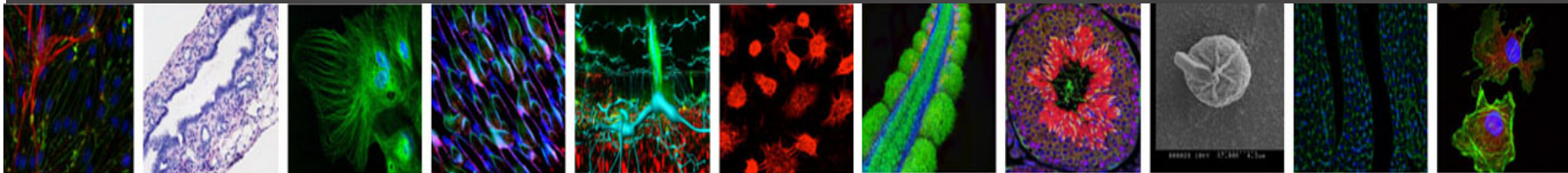




## OMERO: Down Under

Judy Callaghan & Kim Linton  
18 June 2012



# Monash University

- Established in Melbourne, Australia in 1958
- Consists of:
  - 6 local Victorian campuses
  - 3 international campuses  
China, Malaysia, and South Africa
  - Alliance with Warwick, UK
  - 2 international centres (Italy and India)
- One of the top research institutions in Australia - Member of the Group of Eight



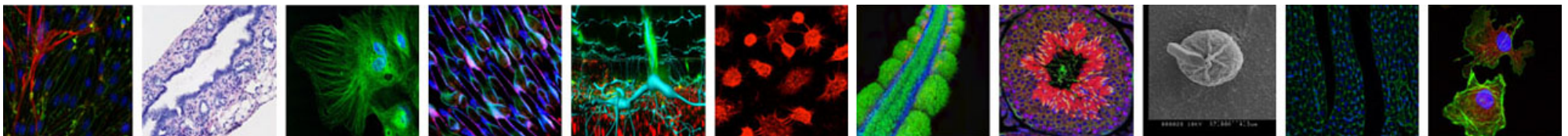
# Monash e-Research Centre (MeRC)

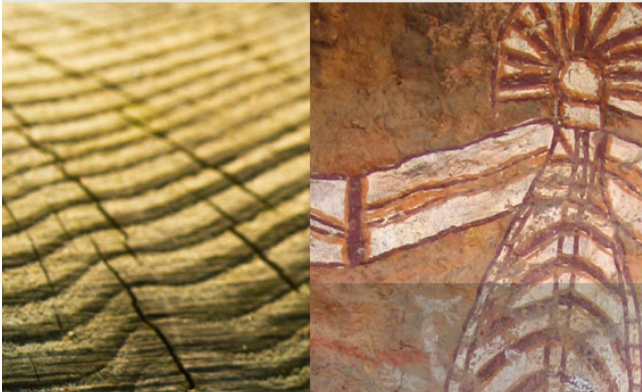
MeRC is a partnership between the DVC (Research), eSolutions (central IT division), the Library, and the Faculty of IT.

It partners with researchers at Monash to enable new research goals, enhance research practices and foster collaborative research through ICT.

Capabilities include:

- High Performance Computing
- Data Storage and Management
- Collaboration Services
- Visualisation





- An initiative of the Australian Government
- A collaboration between Monash University, the Australian National University and the Commonwealth Scientific and Industrial Research Organisation 'CSIRO'
- More researchers re-using more data more often
- Data as a first-class object



## ANDS is enabling the transformation of:

### Data that are:

Unmanaged

Disconnected

Invisible

Single-use



### Collections that are:

Managed

Connected

Findable

Re-usable

Primarily, so that Australian Researchers can easily discover, access and re-use data

# Research Data Australia



HOME COLLECTIONS PARTIES ACTIVITIES SERVICES TOPICS ABOUT CONTACT

ands

RESEARCH DATA AUSTRALIA

SEARCH Advanced Search

**Research Data Australia is a discovery service for Australian research data.**

**What's in Research Data Australia**

- COLLECTIONS** Research datasets or collections of research materials. [Browse All Collections \(39,086\)](#)
- PARTIES** Researchers or research organisations that create or maintain research datasets or collections. [Browse All Parties \(5,221\)](#)
- SERVICES** Services that support the creation or use of research datasets or collections. [Browse All Services \(78\)](#)
- ACTIVITIES** Projects or programs that create research datasets or collections. [Browse All Activities \(27,461\)](#)

**Spotlight on research domains**

More information on research data infrastructure for specific domains:

**TERN** **ATLAS for LIVING AUSTRALIA**

**NCRIS and EIF Capability - Terrestrial Ecosystem Research Network**

TERN is a network of ecosystem scientists and infrastructure for the collection, cataloguing, storage and sharing of long-term ecosystem research data sets for science and management applications.

