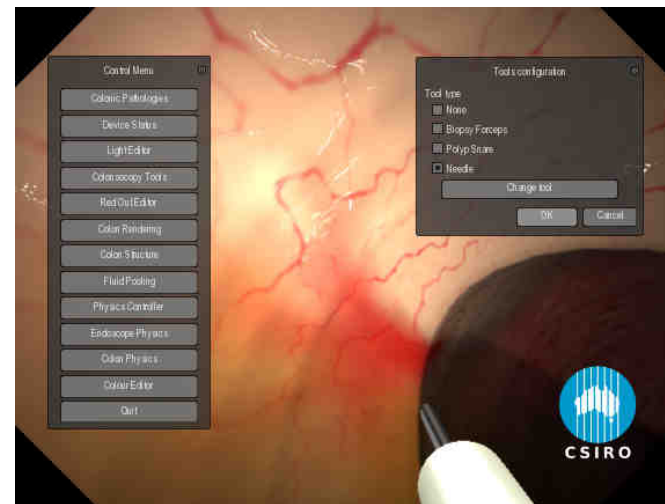
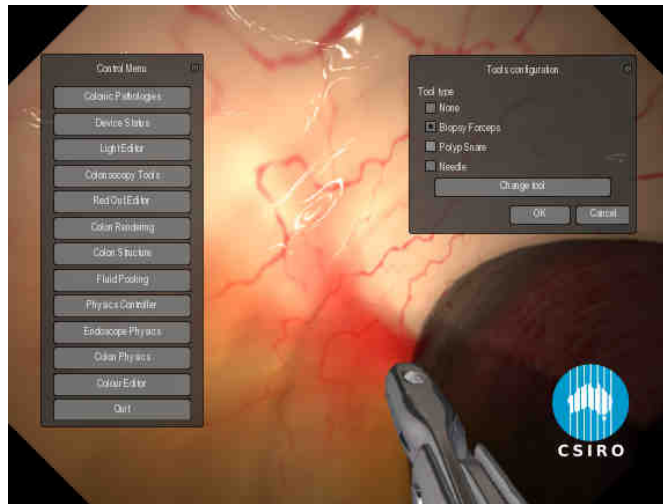
ID: 126765001 Defn
 Primitive: false
 Terms:
 Gastrointestinal obstruction
 Gastrointestinal obstruction
 ConceptId:
 126765001
 altId:

Ontology View: A hierarchical diagram showing the relationship between terms. The path is: Disorder of digestive tract → Disorder of gastrointestinal tract → Gastrointestinal obstruction. A list of related terms is shown on the right:

- Pyloric obstruction
- Gastric volvulus
- Gastric ulcer with hemorrhage AND obstruction
- Gastric ulcer without haemorrhage AND without perforation but with obstruction
- Acute gastric ulcer with obstruction
- Peptic ulcer with hemorrhage AND obstruction
- Paraoesophageal hernia with obstruction but no gangrene
- Gastrointestinal stenosis
- Hiatus hernia with obstruction
- Gastric ulcer with perforation AND obstruction
- Intestinal obstruction
- Chronic gastric ulcer without haemorrhage AND without perforation but with obstruction

Surgical Simulation

Using virtual reality for off-patient training



Selected partners, collaborators and commercialisations

Surgical Science (Sweden), EPFL (Switzerland), Queensland Health Skills Development Centre, Nanyang Technical University, (others under NDA)

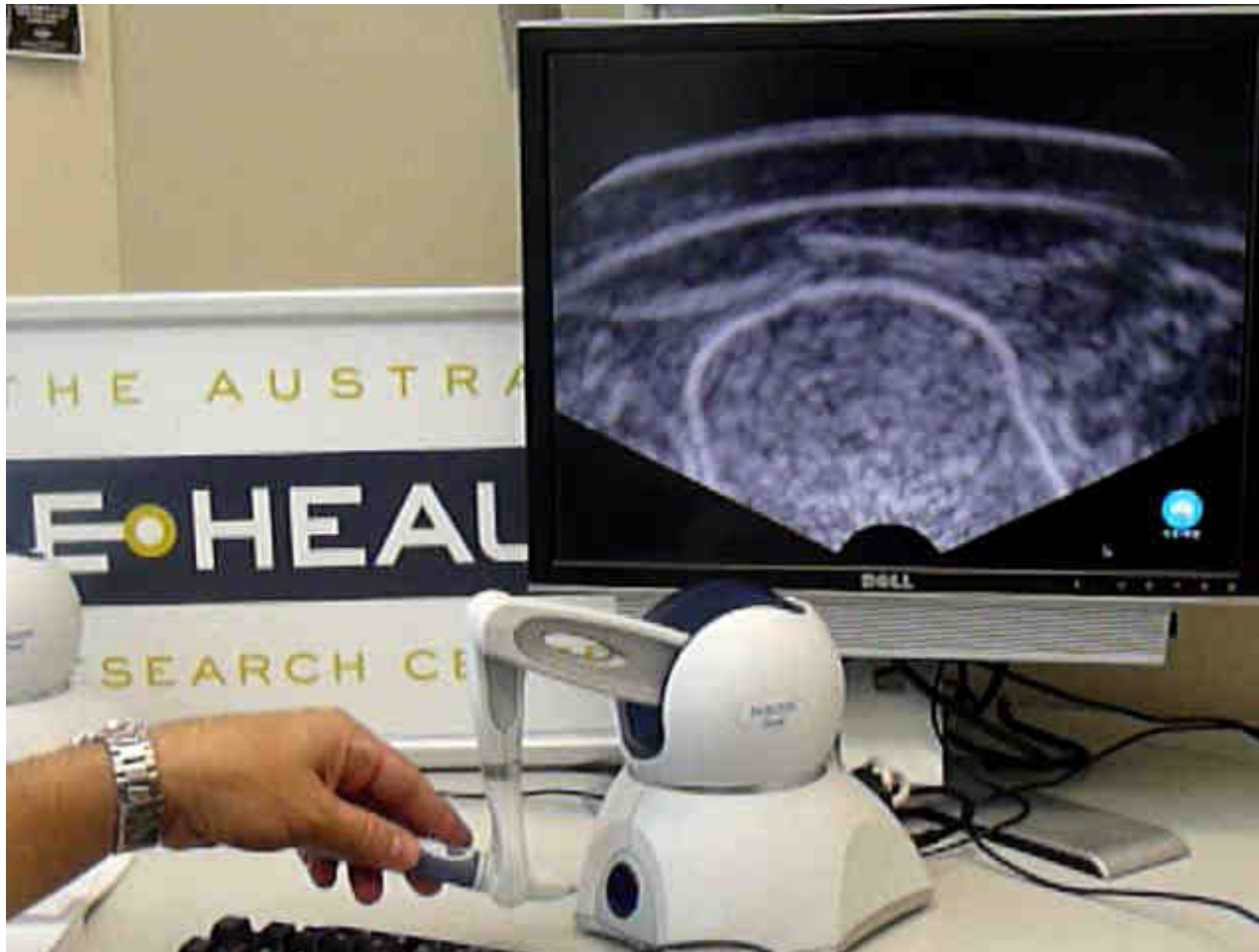
Integrated colonoscopy simulation system



