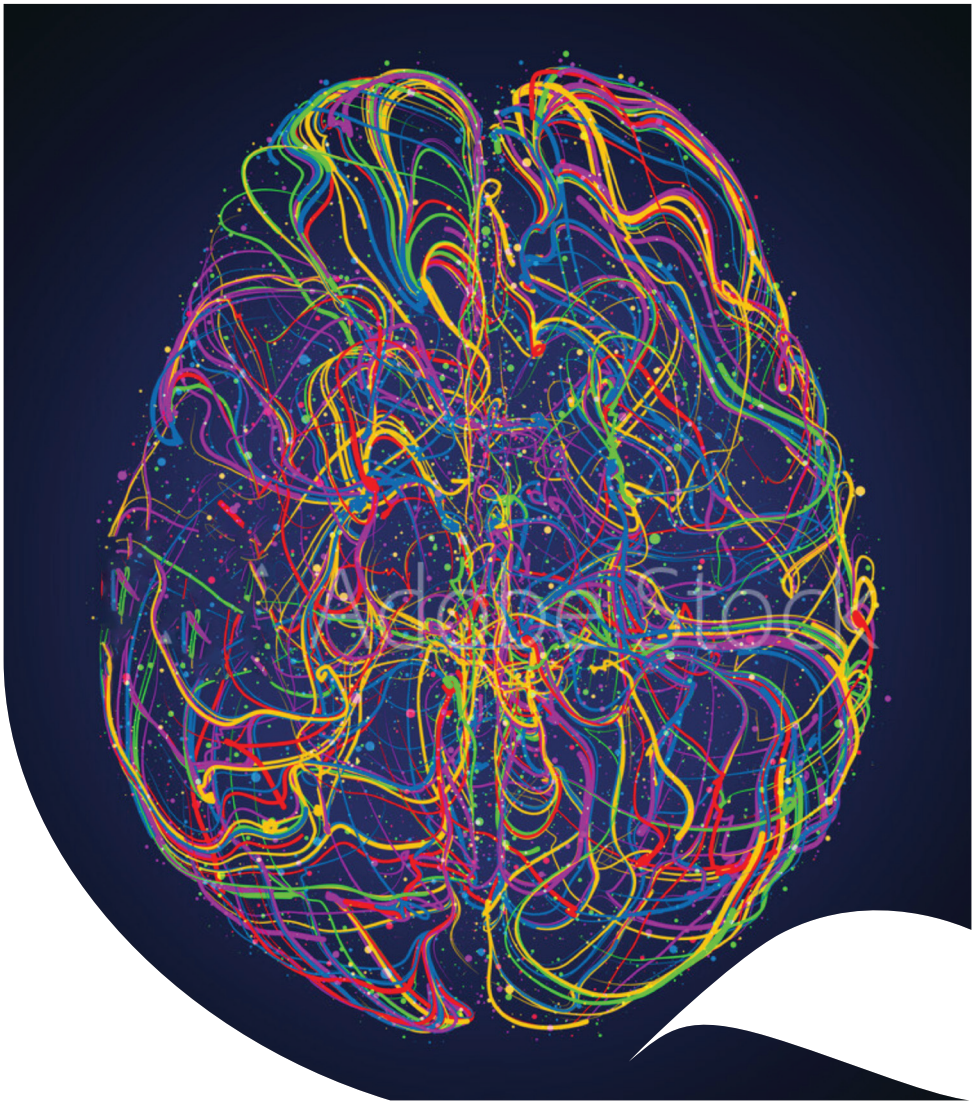
The University Of Queensland
AUSTRALIA

CREATE CHANGE

Biomedical Sciences

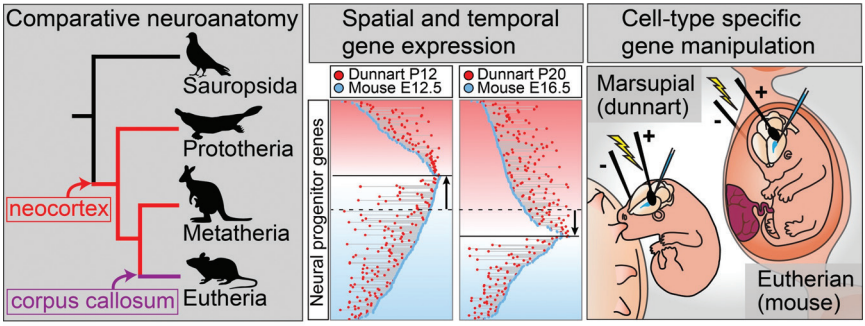
Brain circuits: Anatomy, function, development and evolution



We study brain circuits in the mammalian forebrain, using mice and dunnarts as main experimental models. Our focus ranges from molecular and developmental neuroanatomy to functional and evolutionary neurobiology.