<http://www.tern.org.au>

Share | Facebook | Twitter | LinkedIn | YouTube | RSS | Print

**Who contributes to Research Data Australia**

- AuScope (106)
- AusStage: Gateway to the Australian Performing Arts (1)
- AusStage II (501)
- Curtin University (6)
- Deakin University (64)
- Edith Cowan University (16)
- Flinders University (2)
- Geoscience Australia (1)
- NICTA (3)
- OzFlux: Australian and New Zealand Flux Research and Monitoring (10)
- PARADISEFC (144)
- The University of Sydney (6)
- University of Adelaide (44)
- University of Canberra (5)
- University of New South Wales (104)

<http://services.ands.org.au/home/orca/rda/>

- Search by collection, party, service or activities
- Provides highly fine tuned Google type searches
- Enhances collaboration and potential reuse by exposing collection metadata
- ANDS also provides a service for researchers to assign Digital Object Identifiers 'DOIs' to research datasets or collections

# ANDS funded Data Capture Initiatives

- The Australian Government through NCRIS (National Collaborative Research Infrastructure Strategy) and EIF (Education Investment Fund) contributed \$AU 14 million towards funding research data capture, infrastructure and applications programs.
- Funding for the Data Capture program has been managed by ANDS (Australian National Data Service).
- The purpose of the Data Capture program is to automate the capture of data and metadata from instruments involved in data intensive research, facilitate its management, and to make it easily reusable.
- Monash researchers submitted proposals on how they could use and benefit from ANDS Data Capture funds.
- A number of research disciplines within Monash, including Optical Microscopy, were strategically chosen.
- In Optical Microscopy, the project vision and direction was led by the Lackman Lab and Monash Micro Imaging

# Monash Micro Imaging

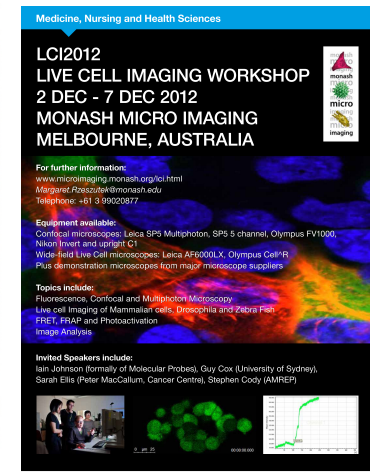


- MMI is a multi site microscopy core facility consisting of both optical and electron microscopes
- There are >300 users and 46 Microscopes
- Training in advanced optical microscopy and Bio-Electron Microscopy
- Project supervision and collaboration
- Assistance with planning and conducting live cell imaging projects
- Assistance with image analysis, image reconstruction and visualisation
- Run annual fluorescent and live cell workshops



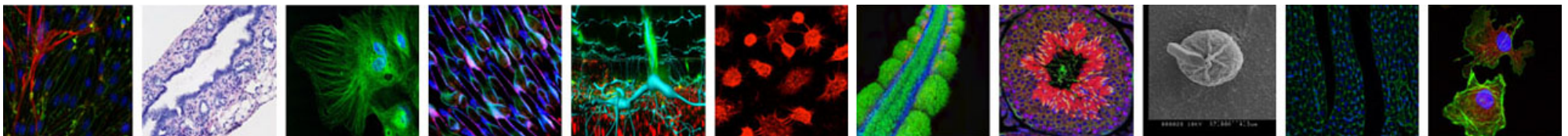
MONASH University

GROUP OF EIGHT



MONASH University

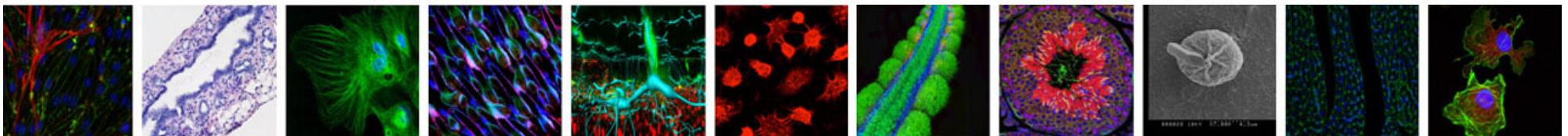
GROUP OF EIGHT





# Problem Statement

- Monash University's Micro Imaging 'MMI' facility required a solution to import, securely store, search, annotate and analyse images for the researchers who use the facility. They also needed to be able to collaborate with other researchers within their communities.
- MMI and their collaborators needed to export large data sets directly to OMERO during the experiment data collection.
- If the data and metadata was stored and shared there was also the possibility to mine the consolidated data and hopefully produce new research outcomes.