Simulated (left) and Real (right)

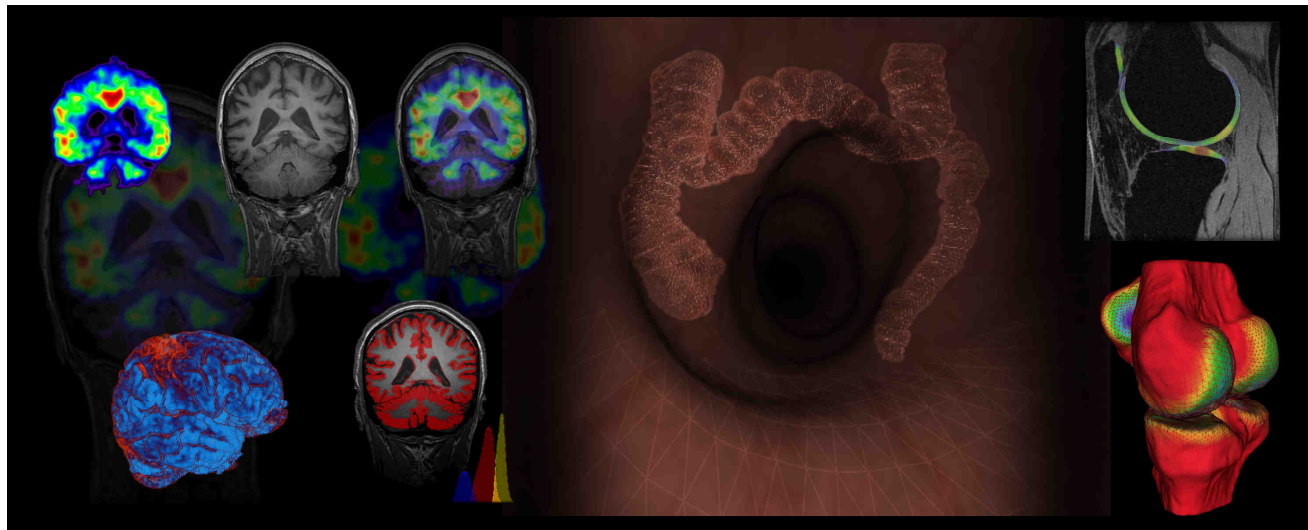


Ultrasound simulator



Advanced Biomedical Imaging

Advanced tools for image analysis and surgical planning

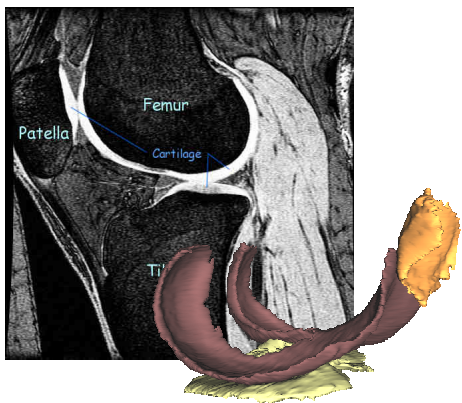


Selected partners, collaborators and commercialisations

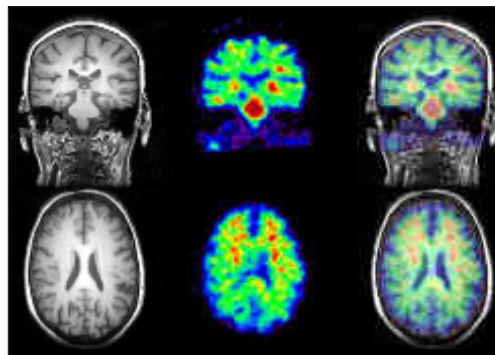
AIBL consortium, University of Queensland, University of Melbourne, National Stroke Research institute, Harvard Medical School, UCLA, ANSTO and many more

