Visualisation: iVEC and ECU

Paul Bourke

iVEC @UWA

Visualisation: A common thread

- Definition: The use of advanced computer graphics and algorithms, applied to research data to inform researchers - their peers - the public.

- Involves a range of advanced algorithms including computer graphics - computational geometry - rendering - realtime graphics - user interaction - data processing ...

- Often benefits from novel display and interface technologies.
  Our sense of vision is the main method by which information is conveyed to our brain.
  Displays that leverage the capabilities of the human visual system.

- Visualisation is a common requirement for research across a wide range of disciplines.
  As such it is an ideal focus for the iVEC presence at ECU.
  Opportunity to foster interdisciplinary research.

Visualisation in iVEC

- Three partially funded staff
  - Andrew Squelch (Curtin - CSIRO)
  - Brad Power (Murdoch)
  - Paul Bourke (UWA)

- Nodes where the visualisation hardware resides
  - CSIRO (Specialise in geoscience)
  - Murdoch (Specialise in bioinformatics)
  - Curtin (School of Design and Art)
  - UWA

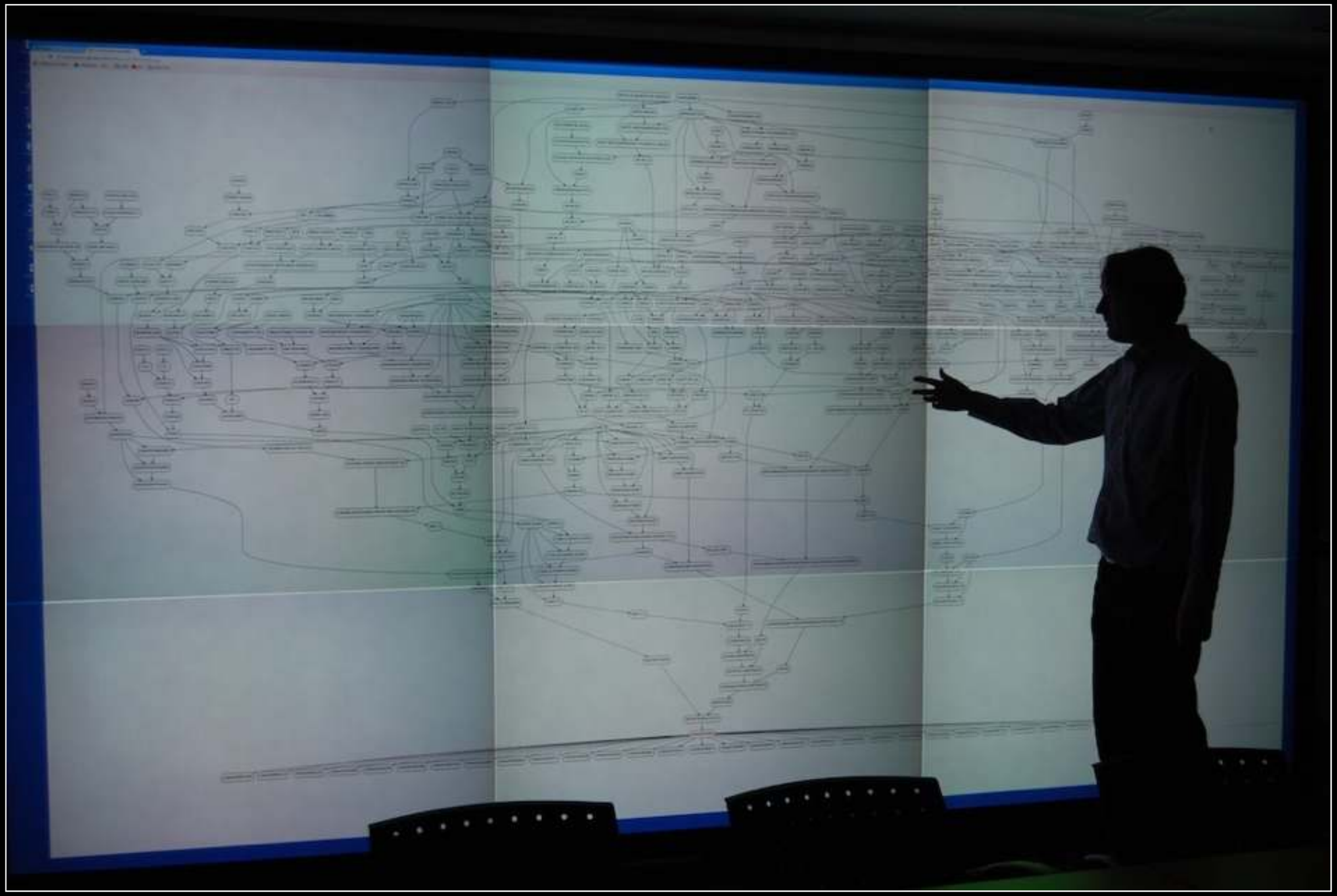
Infrastructure by location

- Murdoch
  - Tiled rear projection display (18 MPixels)
  - High end workstation
- CSIRO
  - Stereoscopic displays (projection and panels)
  - Magic Planet (Spherical display)
  - Stereoscopic video camera
  - Mobile eye tracker
  - High end workstations and various software licenses (eg: Avizo)
- UWA
  - Stereoscopic projection
  - High resolution tiled display (33 MPixels)
  - Immersive display (iDome)
  - Specialist camera hardware (360 video camera, 4K video camera, gigapixel mount)
  - Camera tracking
  - High end workstations and access to software licenses