# Solution Strategy

- MeRC's philosophy is not to develop a customised solution as a first option but to:
  1. Adopt existing solutions used within a research community
  2. Customise an existing solution to fit the research communities needs
  3. Develop a customised solution, as a last resort
- Approach is to provide discipline-specific solutions as apposed to institutional/national solutions
- MeRC's ability to easily deploy, develop and maintain new research systems enable Monash University to remain strategically important within the Australian and International research communities

# Solution Options

## OMERO – OME: University of Dundee

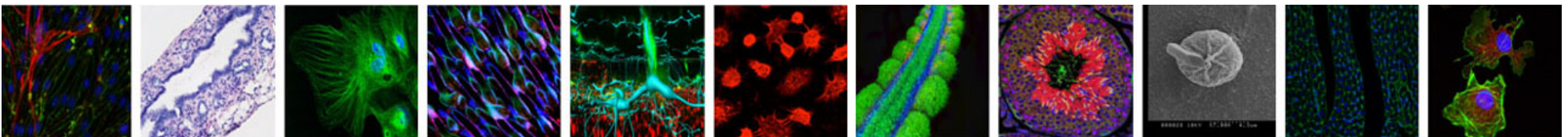
- Open Source
- Need to be deployed and maintained
- Support through the University of Dundee

## Columbus Image Data Storage and Analysis System – PerkinElmer

- \$\$ to purchase
- \$\$ for support
- PerkinElmer to maintain and further develop

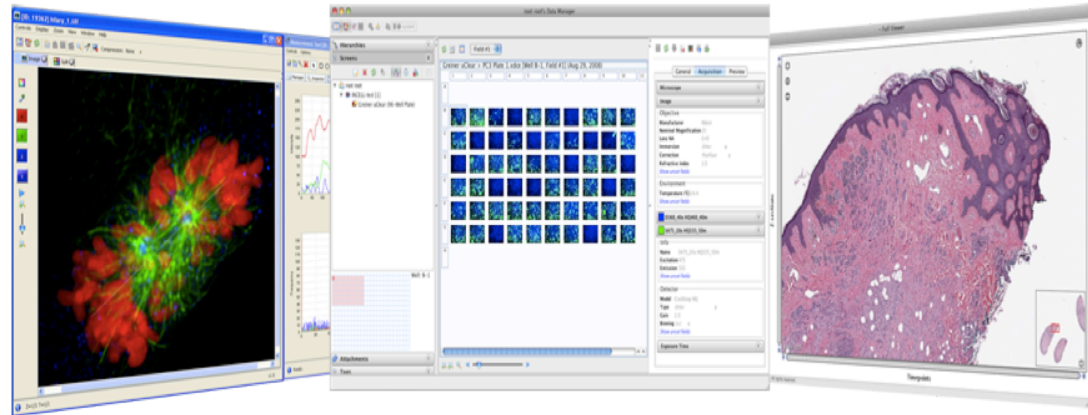
## CellBase – EMBL Heidelberg

- Open Source
- Need to be deployed and maintained



# Final selection

## OMERO

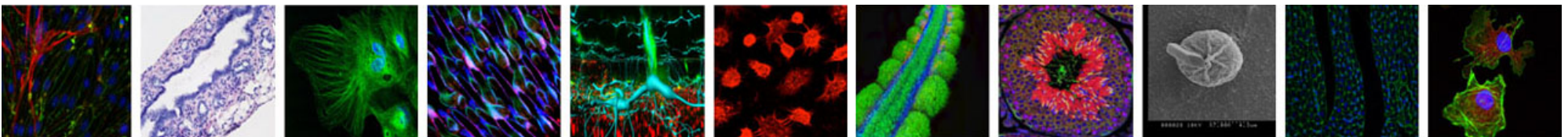


- Open source
- Could be extended to include interfaces from:
  - Leica to OMERO
  - OMERO to [Research Data Australia](#)
- Offered both a web and client version
- Operated within the researchers' existing workflow
- Provides easily searchable secure data/metadata storage
- Opportunity to annotate images with relevant metadata