Main projects

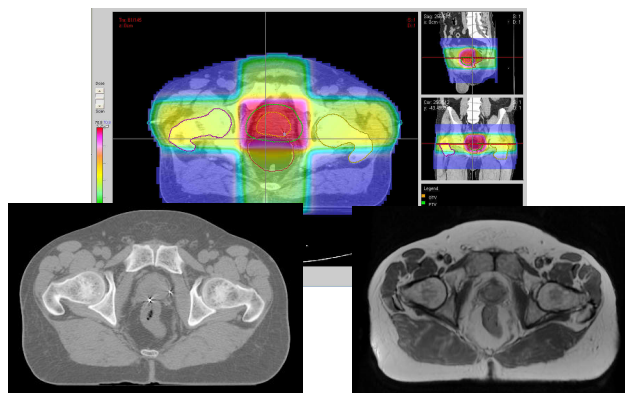
Knee cartilage segmentation



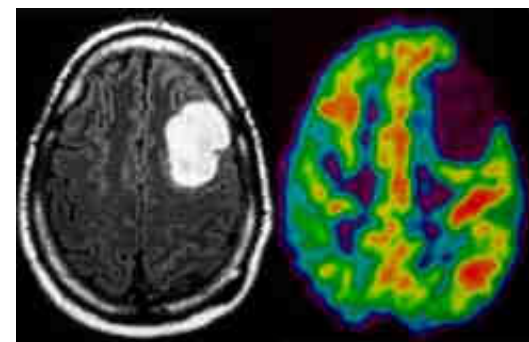
Neuroimaging for ageing and Alzheimer's



Prostate radiotherapy planning with MRI



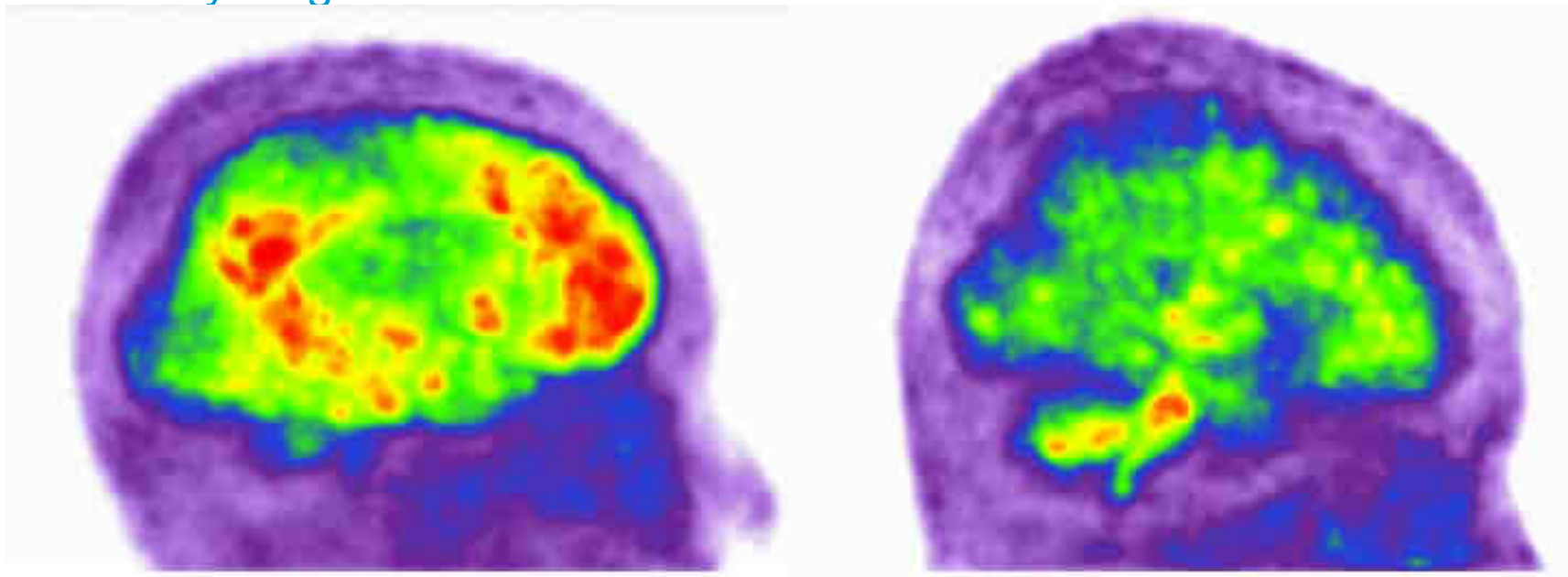
Brain tumour characterization Using PET and MRI



Looking at plaque in vivo with positron emission tomography (PET)

Pittsburgh compound B (PiB) is a new imaging agent

PiB is currently being evaluated worldwide for the early diagnosis of Alzheimer's disease

