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Dr Joseph Brock

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Joe Brock leads a group in membrane structural and synthetic biology at the Division of Biomedical Science and Biochemistry within the Research School of Biology at ANU. He obtained his bachelors degree in medical science with Honours in 2006 and a PhD in biological chemistry in 2012 from ANU. During his PhD, he worked under the supervision of Aaron Oakley, researching the catalytic mechanism of a human glutathione transferase by X-ray crystallography. He then joined the Division of Biochemistry and Biophysics at the Karolinska Institute in Stockholm for his first postdoctoral position, where he worked on the structural biology of human integral membrane glutathione transferase enzymes, involved in prostaglandin biosynthesis (2013-2017). From here, he moved around the lake to Stockholm University where he was mentored by David Drew in transporter structural biology and function using X-ray crystallography, cryo-EM and biophysical assays (2018-2019). This training allowed him to successfully interview for a tenure-track lectureship at the ANU in 2019, where his group now works on membrane proteins of apicomplexan and fungal pathogens.

The Structural basis of multi-drug transport: A story of a SynBio curious structural biologist.

When Joe started his lab at ANU in 2019, he planned to run a research program based solely around transporter structural biology and function. However, the COVID-pandemic that followed quickly thereafter meant that he was unable to travel to established cryo-EM facilities in Wollongong and Melbourne while an ANU facility was being constructed. Thus, he diversified his research program in the proceeding years to incorporate yeast synthetic biology, including a yeast surface display nanobody platform, CRISPR-based genetic screens and genome engineering. In November 2022, completion of the ANU facility and the end of lockdowns enabled them to get back to transporter structural biology. Today, he will share the first structure from the facility of a Candida ABC transporter, CDR1, responsible for multi-drug resistance. This will hopefully be the first of many structures allowing his group to understand the structural basis that enables transporters to evolve the functional pleiotropism associated with a multi-drug resistance phenotype, without an associated fitness cost to the pathogen.