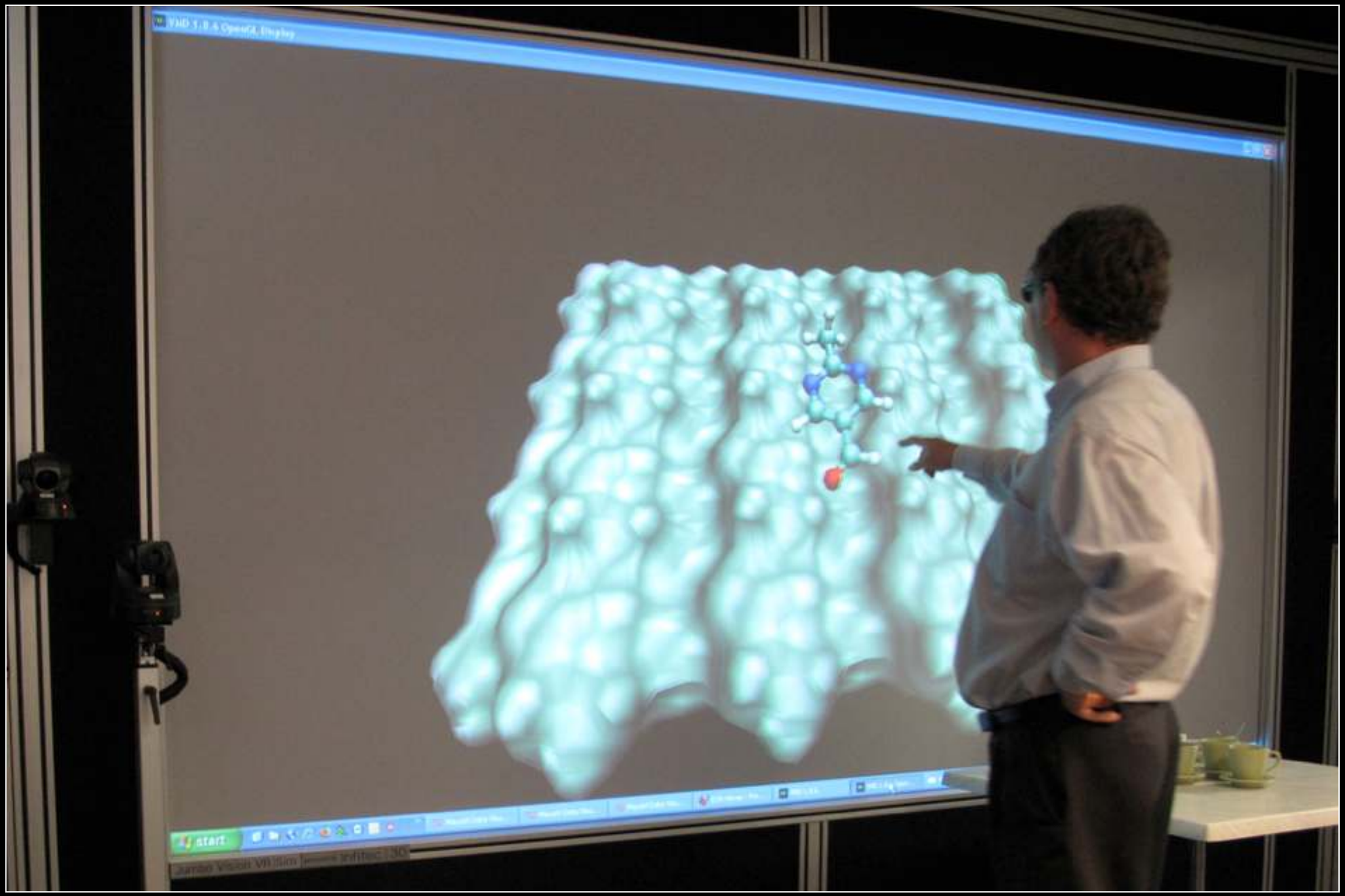
Visualisation expertise

- Extensive experience with volume rendering across a range of dataset types.
- Stereoscopic 3D theory, content (CG) development and filming.
- Development of virtual environments, eg: game engines.
- Rapid prototyping, holography.
- Image and geometry processing.
- Novel image capture modalities, projection into matching visual environments.
- Data format conversion.