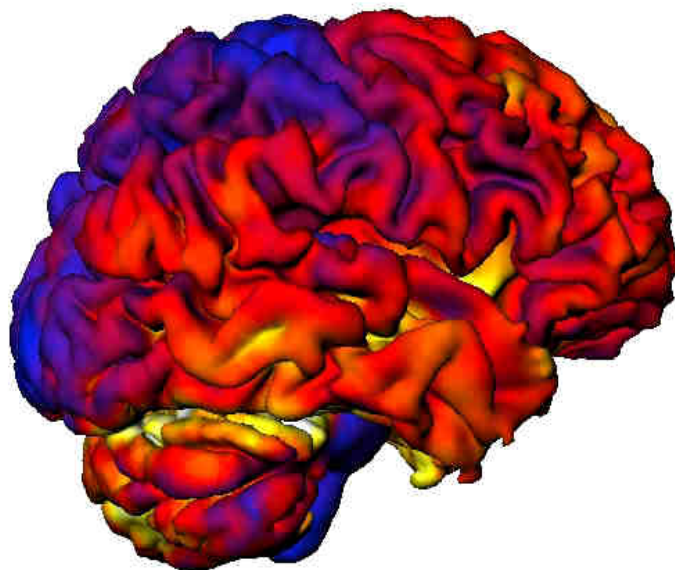


Alzheimer's

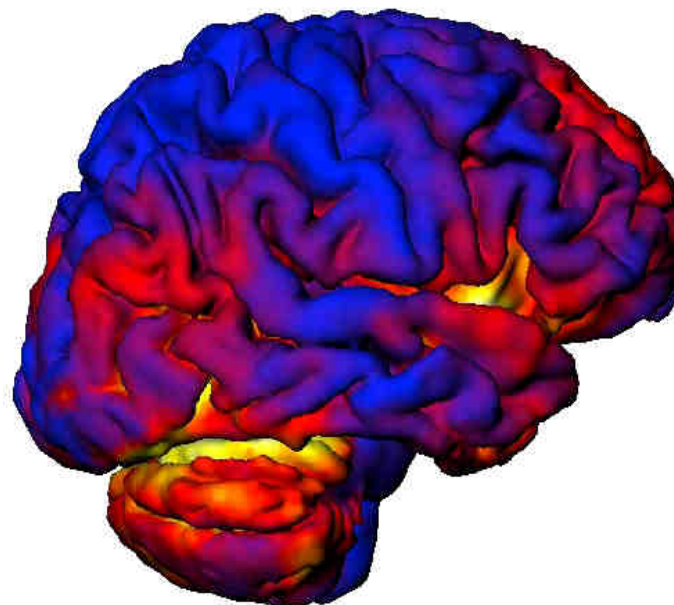
Healthy

Alzheimer's Disease

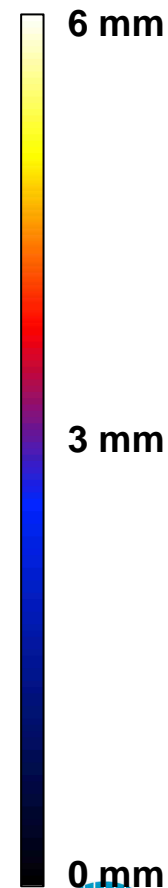
Qualitative evaluation of thickness information



70 Years old NC

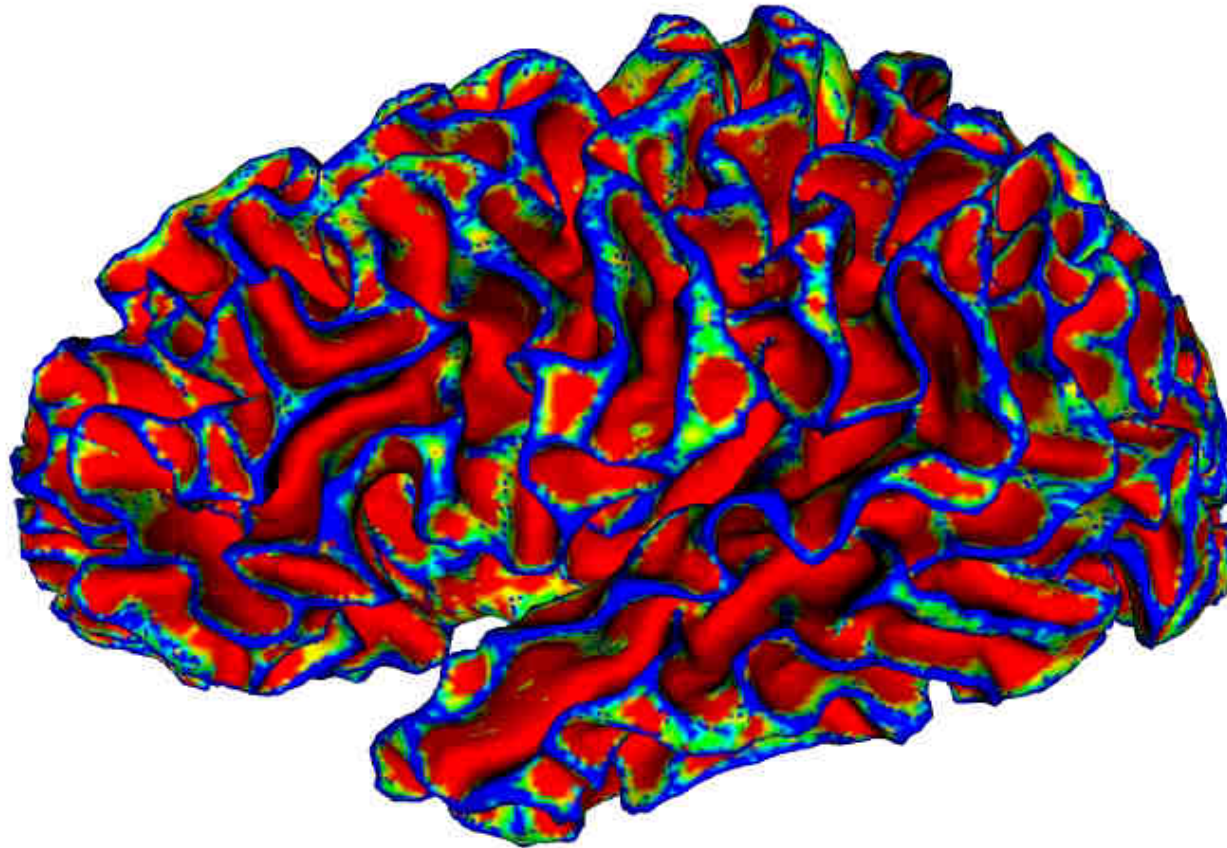


70 Years old AD



Significant differences between AD and NC in the temporal, parietal and occipital

