

Signature Projects Our CBNS Signature Projects draw on the capabilities of our expert researchers to solve the big questions in bio-nano research.

JTCC: VISUALISING BIO-IMAGING AND DATA IN 3D VIRTUAL REALITY (VR)

Leaders: Associate Professor John McGhee, Professor Tom Davis

Co-Leaders: Dr Andrew Lilja, Mr John Bailey, Mr Campbell Strong



THE PROJECT

This ARC Centre of Excellence project will explore how design-led 3D VR immersive techniques can be used to visualise the Dynamics process within a cancer cell. The research also intends to conduct user testing of the VR content with students and scientific communities. The goal of this research is to establish whether VR immersive data interaction provides benefits as an educational tool. We also intend to investigate whether 3D VR visualisations of laboratory data can facilitate and enhance the scientific discovery process. As part of this evaluation, we will be developing a VR platform to 'share' content. The goal is to connect VR 3D cellular data between multiple users and sites across the CBNS nodes simultaneously on a collaborative VR platform, to be termed the 'VR Cell Arena System'.

Sub-projects:

1. 3D Visualisation of Cancer Cell Data – UNSW, UQ and Monash
2. 3D VR of High Resolution 3D Cell Dynamics Data – UNSW and CCIA
3. 3D VR *in-vivo* Nanoparticles Dynamics Data – UNSW and UQ

THE BIG QUESTIONS

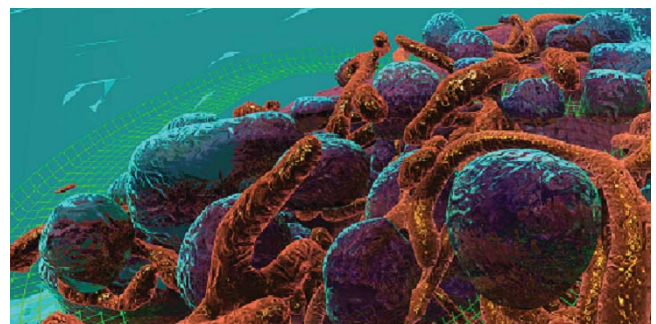
-  Can the use of data-driven 3D computer visualisation provide greater insight into the mechanisms of internalisation of a drug delivery system?
-  Can design-led VR through the use of Head Mounted Displays (HMDs), provide improved modes of interaction and education of the scientific data?

The benefits of this research

- The core benefit of this research is to enhance data visualisation through design-led approaches to VR immersion and experience design.

Our goals

- Establish new computer graphics pipeline tools for enhanced forms of VR 3D visualisation on HMDs.
- Develop an education and scientific discovery VR platform for improved interaction with Nanoscience laboratory data.
- Design and build meaningful and embodied interfaces that allow multi-user immersive 3D VR data interaction.

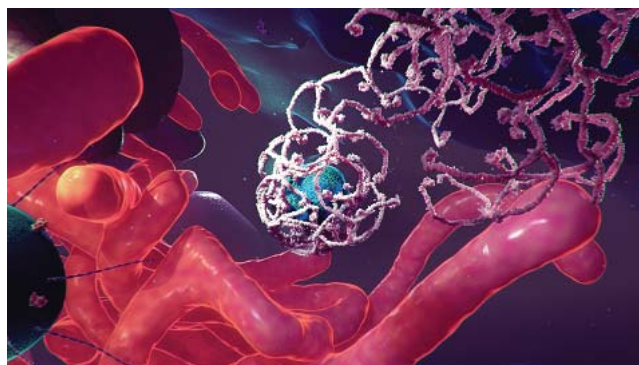


Immersive visualisation of the internal structures of a cancer cell.
Image: John McGhee, John Bailey, 3D Visualisation Aesthetics Lab, UNSW (@3DVAL).

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Media highlights

- ABC Catalyst Science Show: <http://www.abc.net.au/catalyst/stories/4519963.htm> 2016.
- TEDx UNSW: – VR research presentation - Invited speaker <https://www.youtube.com/watch?v=29ohlo5Gdgs> 2016.
- The Age: <https://goo.gl/AhRAzB> 2016.
- Wired: <http://www.wired.co.uk/article/swallow-batteries-robots-disease> 2016.
- New Scientist: <https://goo.gl/udUr1T> 2016.



Visualisation of vesicle transport within a cancer cell.
Image: John McGhee, John Bailey, Andrew Lilja, 3D Visualisation Aesthetics Lab, UNSW (@3DVAL).

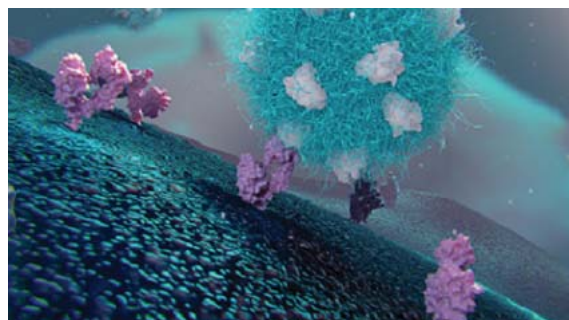
Recent publications

- Journey to the Centre of the Cell (JTCC): A 3D VR experience derived from migratory breast cancer cell image data: VR Showcase, SIGGRAPH Asia Conference in Macao, 2016.
- The role of personalised virtual reality in education for patients post stroke: A case series.. Oral Presentations in Order of Conference Program. International Journal of Stroke: 10, 40 - 51; 2015.
- The Fantastic Voyage: an arts-led approach to 3D virtual reality visualisation of clinical stroke data: In Proceedings of the 8th International Symposium on Visual Information Communication and Interactin, ACM, Tokyo, AA, Japan, 69 - 74; 2015.
- Alternate Ways of Seeing the Inner Body: An Arts-Led Approach to Visualising MRI Scan Data: Leonardo, 47 (1), 90 - 91; 2014.

Signature Project collaborations:

JTCC: Visualising bio-imaging data in 3D virtual reality (VR)

Institution	Collaborator
University of Nottingham	Professor Cameron Alexander
Memorial Sloan Kettering Cancer Centre	Professor Jason Lewis
St Vincent's Clinic	Associate Professor Steven Faux
University of New South Wales	Professor Maria Kavallaris
University of Queensland	Professor Rob Parton Associate Professor Kris Thurecht
Monash University	Dr Angus Johnston



Visualisation of a nanoparticle binding to receptors on the surface of a cancer cell.
Image: John McGhee, Andrew Lilja, John Bailey, 3D Visualisation Aesthetics Lab, UNSW (@3DVAL).



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