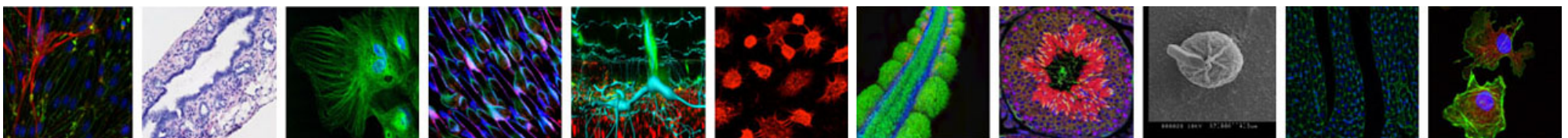
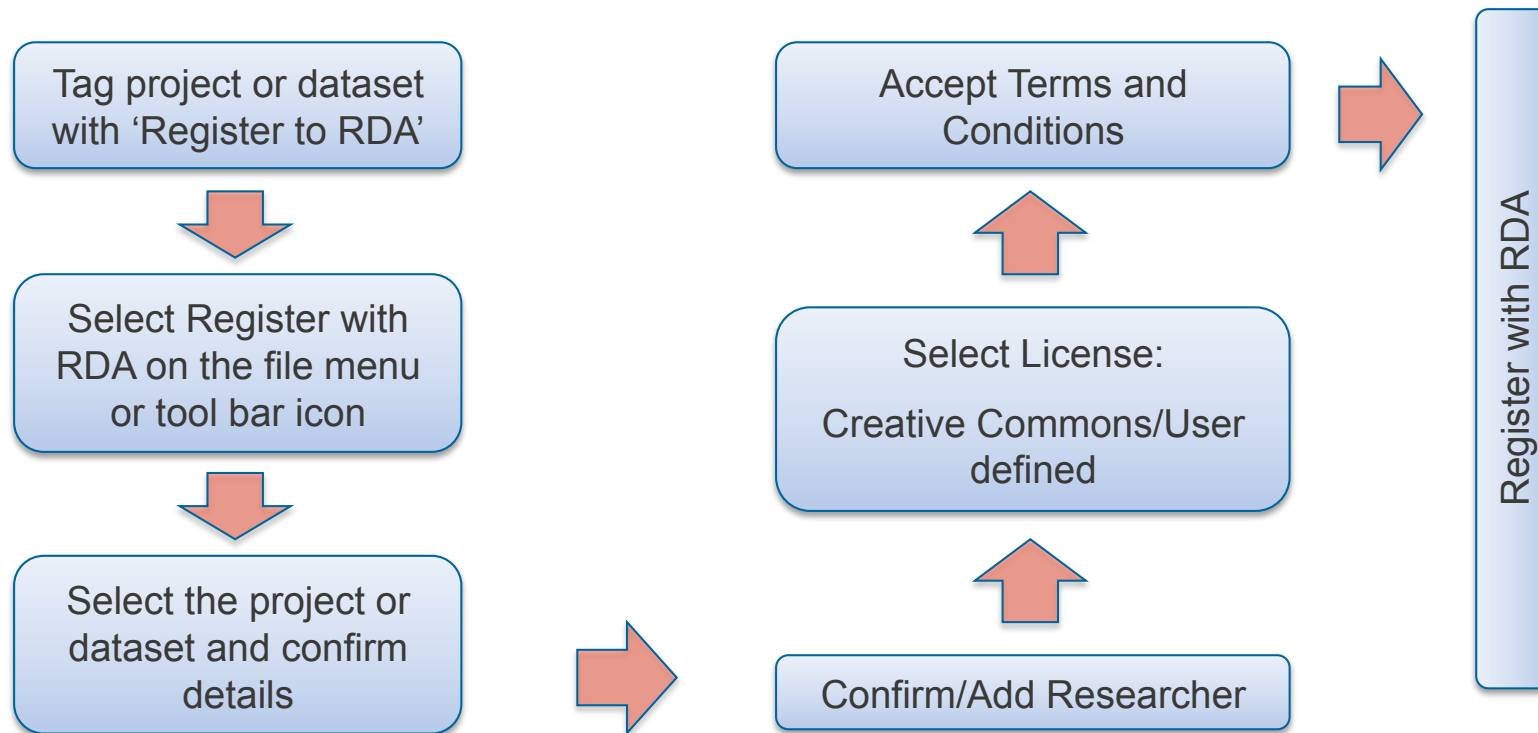


# Extending OMERO

1. To meet the ANDS requirements of being able to register data collections with Research Data Australia, the OMERO client was selected and extended, as it operated within the researchers' existing workflow
2. A workflow was developed from Leica Microscopes to OMERO using Kepler so that specific experimental metadata would be automatically imported into OMERO (Leica and Monash IT faculty representatives).
3. A second workflow was developed to take image data from OMERO, conduct analysis and then re-import the results back into the OMERO server against the original image/set of images (Leica and Monash IT faculty representatives).