Surface smoothing



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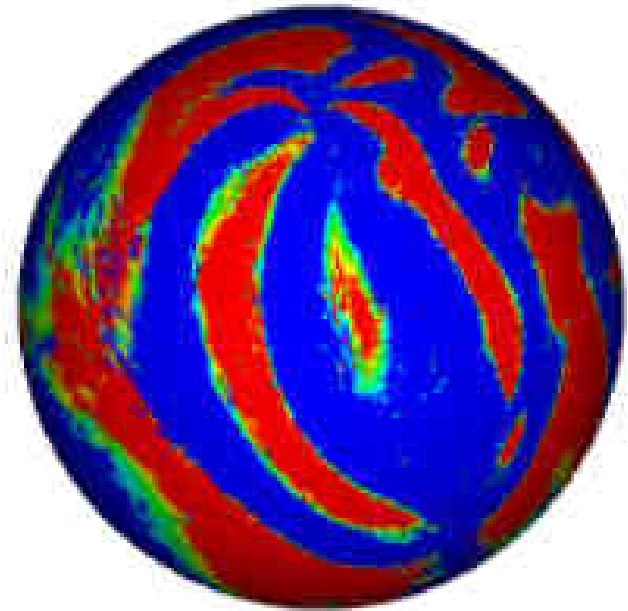
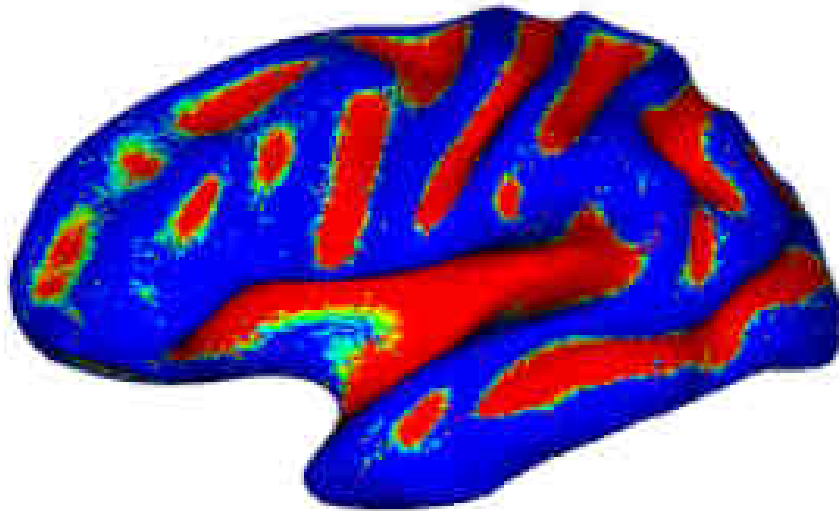
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RESEARCH CENTRE

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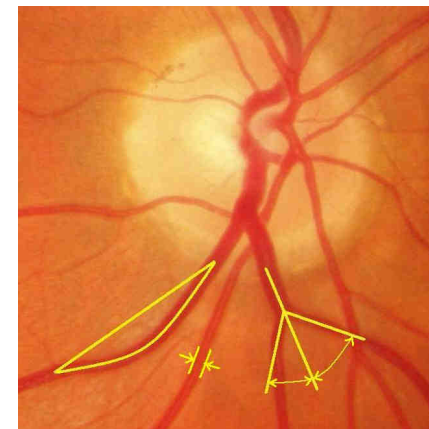
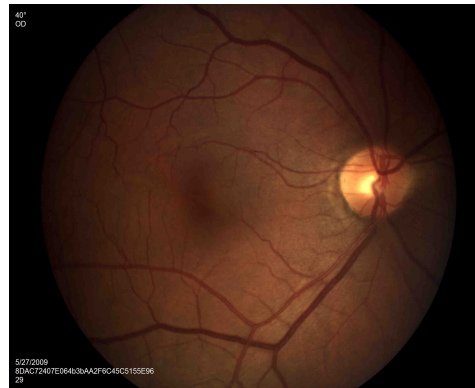