Murdoch Data Wall

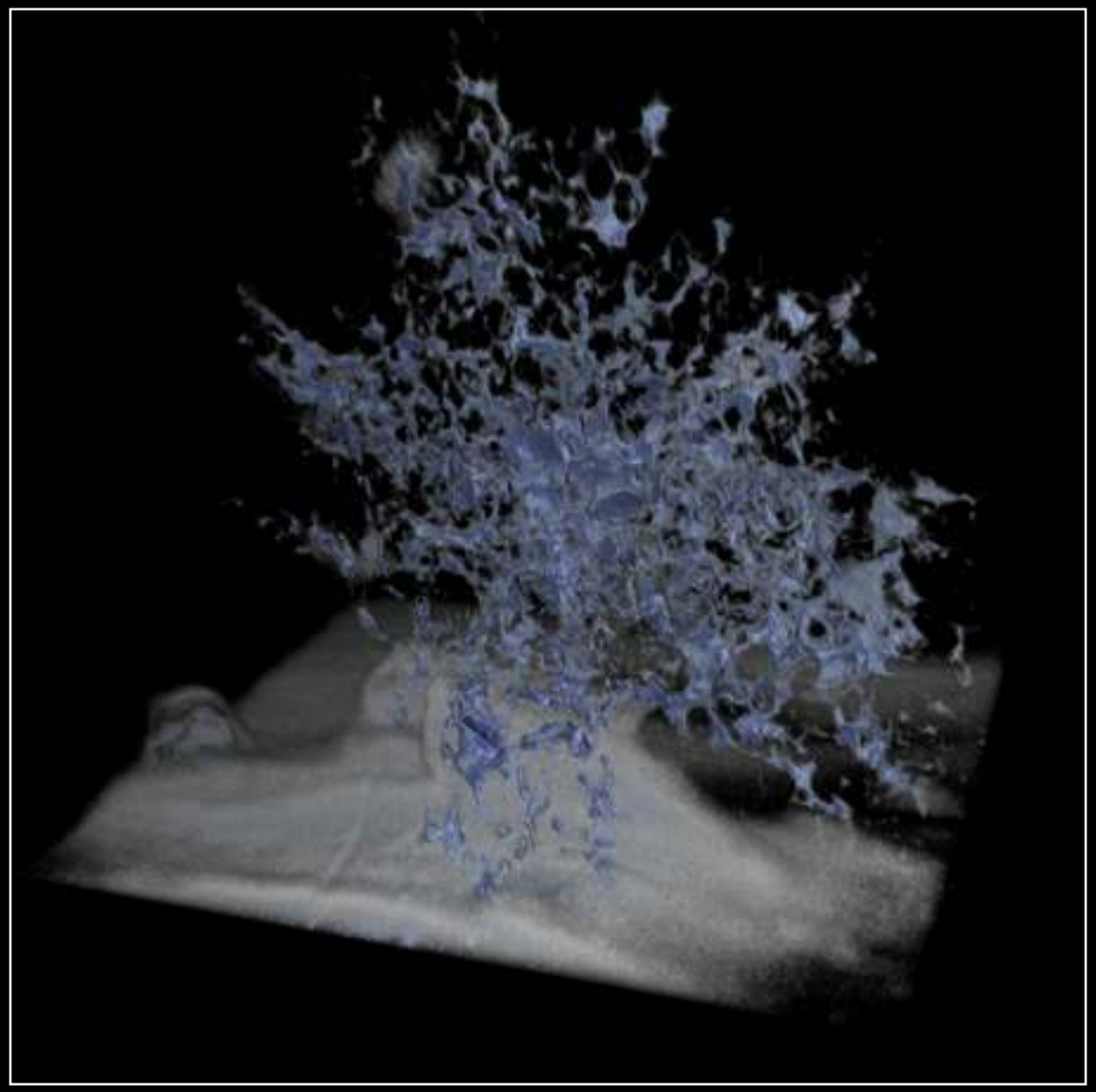


CSIRO Visualisation/Conferencing room



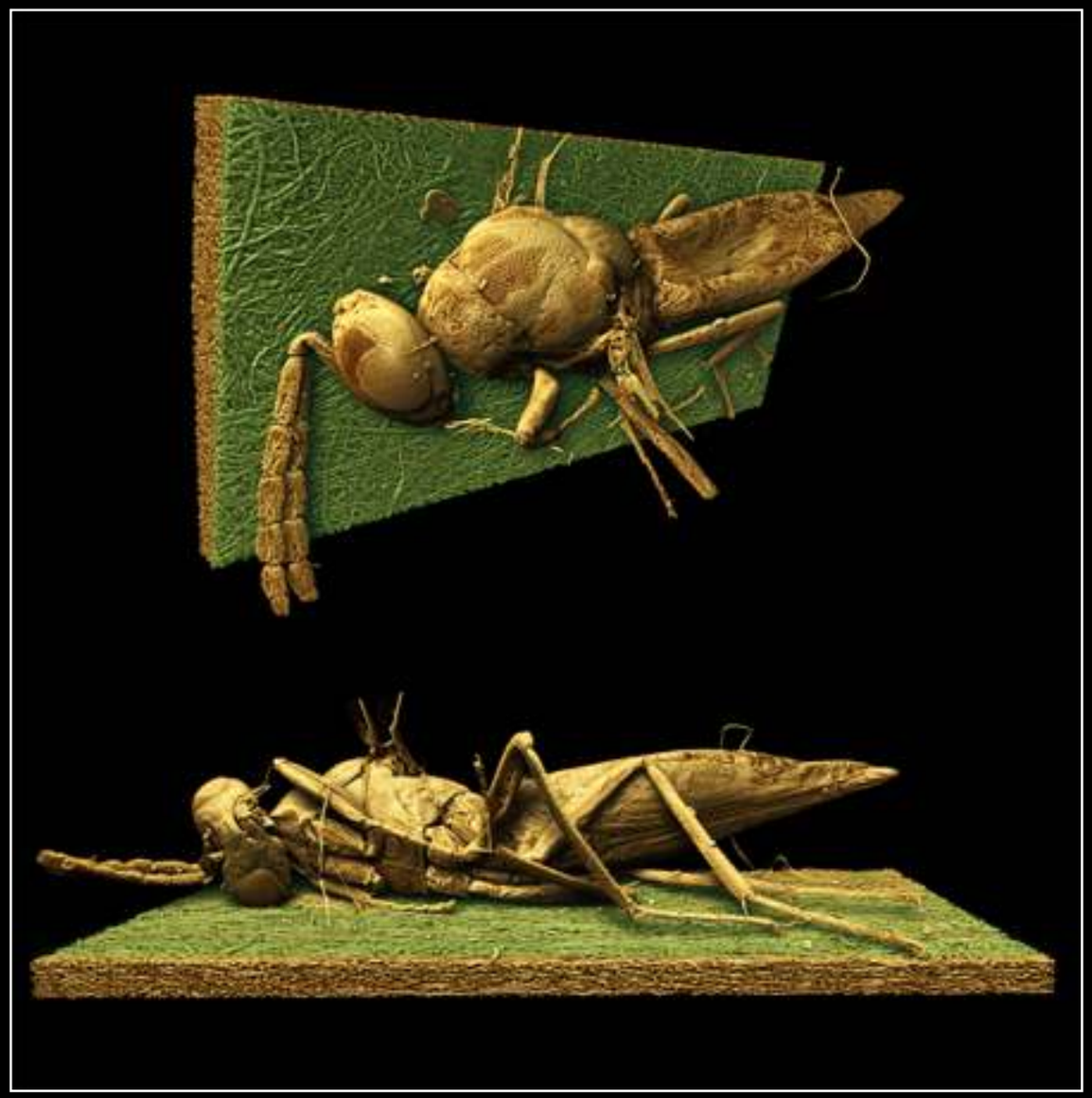
UWA Visualisation Laboratory

Examples: Volume rendering



Microfossils

David Wacey, Charlie Kong

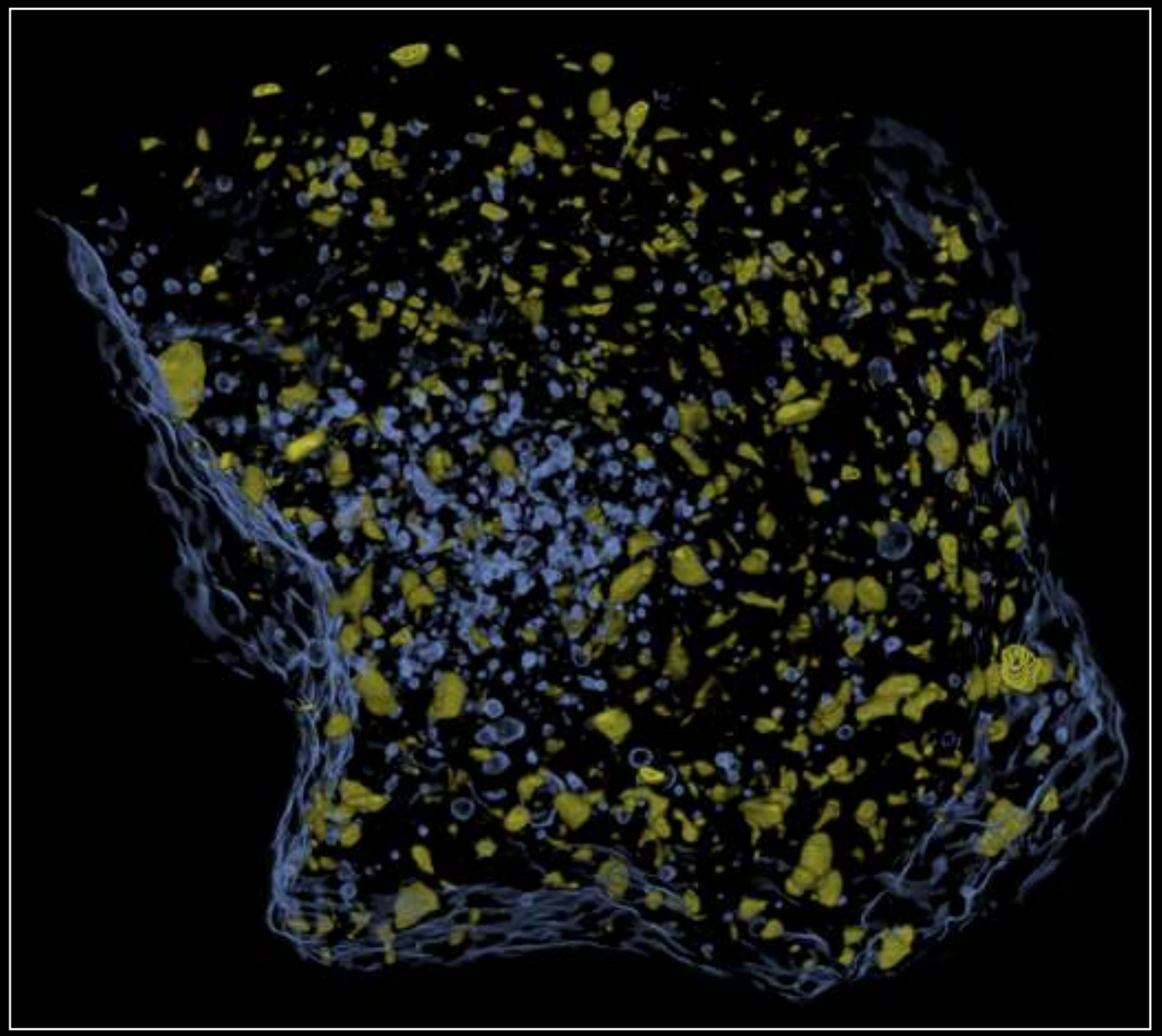