# 1. User Workflow to register collections to Research Data Australia



# REGISTER WITH RESEARCH DATA AUSTRALIA

Register with RDA

Register the following collection with RDA

**MONASH University**

**Kim Linton New collaborative project**

Kim Linton New collabora

Metadata Public Registration

**Collection Name** Kim Linton New collaborative project

**Collection Description** collaborative project

**The Associated Researcher(s):**

**License Required:**

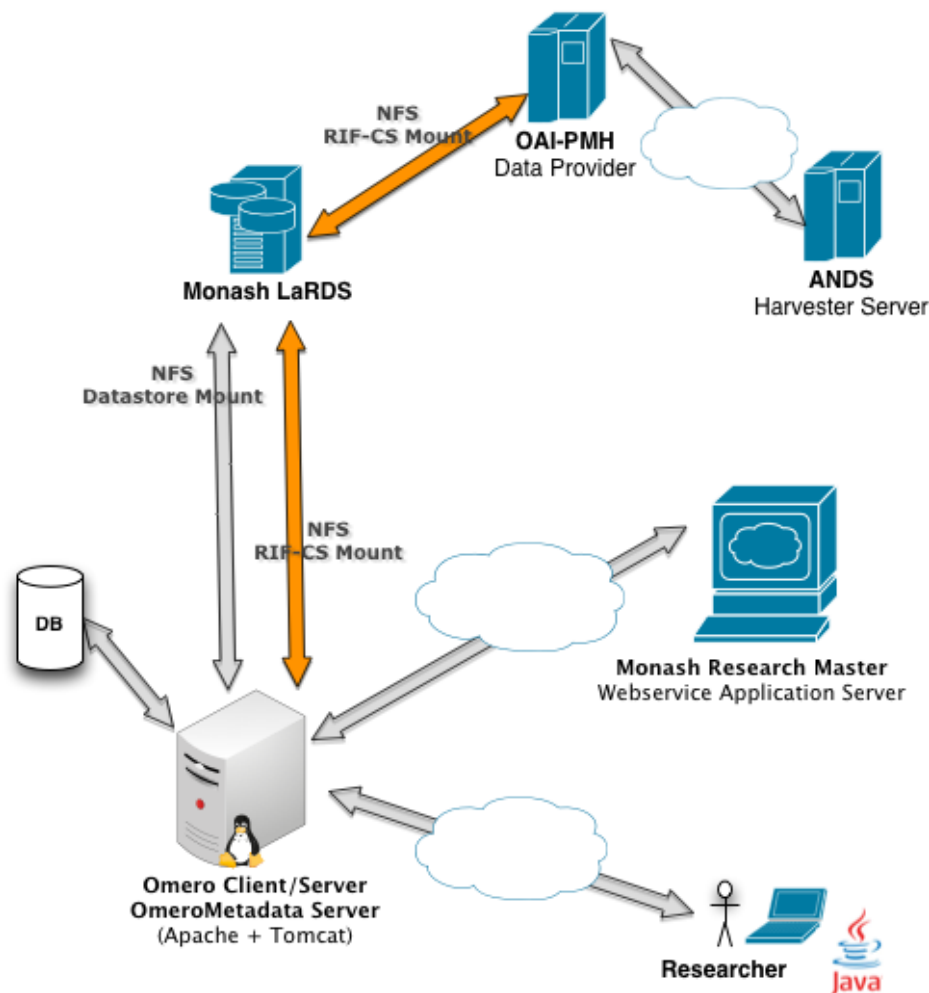
**Terms and Conditions:**

You are about to publish or register the above research work outside Monash University to be available to the general public via Internet sites that can harvest this information. Sites include but are not limited to: Research Data Australia and search engines.

Before you proceed, please ensure you have selected a licence to associate with your research data and work.

By using this system to publish or register your research work you are continuing to agree to adhere to the Terms and Conditions of use detailed at <http://www.monash.edu/eresearch/about/ands-merc.html>. Please read these Terms and Conditions carefully before registering.

# High Level Architecture

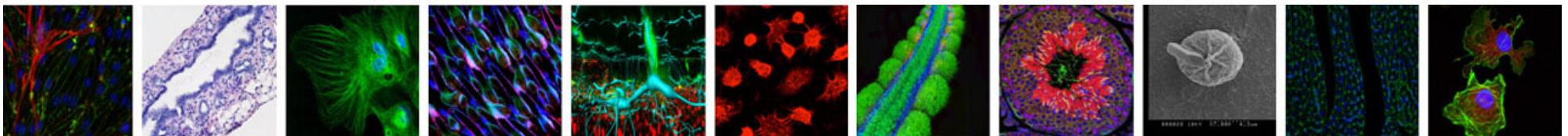


- **OAI-PMH** – Open Archives Initiative for Metadata Harvesting
- **ANDS Harvester** – Uses OAI-PMH protocol for harvesting RIF-CS documents
- **LaRDS** - Large Research Data Store, provides hundreds of terabytes (TB) of capacity for storage of Monash research data.