Conformal mapping

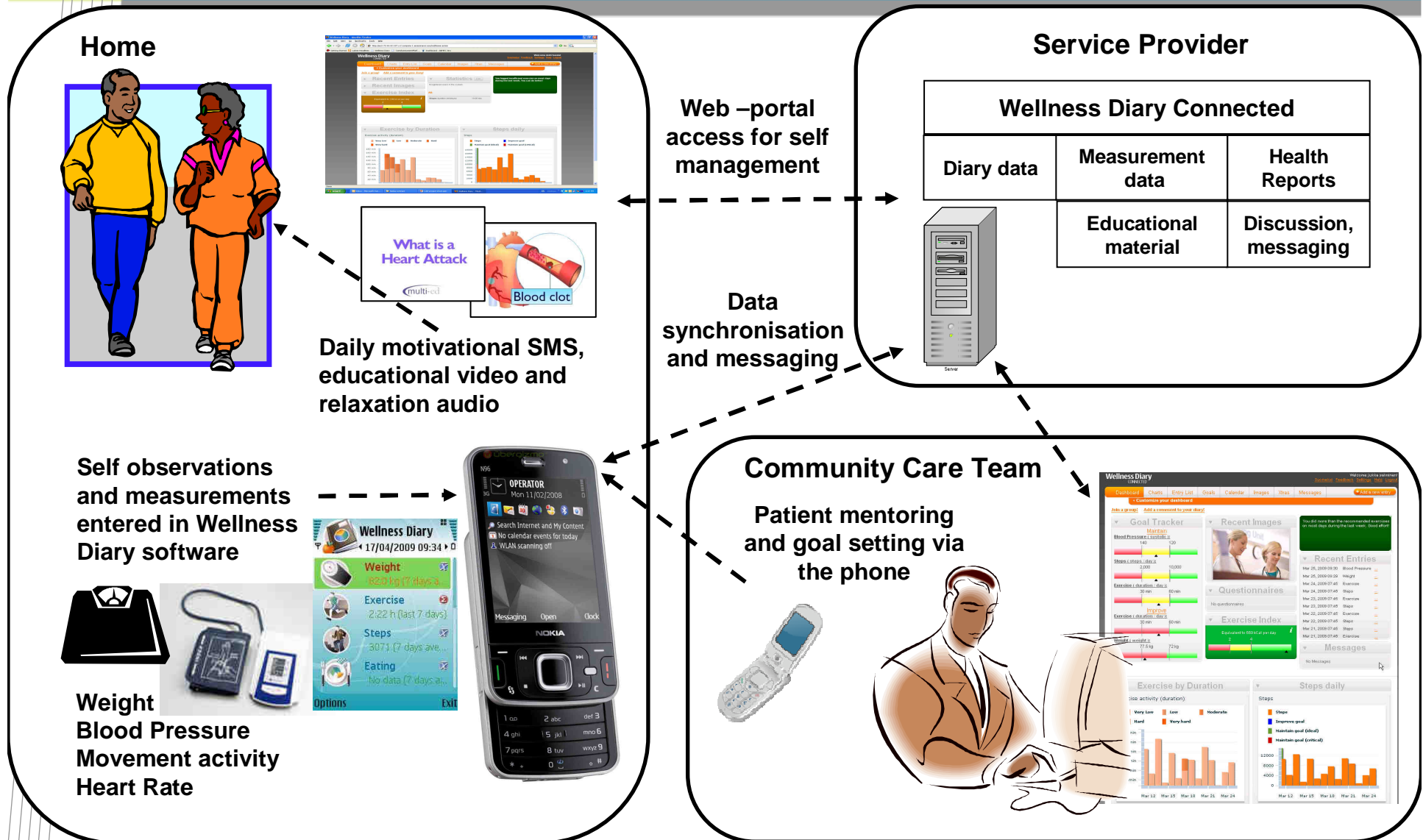


Telemedicine : Non-invasive remote diagnostics

- Use the eye as the window to the body
 - Low cost camera, on-site analysis software
 - Images transmitted for remote expert consultation
- Detecting changes related to a range of conditions
 - Prevent needless blindness
 - Screening and early detection of diabetic retinopathy, glaucoma and other eye disease
 - Screening and early detection of systemic disease: Alzheimer's disease, cardiovascular disease, stroke and CMV-Retinitis



