

## **Geological and petrophysical characterization of the electromagnetic anomaly of the Lisheen Zn – Pb deposit in Ireland**

### **Supervision team**

Lead supervisor: Dr. Aline Melo

University College Dublin (UCD) and SFI Centre for Research on Applied Geology (iCRAG)

In collaboration with: Dr. Murray Hitzman and Dr. Koen Torremans (UCD & iCRAG), and John Guven (iCRAG)

### **About the project**

Natural resources are needed to construct infrastructure to increase mobility, to develop digital life, and to produce renewable energy. The current rate of discovery of mineral deposits is lower than the demand of society. In part, because most mineral deposits close to the surface have already been found and recycling techniques do not yet produce enough quantities to supply this demand. Therefore, mineral exploration has been focusing on deep subsurface regions, which requires the application of geophysical methods. Thus, the successful application of geophysical methods depends on understanding the geophysical anomalies of the different rocks and these anomalies are associated with the petrophysical characteristics.

For this reason, this fully funded four-year PhD project will explore the geological source of the electromagnetic anomaly of the Lisheen Zn-Pb deposit in Ireland aiming to construct better subsurface models for solving geological challenges in mineral exploration. While the distribution of minerals suggests that the feeder zones should be conductive because they have higher concentrations of Cu and Ni sulphides, the EM data from Lisheen deposit is used as a textbook example for a conductivity anomaly associated with the Zn-Pb mineralization, which is not composed of high conductive sulphides. One possibility is that the EM response is associated with the pyrite cap around the Zn-Pb ore. However, the pyrite in this cap is described as mainly disseminated and in veins, which contradicts the main premises of the application of EM data, the requirement for massive (to semi-massive) conductive sulphides. Given this puzzle and lack of clear understanding of the origin of the association between mineralogy and geophysical data, this project proposes to conduct a detailed petrophysical characterization of the different units in Lisheen. This data will be further utilized to guide the 3D modelling of EM data to understand the association with the mineralization and define exploration vectors for exploration of this type of deposit. The expected outputs are a database of petrophysical data for Lisheen, simulated multiphysics data using the 3D geological model (based on extensive drilling), 3D EM inversion, and geophysical exploration vectors. The physical properties (velocity, magnetic susceptibility, electrical conductivity, density, and chargeability) of the rock samples will be acquired in the new Petrophysics Laboratory at UCD. The skills that will be acquired in this project are highly valued across most industries. This project is suitable for a candidate who wishes to conduct applied research that makes an immediate impact in the real world.

## Candidate profile

For the development of this project, the student needs a solid background on the physics and maths of the geophysical methods, for this reason a bachelor's degree in Geophysics is required. The core of the project is on petrophysics and application of methods of 3D inversion of geophysical data; for this reason, keen interest in geology and good programming skills (preferentially in Python) are required. Some experience in research is highly relevant and a MSc is desirable (but not required). Willingness to collaborate with the open-source community is important. The student will receive training in geophysical inversion, geology of the study area, and other relevant methodologies.

You will join a large team of researchers at the [iCRAG](#) and [UCD School of Earth Sciences](#). iCRAG is the SFI (Science Foundation Ireland) Centre for Research in Applied Geosciences and is focused on creating solutions for a sustainable society.

## Funding provided

The successful applicant for this project will be based at the School of Earth Sciences, University College Dublin. This 4-year award covers university tuition fees at EU rate, an annual tax-free stipend of €18,500, and a project-specific research grant covering research expenses and conferences of €4,000 per year. This scholarship is open to EU students in the first instance but highly qualified applicants from non-EU countries will be considered.

The successful candidate needs to start on [January 2023](#).

## How to apply

If you are interested in this opportunity, please fill out the form in this [link](#). In the end of the form you will be asked for your CV, a motivation letter, and a valid English test for non-native English speakers according to UCD [guidelines](#).

Closing date: [31<sup>st</sup> August 2022](#) (evaluations and interviews are planned soon thereafter).

## Equality, diversity, and inclusion

UCD is committed to creating an inclusive environment where diversity is celebrated, and everyone is afforded equality of opportunity. To that end the university adheres to a range of equality, diversity, and inclusion policies. We encourage applicants to consult those policies [here](#). We welcome applications from everyone, including those who identify with any of the protected characteristics that are set out in our Equality, Diversity and Inclusion policy.

## About the supervisor

Aline Melo is an assistant professor at University College Dublin (Ad Astra Fellow), she received a B.S. (2008) in geology and M.Sc. in geophysics both from Universidade de Brasilia (Brazil). Aline completed a Ph.D. (2018) in geophysics at Colorado School of Mines (United States). She is a geologist and geophysicist passionate about closing the gap between geophysical tools and geological challenges. More information [here](#).

Information about the collaborators: [Murray Hitzman](#), [Koen Torremans](#) and [John Guven](#).