Entomology

John LaSalle

Volume rendering is a common visualisation activity applied to data from many 3D capture systems

Examples: Geology



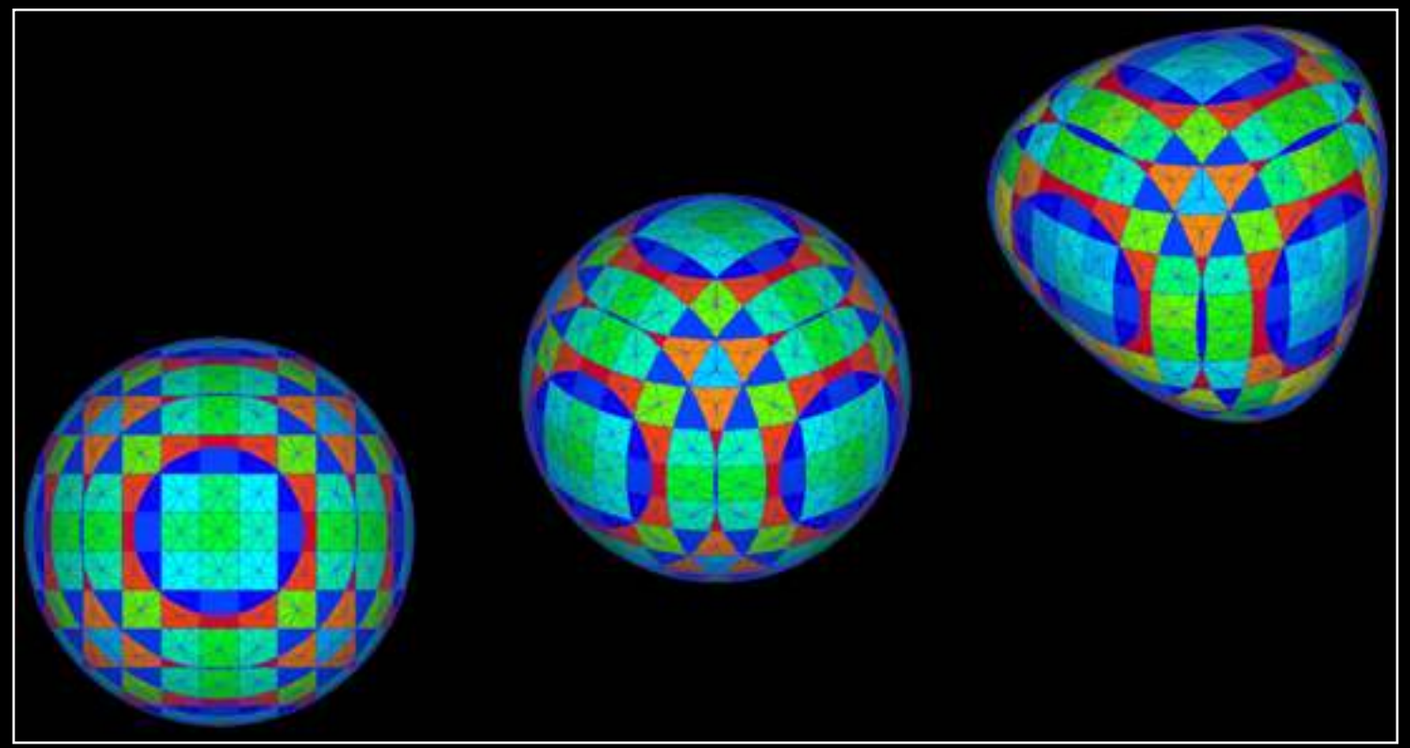
Geology: Visualisation of basalt
CT scan

Andrew Squelch

Geology: Sandstone
Study of porosity and permeability.