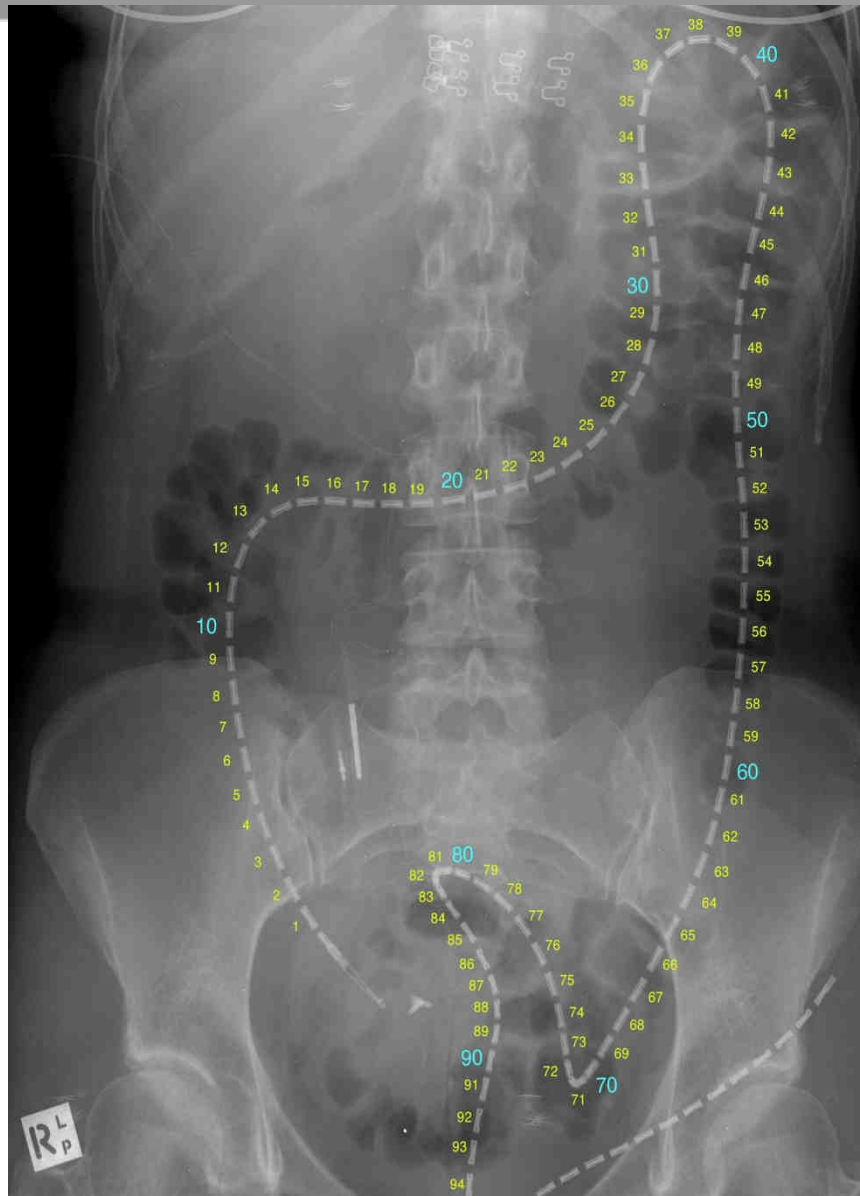
CAP technology setup



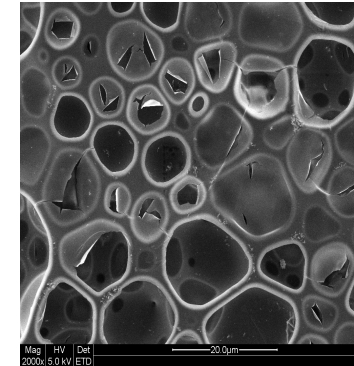
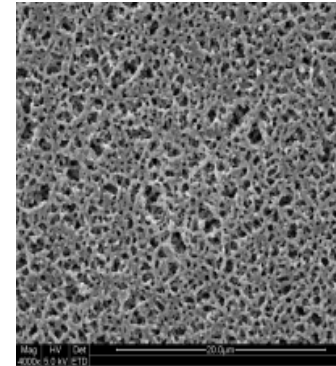
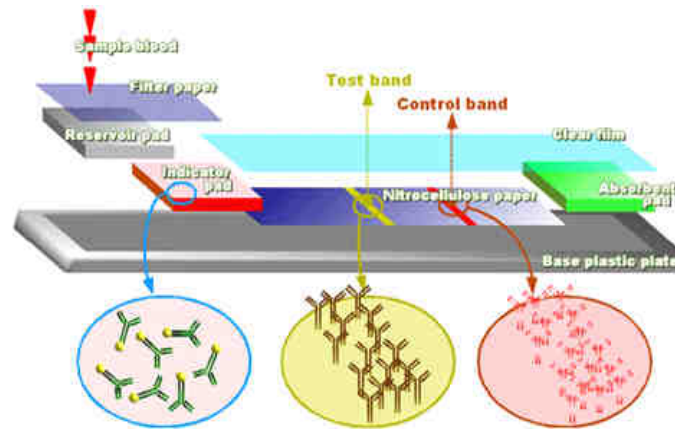
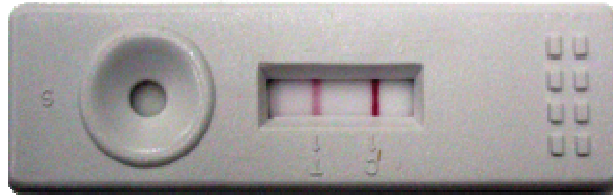
Biomedical Manufacturing (Sydney / Melbourne)