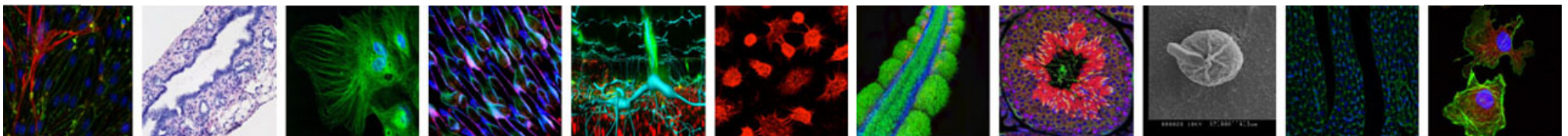
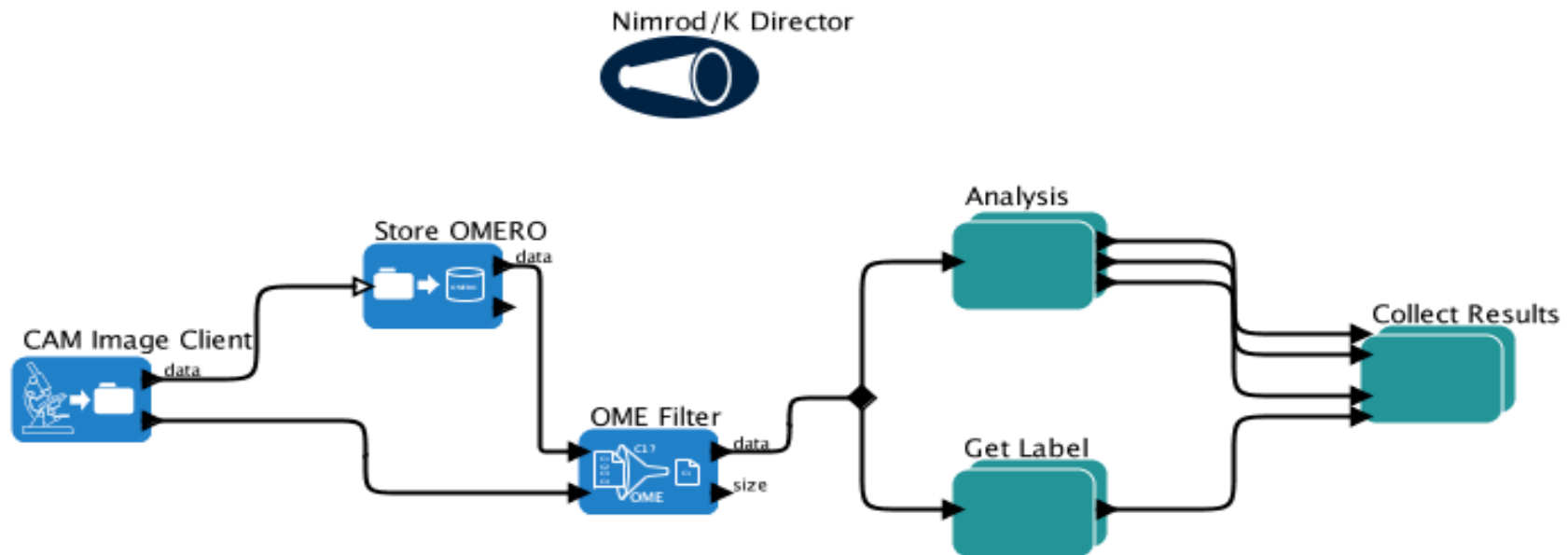


# Extending OMERO

1. To meet the ANDS requirements of being able to register data collections with Research Data Australia, the client was extended, as it operated within the researchers' existing workflow (MeRC).
2. **A workflow was developed from Leica Microscopes to OMERO using Kepler so that specific experimental metadata would be automatically imported into OMERO (Leica and Monash IT faculty representatives)**
3. A second workflow was developed to take image data from OMERO, conduct analysis and then re-import the results back into the OMERO server against the original image/set of images.