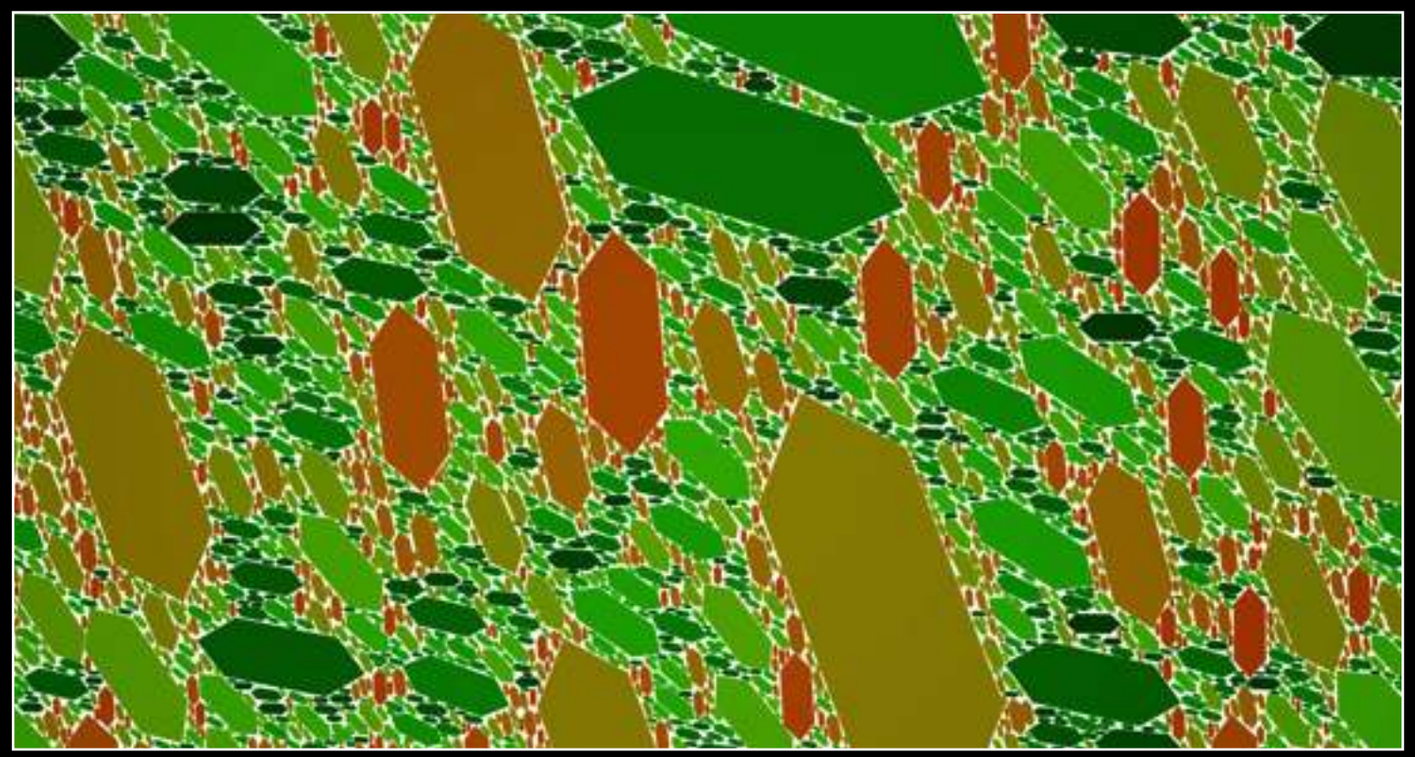
Andrew Squelch

Examples: Mathematics



Interface Tracking in Computational Fluid Dynamics

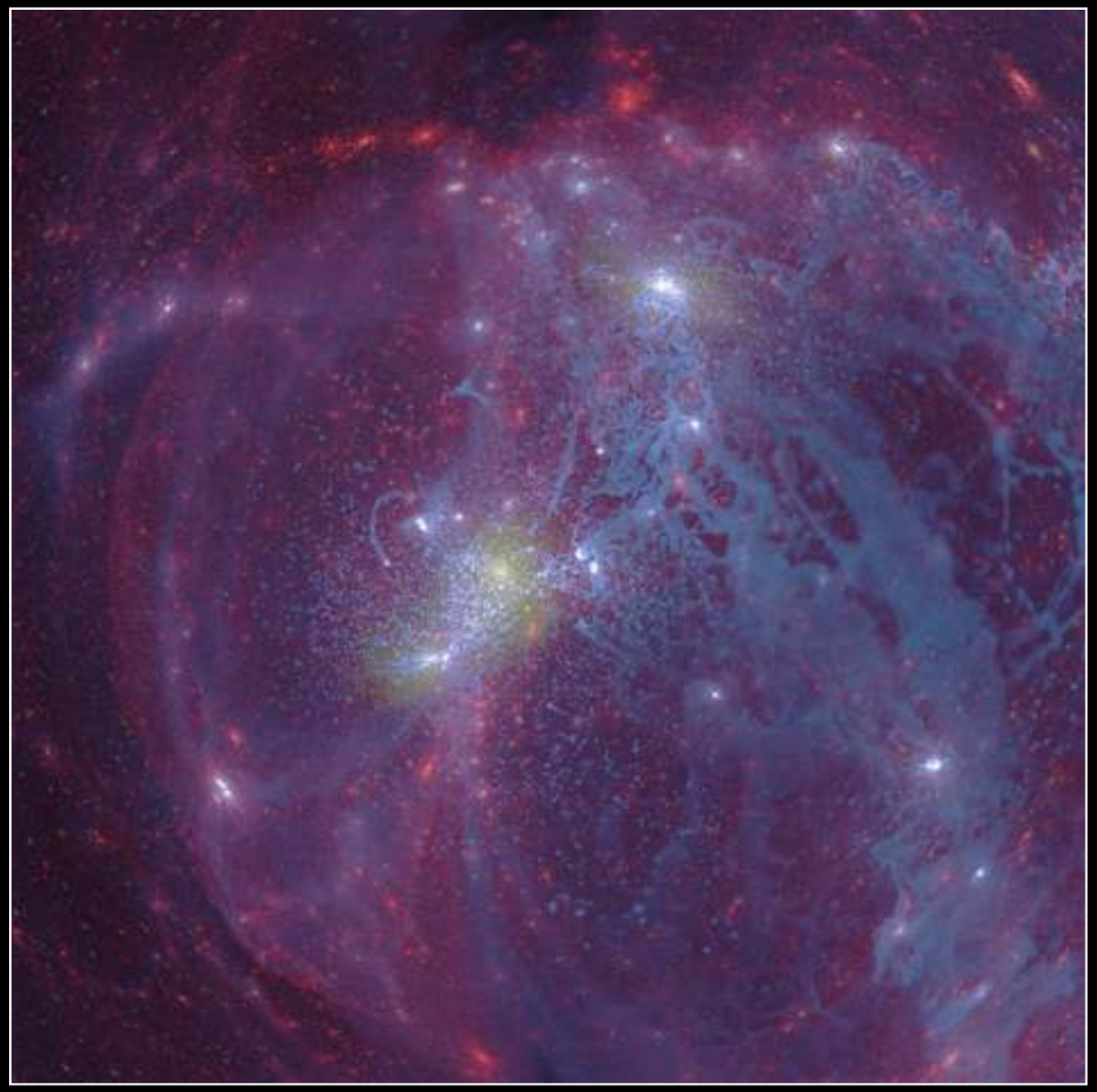
Mark K. Ho, Guan H. Yeoh, Victoria Timchenko, John A. Reizes