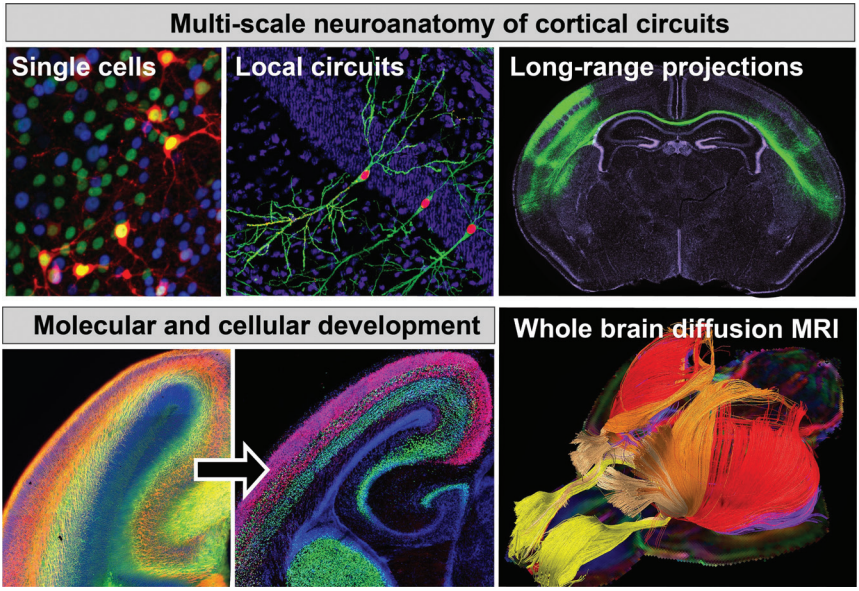
Techniques

- In utero/in pouch/post-natal electroporation
- Molecular biology, cloning, qPCRs
- High-throughput transcriptomics (RNAseq: bulk, single-cell)
- Small animal handling and microsurgeries
- Stereotaxic brain injections and surgery
- Comparative neuroanatomy mapping (developing & adult; genetic and chemical markers)
- Histology, immunohistochemistry and *in situ RNA hybridisation*, cell-type quantifications
- Image analysis (confocal and multiphoton microscopy, dMRI)
- Optogenetics (manipulation and visualisation of neural activity with light)



Experimental models

- Fat-tailed dunnarts *(Sminthopsis crassicaudata)*
- Domestic mouse *(Mus musculus)*
- Other vertebrate species with evolutionary, ecological or functional relevance.



Publication examples

Differential timing of a conserved transcriptional network underlies divergent cortical projection routes across mammalian evolution. Paolino A., **Fenlon L.R.**, **Kozulin P.**, Haines E., Lim J.W.C., Richards L.J. & **Suárez R.** (2020) Proc Natl Acad Sci USA, 117(19): 10554-10564.

A pan-mammalian map of interhemispheric brain connections predates the evolution of the corpus callosum. **Suárez R.**, Paolino A., Morcom L.R., **Kozulin P.**, **Fenlon L.R.**, Kurniawan N., & Richards L. J. (2018) Proc Natl Acad Sci USA, 115(38): 9622-9627.

UQ's School of Biomedical Sciences – mission statement:

By harnessing our diversity across the breadth of biomedical science, we will generate, disseminate and apply foundational biology underpinning health and disease to inspire and empower the next generation of leading researchers, educators, and healthcare professionals to innovate together for better health outcomes globally. Our innovative research encompasses basic discovery through translational pathways to medical solutions:

Cell architecture: We use sophisticated molecular and imaging techniques to explain how various cellular components and pathways contribute to building healthy bodies.

Receptors and signalling: We decipher the passage of external messages from the cell surface, through cytoplasmic signalling pathways, and ultimately to genetic regulatory circuits in the nucleus.

Chronic disease: We characterise the genetic, molecular and cellular microenvironments associated with diseases, such as Alzheimer's disease, cancer, MND and others.

Drug design and development: We identify critical biological targets and design drugs based on structural analyses to develop novel therapies.

Functional and comparative anatomy: Our interdisciplinary studies of structure and function across phylogenetically disparate species advance our understanding of the human body in healthy, aging and diseased states.

Injury and repair: We study fundamental mechanisms of cells in response to stress, consequences of repair processes and how these may be influenced for optimal outcomes.

Musculoskeletal and motor control: We develop and apply novel tools, to investigate muscle function and neural control of muscles in humans.

Neurobiology and brain function: We search for and discover genetic and environmental factors that lead to and maintain healthy nervous systems.

Reproduction: We investigate the genetic and molecular environment during early fetal development to advance reproductive technologies and facilitate healthy pregnancies.

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