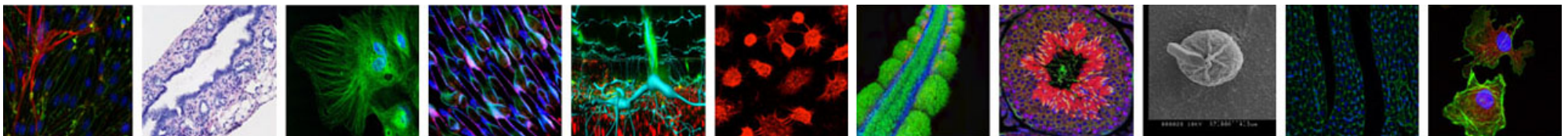


## 2. Example Workflow 1- Upload and Analyse

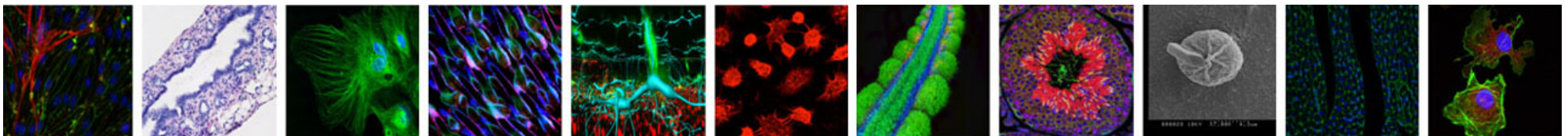
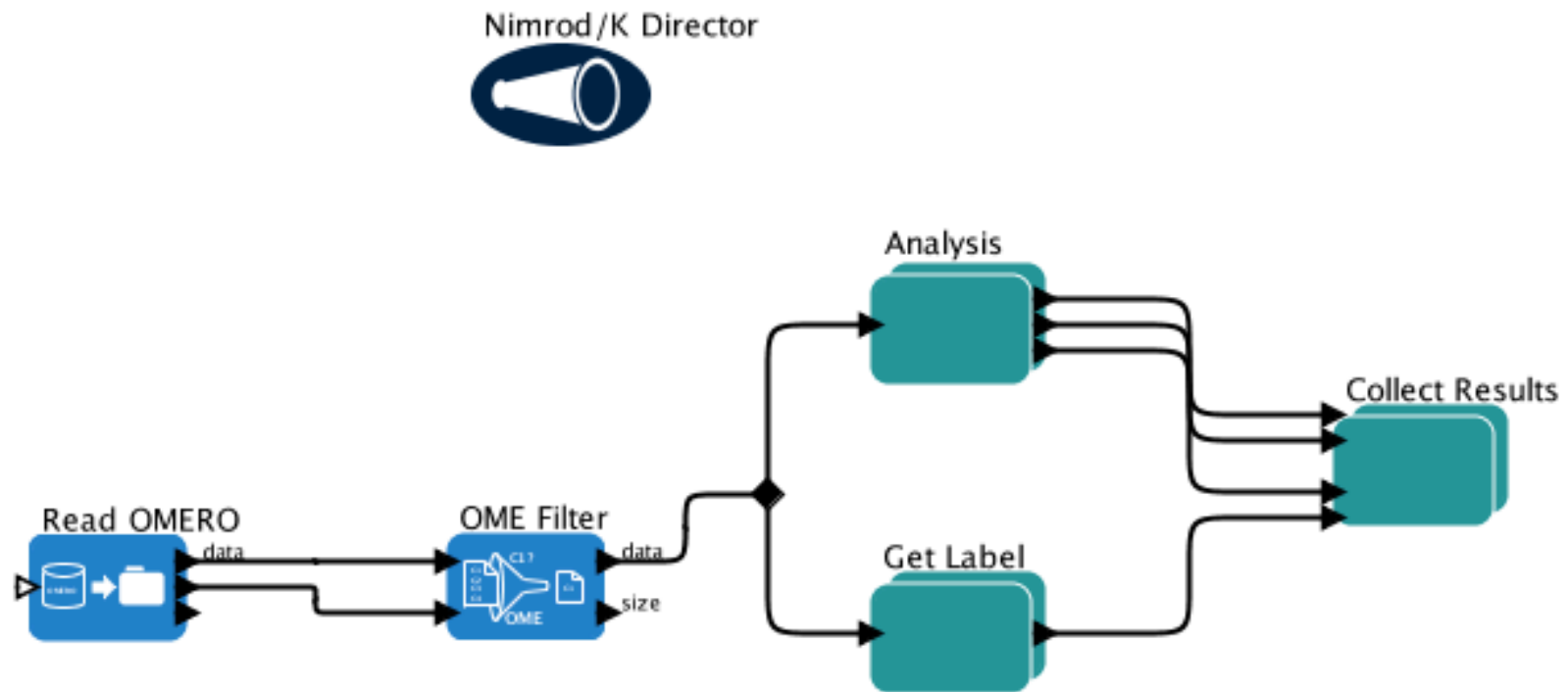


# Extending OMERO

1. To meet the ANDS requirements of being able to register data collections with Research Data Australia, the client was extended, as it operated within the researchers' existing workflow.
2. A workflow was developed from Leica Microscopes to OMERO using Kepler so that specific experimental metadata would be automatically imported into OMERO.
3. **A second workflow was developed to take image data from OMERO, conduct analysis and then re-import the results back into the OMERO server against the original image/set of images.**