Space filling packings

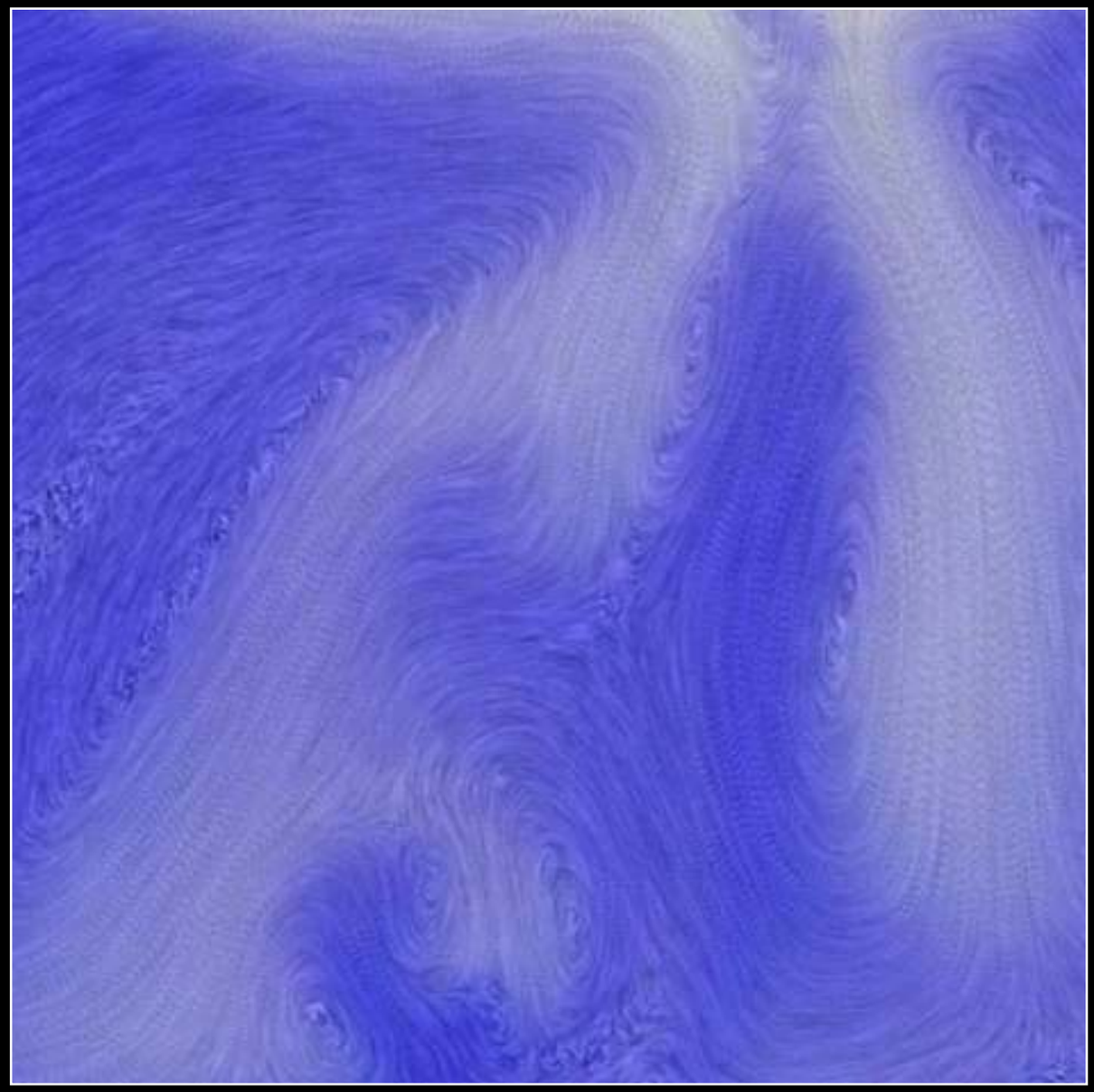
John Shier, Paul Bourke

Examples: Visualising simulation science



Cosmological simulation

Alan Duffy,

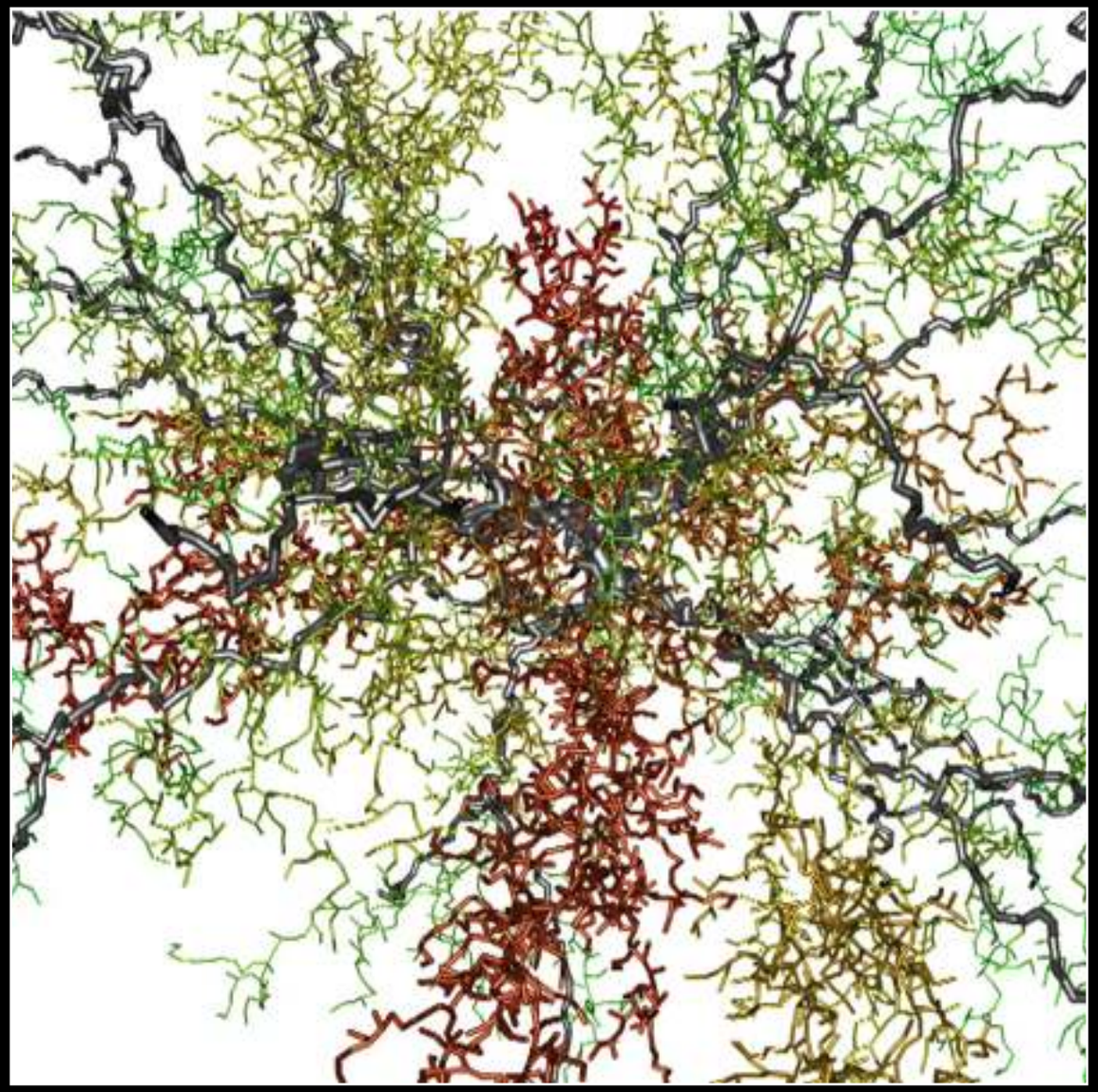


Ground water flow

David Warne, Ben Cumming, Joe Young

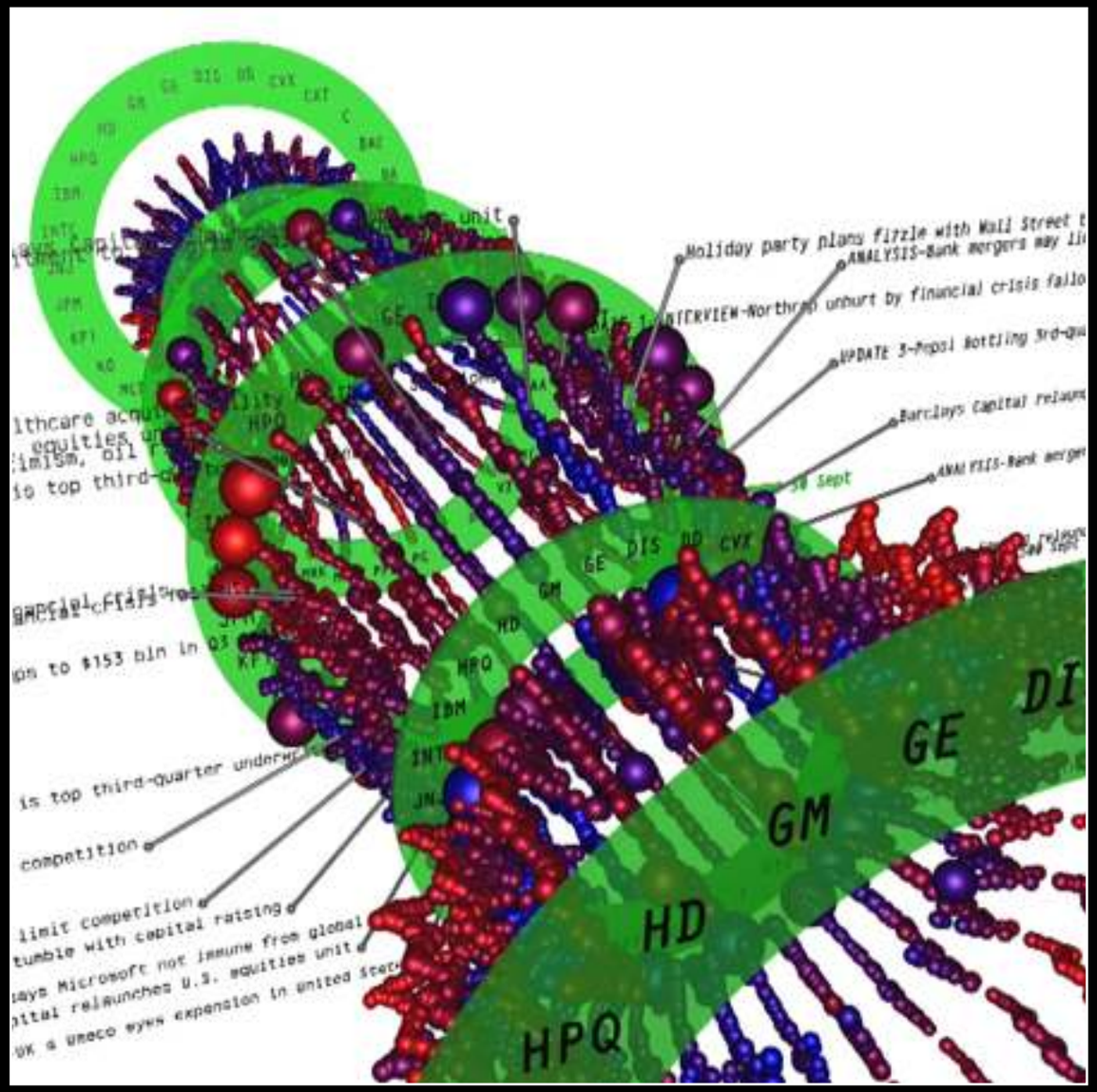
Both using similar algorithms

