Item for ASEG Preview and Newsletter

2022 Winner Richard Lane Scholarship

The winner of the second annual Richard Lane Scholarship is **Tom McNamara** from University of Melbourne – School of Geography, Earth and Atmospheric Sciences. Tom is undertaking a Masters degree in Geophysics and is to be awarded $5,000. Tom's supervisor is Dr Mark McLean.

The ASEG Scholarship has been established to support Geophysics Honours and Masters Students and to commemorate the life and work of ASEG Gold Medal recipient Richard Lane. The scholarship is open to all BSc (Hons) and MSc geophysics students and consists of a grant of $5,000 to the best ranked student for the current year. Ranking will be based on a 200 word discussion, overview of geophysics project and on academic transcript. For 2022 we acknowledge and thank the donation and concept from Jayson Meyers and Resource Potentials Pty Ltd.

The scholarship will be an annual event and donations to support the continuation of this scholarship are sought from institutions, companies and individuals. Information on donations via the ASEG Research Foundation can be found at www.aseg.org.au/foundation/donate Please mark donation specifically "Richard Lane Scholarship:"

Masters project description:

Project title:

Characterisation of metavolcanic megaclast structures within the Moyston Fault hangingwall mélange (Moornambool Metamorphic Complex), western Victoria: Insights from potential field modelling and machine learning.

Description:

Victoria's goldfields are highly prospective, and are the target for ongoing large-scale exploration and mining operations. With advances in undercover exploration driven by geophysical imaging and recently acquired high-resolution geophysical surveys over major gold prospects, Victorian gold exploration is seeing renewed activity. The Stawell Corridor is a highly prospective goldfield with multiple large-scale mining operations currently active. One of these operations is Stawell Gold Mine, the second largest hardrock gold mine in Victoria. The mine has produced 62 tonnes of gold since 2016, and the goldfield has produced a historical total of 170 tonnes. Undiscovered gold resources in the region are estimated to be up to 900 tonnes.

The Stawell Corridor is bounded by the north-northwest trending Moyston Fault and Congee Fault, and extends approximately 250km. Along the corridor, a suite of kilometre-scale metavolcanics lies beneath the Murray Basin sedimentary top cover. These metavolcanics are referred to by the local mines as dome structures, and are known to be high potential gold targets. Stawell Gold Mine is hosted in the Magdala dome, where mineralisation occurs along a sheared contact between the dome metabasalt and the sedimentary country rock. The currently accepted model for mineralisation is that the competence contrast between the lithotypes caused major deformation in the sediments and provided a vector for fluid flow along the dome body. This style of ore deposit is termed 'Magdala-style mineralisation'. Mines are actively exploring the other domes along the corridor to determine potential for other Magdala-style domes. However, the top cover becomes thicker as the corridor progresses north, and geometries of the dome structures become more difficult to identify and constrain.

The project aims to characterise the gravity and magnetic responses of a few targeted dome structures along the Stawell Corridor, and subsequently develop a method for applying machine learning algorithms to the exploration of undercover 'Magdala-style' volcanic domes. We partnered with the operator of Stawell Gold Mine, North Stawell Minerals (NSM) for the project. NSM have recently acquired a high quality aerial gravity gradiometry survey over their tenement in the corridor, which includes the high-potential Wildwood and Lubeck domes. We will collect high resolution ground gravity data across the Magdala, Wildwood and Lubeck domes to help constrain their geometry, then with the data provided by NSM, train a machine learning algorithm on real and synthetic gravity responses to identify potential undercover domes at various depths out of regional datasets.

Beyond the scope of this project, an algorithm like this could be scaled and applied to other datasets and deposit styles, to recognise potential targets for undercover deposits that have not yet been identified or explored.

Why Tom is studying Geophysics (~200 word discussion): I have a deep personal interest in how the world works on a mechanical level. Initially as I was studying, I explored this through physical sciences and thought I might pursue theoretical physics. Instead, I've found fulfilment in pursuing those questions through geology and the long histories of the Earth. It was by coincidence that I came back to physics later in my degree, and its applications in exploration.

The central principle of exploration geophysics – that we can image and understand sequences buried in the crust without ever needing to see them – reminds me constantly of the strangeness and complexity of the natural world, and the depth of knowledge that is still buried.

It was important to me when designing the master's project that it could have applications that would be useful beyond obtaining the degree. When I've finished my masters, I plan to spend time in industry and learn as much as I can about a breadth of resource industries at each level. My long-term goal is to work on constructive applications for geophysics in environmental remediation. I also have an interest in modelling tools and intend to spend time developing more comprehensive multi-discipline modelling and integration methods.