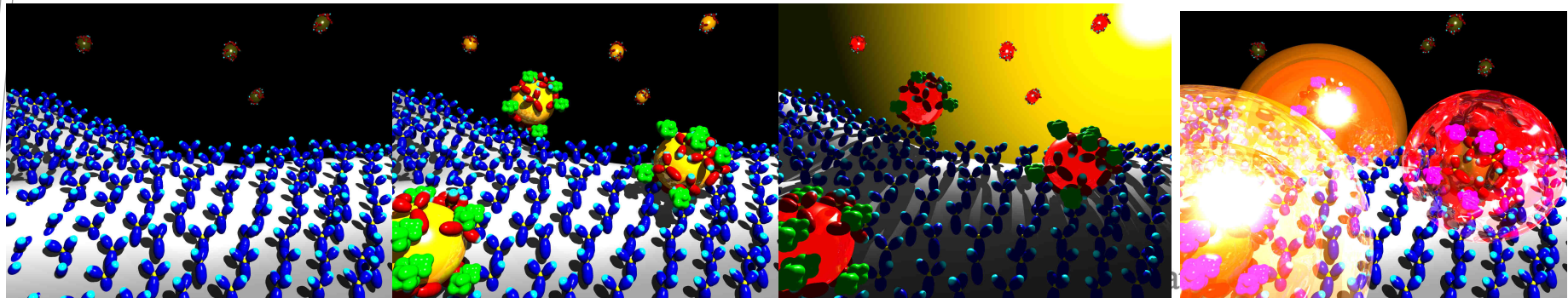
120 sensor fibre optic catheter



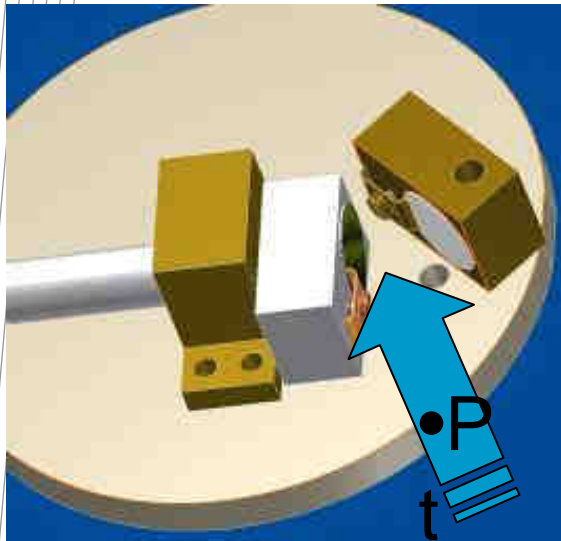
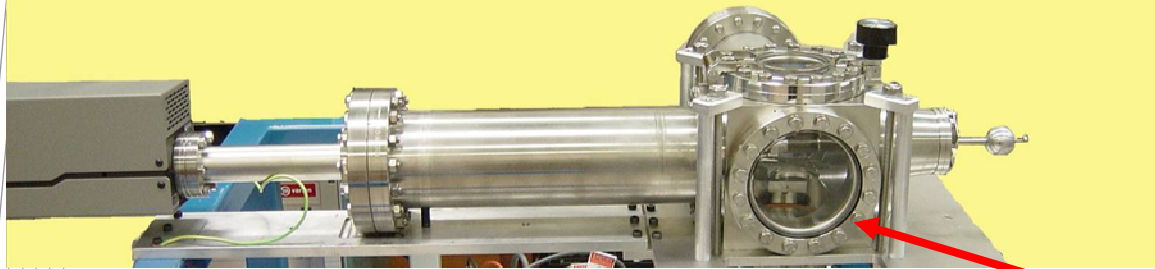
nanoBang – in vitro diagnostic



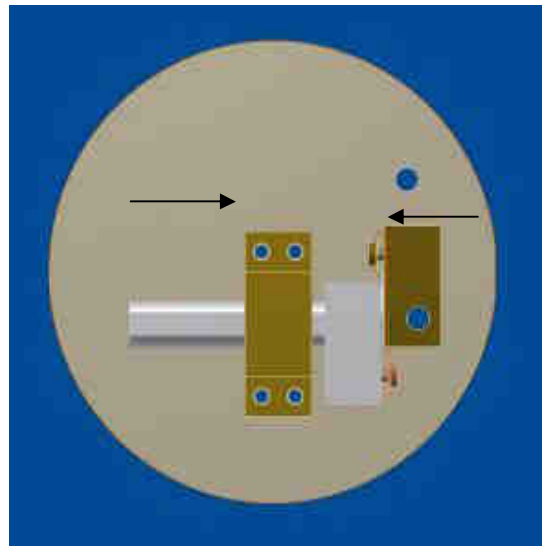
SEM images of nitrocellulose membrane with gold nanoparticles before (left) and after (right) exposure to a light pulse from a photoflash.



Neuro-stimulator Project NICTA



Stage I: coat silicon
with 5 nm Pt



Stage II: rotate and bring
surfaces together in UHV to
create atomic bonding

System developed to
bond silicon wafers
in the construction of
implantable
electronic enclosures

Jobs at CSIRO

- **Research scientists/engineers**
 - Scientists, Engineers, Managers
 - Undertake and manage research activities
 - PhD or equivalent qualifications
- **Research Projects staff**
 - Software engineers
 - Project managers
 - Support scientific projects, experimentation and practical work
 - Relevant qualifications and skills
- **Research support services**
 - Technical staff
 - Admin staff
 - Communications

Working at the AEHRC

- Undergraduate projects
- Vacation students
- Interns and casual employment
- PhD and Masters projects
- Research staff
 - PhD qualified
- Research projects
 - Software engineers
- Administration
- Specialist staff
 - Medical Director


CSIRO Careers and Employment - Mozilla Firefox

File Edit View History Bookmarks Tools Help

recruitment.csiro.au https://recruitment.csiro.au/asp/index.asp

McAfee

Office Live Meeting VoIP and Broadban... Top Structure July 2010.pdf (applicatio... CSIRO Careers and Employment



CSIRO Positions Vacant

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Career Opportunities
 CSIRO has a world-wide reputation for excellence and achievement in basic and applied research. Working for CSIRO will give you the satisfaction of making a vital contribution to the future. To view current career opportunities and apply online use our job search facility.

To find out more about the kinds of research CSIRO undertakes watch our ["80 Anniversary"](#) video.

CSIRO's values are: Integrity of excellent science, trust and respect, initiative to explore new horizons, delivering on commitments and safety and sustainability. To be successful you will need to demonstrate behaviours aligned to these values in your application and at interview.

Applications can be submitted until midnight (AEST) on the closing date shown in the vacancy information.

Previous Applicants
 To amend your contact details or previously lodged Résumé/CV online please [click here](#).
 To replace an application for a specific position, re-apply for the position.

Job Search

Division

Location

Date Added

OR

Reference #

If you experience difficulties applying online please call 1 300 301 509 and someone will be able to assist you.
 Outside business hours please email [CSIRO Careers](#).

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 RESEARCH CENTRE

National Research
FLAGSHIPS
 Preventative Health



The Australian e-Health Research Centre

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Thank you

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Email: Enquiries@csiro.au **Web:** www.csiro.au



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