Examples: Information visualisation



Flow networks

Tony Roberts



Information visualisation

Examples: Virtual worlds

SecondLife

Mawsons huts

Peter Morse

ASKAP site simulation

Examples: Sports science

Running room (iDome)

Kevin Hewlett

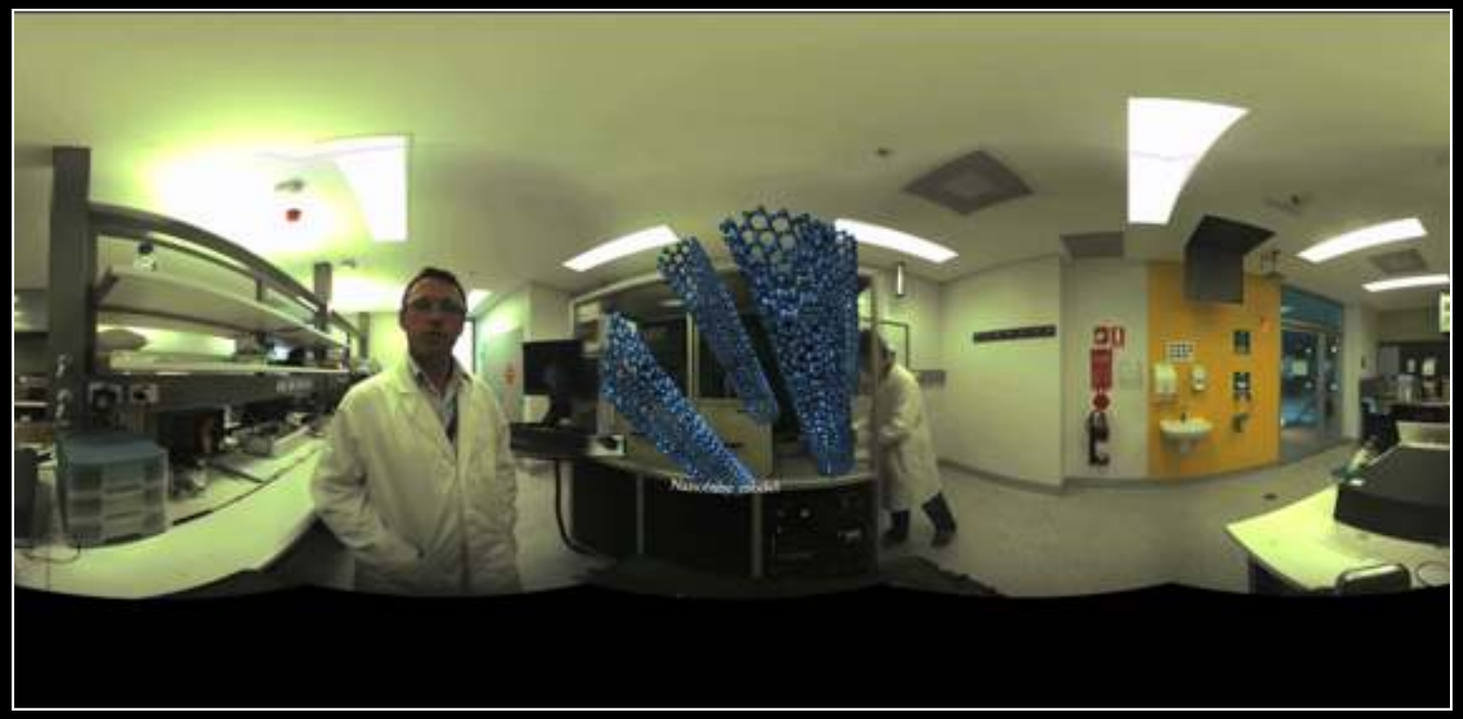
360 video capture
originally acquired for
cultural heritage project