### 3. Example Workflow - Download and Analyse



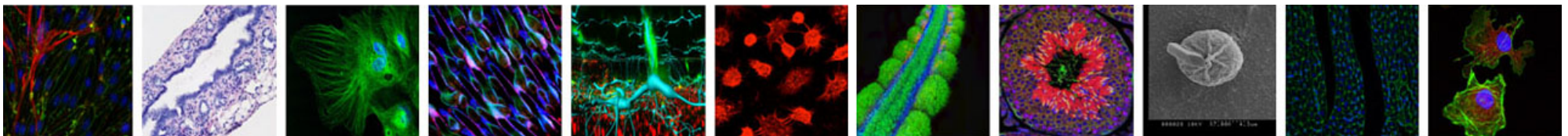


# Future Initiatives

Monash would like further collaboration with OME to enhance OMERO for our research community

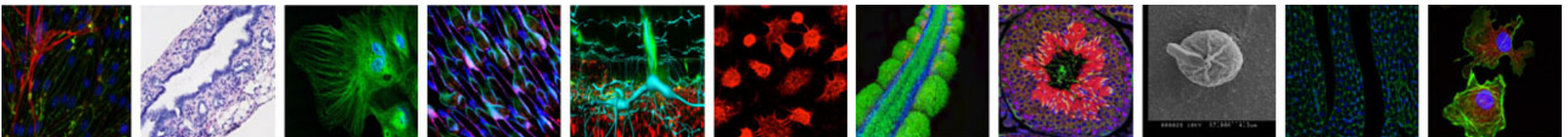
Initiatives may include:

- Enhanced visualisation
- Integration with Monash High Performance Computing capabilities
- OME presenting OMERO at the e-Research Australasia conference



# Opportunities

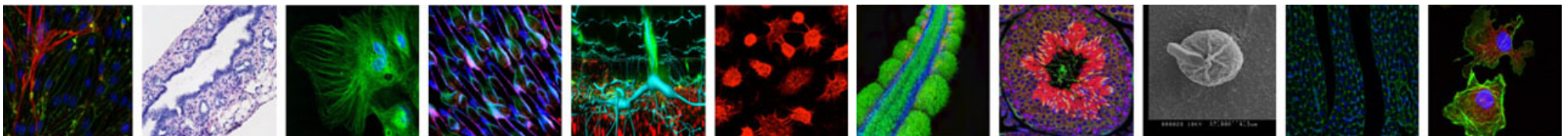
- Strategies on further uptake of OMERO
- Enhanced group functionality
- Increased speed to display images
- Increased speed when uploading and viewing images externally
- Administrator reporting of usage
- Enhanced transfer of metadata from the instrument to OMERO
- Electron Microscopy researchers are showing signs of interest



# Growing OMERO community in Australia

## Implemented or seriously considering implementing OMERO

- Monash University - Australia
- Griffith University – QLD, Australia
- Walter & Eliza Hall Institute – Melbourne, Australia



# Acknowledgments

## Monash Micro Imaging

- Associate Professor Ian Harper
- Stephen Firth
- Dr Judy Callaghan

## Monash e-Research Centre

- Anthony Beitz
- Anitha Kannan
- Sindhu Emilda
- Kim Linton
- Leon Kolchinsky

## OME

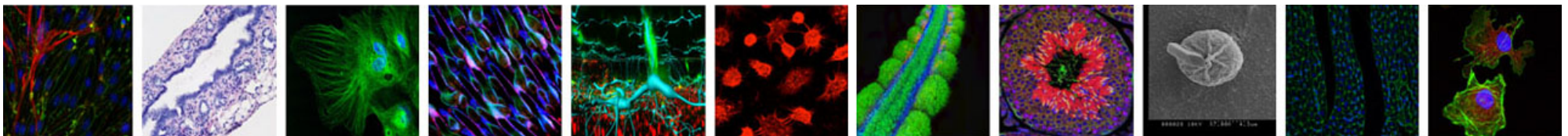
- Jason Swedlow
- Jean-Marie Burel
- Emma Hill
- Scott Loynton

## Lackman Laboratory - Biochemistry

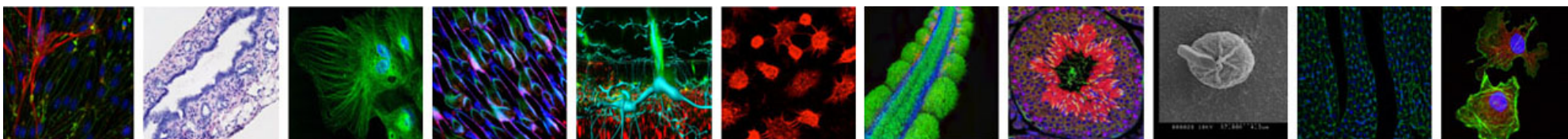
- Associate Professor Martin Lackman
- Dr Mary Vail

## MeSsAGE Lab

- Professor David Abramson
- Slavisa Garic



Thank you!





**This project is supported by the Australian National Data Service (ANDS)**



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**Australian Government**  

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**Department of Innovation  
Industry, Science and Research**