Investigating mineralisation processes in the Mbe gold deposit, Central Cameroon

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Project Highlights:

- First study of a newly discovered gold deposit in Central Cameroon.
- Opportunity to work with Oriole Resources on an exciting field exploration program.
- Use cutting edge laboratory techniques to answer key research questions with implications for orogenic gold deposit formation models and regional exploration.

Overview:

Orogenic gold deposits are the one of the world's main sources of gold, forming at depths of 2-15 km in the Earth's crust, with gold carried in low-salinity H_2O-CO_2 fluids. There is a long-running debate over whether or not magmatic-hydrothermal fluids derived from igneous intrusions play a key role in orogenic gold deposit formation, with implications for exploration targeting.

Cameroon contains significant orogenic gold enrichment in the Neoproterozoic central African "mobile belts" but is under-represented in terms of gold 'discoveries'. These Pan-African belts are considered analogous to Au-endowed 'Greenstone' belts found world-wide, known to host world class orogenic gold deposits. Despite the resource potential of Cameroon, the country remains underexplored in terms of mineral exploration and the geological setting, petrogenesis and evolution of gold deposits and their host rocks are not well understood.

Oriole Resources PLC is a UK-based exploration company focused on early-stage gold exploration in Cameroon with multiple orogenic gold related projects. This research project will focus on an early-stage orogenic gold prospect within Oriole's Mbe licence in central Cameroon. A broad anomalous gold zone of ~12.5km by ~3km has been identified from stream and soil sampling programmes. Recent geological mapping and rock chip sampling has identified a corridor of sheared and strongly altered quartz-feldspar porphyry and quartz veins with gold grades of up to 256.74 g/t Au. However, the characterisation of gold within the system (distribution, associated mineralogy etc.) is unknown. Preliminary work has identified some aspects of mineralogy more commonly associated with magmatic-hydrothermal epithermal gold deposits. This, coupled with the presence of igneous host rocks, may suggest a possible epithermal overprint or involvement of magmatic-hydrothermal fluids. However, the relationship between the mineralisation and the magmatism which formed the host rocks is still unknown, as are the characteristics of the ore forming fluids.

This project will characterise the gold mineralisation and the conditions and sources of the ore-forming fluids at Mbe to determine 1) if there was significant magmatic-hydrothermal influence during deposit formation; 2) if the epithermal overprint is gold enriching; and 3) how formation of the Mbe deposit relates to the regional geological history.