Sorts science (stereo3d)

Marcus Lee, Steve Tidman

Presenting realistic visual stimulii

Example: Public education



Science (nanotechnology) public outreach, Wollongong Science Centre
Glen Moore

Examples: Public exhibitions

MONA Museum:
Pausiris Mummy

Peter Morse

ASKAP:
Dark Fulldome Show

Peter Morse

Examples: Heritage

Reconstruction of aboriginal rock art

Jo McDonald, Alistair Paterson

Capture of Indian temple facades

Indian Ministry for Culture

Software to reconstruct 3D geometry purely from photographs

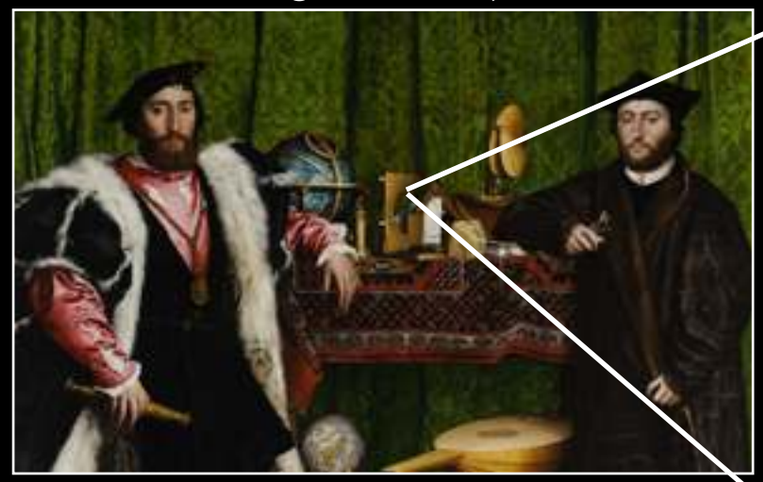
Examples: Cultural heritage

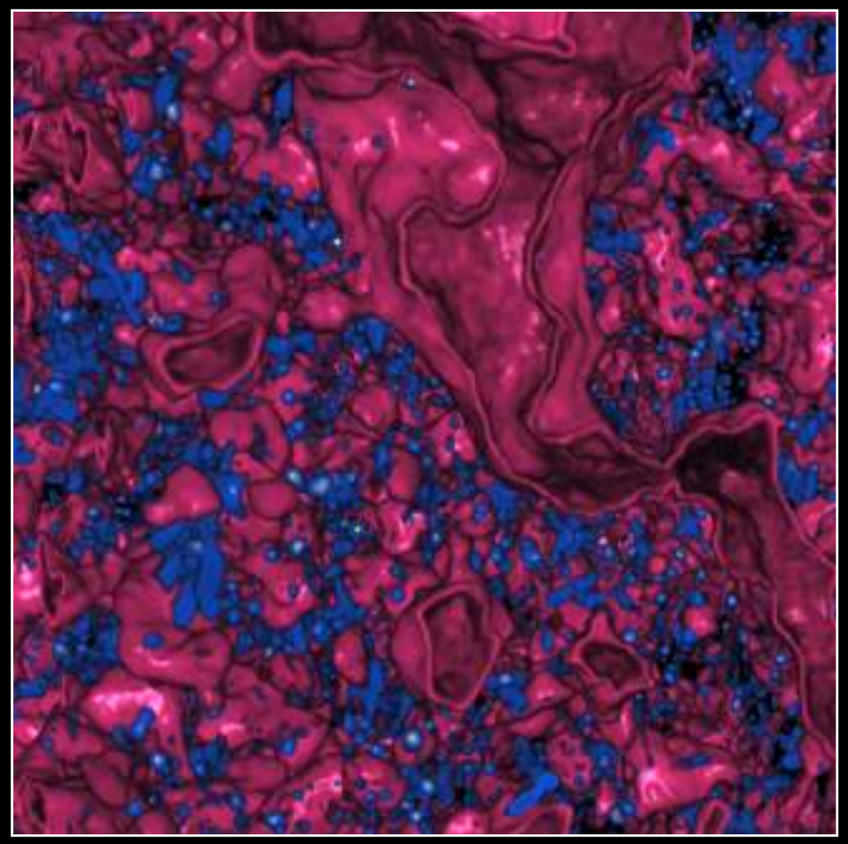
Jiao festival

Sarah Kenderdine

Favourite example of an interdisciplinary outcome

Google Art Project





Algorithms being used to analyse porosity in rock could be used to study the material properties of the inks.

Summary

- A shared research/visualisation space is an ideal basis (maximises opportunity) for interdisciplinary research.

- iVEC manages a number of infrastructure items, these are available for use by researchers located at the partners including use of the portable items at the researchers home institution.

- iVEC has employees with visualisation expertise, available for advice and joint project collaboration.

[Andrew and myself will be around to field any questions]

Promotional plug

- OzViz: annual (informal) conference for visualisation professionals across Australia
- http://www.ozviz2012.org
- No conference fee, sponsored this year by iVEC (@UWA)
- Will be hosted at UWA this year
- Organising committee
  - Derek Gerstmann (ICRAR)
  - Tomasz Bednarz (CSIRO)
  - Andrew Squelch (iVEC@Curtin)
  - Drew Whitehouse (VizLab ANU)
  - Paul Bourke (iVEC@UWA)

OZVIZ2012
PERTH, WA