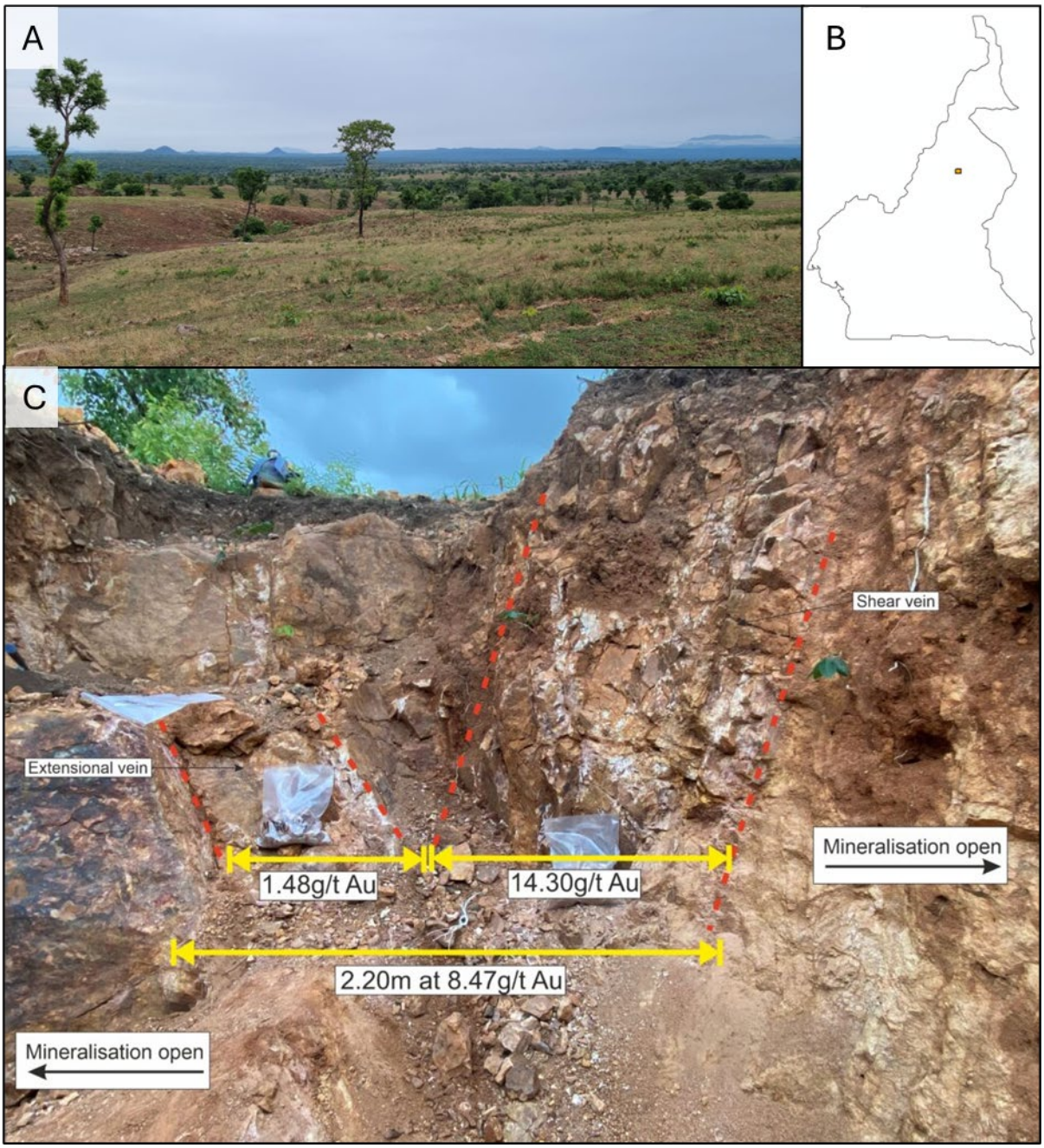

Figure 1: A) Panoramic photo of the Mbe license area (facing North). B) Location of Mbe prospect (gold shaded area) within Cameroon. C) Example of gold mineralisation at Mbe, showing showing conjugate sets of gold bearing quartz veins.

Methodology:

Characterisation of the mineralisation will be by field mapping and sampling, and logging and sampling of drill core from Oriole Resources' maiden drilling campaign on Mbe. This will be followed by mineralogical analysis using microscopy, scanning electron microscopy (SEM), and automated mineralogy using Cardiff University's ASEM and the Natural History Museums' TIMA.

Characterisation of the fluids will be done by fluid inclusion analysis in UCL's Fluid and Melt Inclusion Laboratory, including petrographic analysis, cathodoluminescence, laser microRaman spectroscopy,

and microthermometry. Stable isotope analysis (S, H, O and potentially C-O), undertaken at the NERC isotope facility (SUERC), will be used to determine the source of the fluids and any magmatic influence.

Comparison with other Cameroonian orogenic gold deposits and U-Pb zircon dating of host rocks, and potentially (U-Th)/He zircon and apatite dating of late-stage hydrothermal overprints, in the London Geochronology Centre will place the Mbe prospect in context with regional geological history.

Possible Timeline

Year 1: Literature review, field mapping and sampling and work on drill core from initial drilling campaign to define vein paragenesis. Ore mineralogy using reflected light microscopy, SEM and TIMA. TARGET training and networking events.

Year 2: Quartz characterisation with cathodoluminescence. Fluid inclusion petrology, including microRaman spectroscopy, and fluid inclusion microthermometry. Preparation for stable isotope work and pilot stable isotope study. Presentation at UK conference in winter and international conference in summer. Continuing TARGET training.

Year 3: Stable isotope analysis at SUERC, dating at London Geochronology Centre. Preparation of thesis and manuscripts for publication. Presentation of work to Oriole Resources, at national and international conferences.

Training and skills:

TARGET researchers will participate in a minimum of 40 days training over the 3.5 years of study composed of:

- an annual one-week workshop dedicated to their year group, and tailored to that cohort's needs in terms of skills development – *for the first three years of their study*;
- an annual all-TARGET workshop with cross-year interactions, advanced training and opportunities to specialise in particular areas – *all years of study*;
- a number of one-day workshops;
- additional online events and in-person workshops attached to relevant conferences.

Project-specific training will include lab training (e.g. SEM automated mineralogy, fluid inclusions) and field training (e.g. core logging).

Partners and collaboration (including CASE):

This project is supported by Oriole Resources PLC, who will provide logistical support during the field work, as well as providing samples and data. The successful applicant will have regular progress meetings and opportunities for discussion with Oriole Resources personnel, as well as gaining field experience in relation to an early-stage exploration program at a greenfield project.

The successful applicant will be based primarily at UCL where they will be part of the UCL Earth Resources Centre, however there will be regular online meetings with the wider supervisory team and they will also visit Cardiff University to use lab facilities and join their research community.

Further reading:

Gaboury, D. (2019) 'Parameters for the formation of orogenic gold deposits', *Applied Earth Science*, 128(3), pp. 124–133. doi: 10.1080/25726838.2019.1583310.

Groves, D.I., Santosh, M., Deng, J., Wang, Q., Yang, L., Zhang, L., 2020. 'A holistic model for the origin of orogenic gold deposits and its implications for exploration.' *Mineralium Deposita* 55, pp. 275–292. https://doi.org/10.1007/s00126-019-00877-5

Saha-Fouotsa, A.N., Vanderhaeghe, O., Barbey, P., Eglinger, A., Tchameni, R., Zeh, A., Tchunte, P.F., Nomo, E.N., 2019. 'The geologic record of the exhumed root of the Central African Orogenic Belt in the central Cameroon domain (Mbé – Sassa-Mbersi region).' *Journal of African Earth Science,* 151, pp. 286–314. https://doi.org/10.1016/j.jafrearsci.2018.12.008

https://orioleresources.com/projects/central-licence-package/

Further details:

Please visit https://target.le.ac.uk/ for additional details on how to apply. For project enquiries please contact k.mcfall@ucl.ac.uk. For details on the UCL Earth Resources Centre visit: https://www.ucl.ac.uk/earth-sciences/research/research-groups/earth-resources-centre