

Europlanet Expert Exchange program 2022 - Report

Applicant details: Silvia Frisia, The University of Newcastle, Australia

Host details: Fulvio Franchi, Botswana International University of Science and Technology (BIUST), Palapye, Botswana.

Timing of visit: 5 – 16 September 2022

Silvia Frisia visit at BIUST was intended to provide training in microscopy techniques used in Astrobiology to detect evidence for Life within the rock record. It was also targeted to provide training in sampling techniques within extreme environments where Life exists. Thus, 4 days were dedicated to field experience in Gcwihaba caves (Kwihabe, Ngamiland), which preserve thousands of years of harsh climate and environmental history and can be utilised as an analogue to detect traces of ancient microbial life in settings protected by UV and with poor nutrient inflow.

Training for the academic and research staff in the field, consisted in showing how to select samples, how to collect and preserve specimens of biological and microbiological interest and set up an environmental monitoring program. In addition, the basis for near-future scientific collaboration were set.

The following 4 days were devoted to preparation (12 September) and delivery of lectures and workshop at BIUST, back in Palapye. Frisia delivered the followings (13 to 15 September):

- 1) Lecture: Carbonate and Carbonate Factories
- 2) Lecture: Carbonates and environments of deposition: Marine
- 3) Lecture: Carbonates and Environment of Deposition: Continental

- 4) Applied carbonate sedimentology Lab: Facies analysis (Microscopy)
- 5) Carbonate textures and fabrics: Microbial morphologies
- 6) Astrobiology: Life under the Ice (microscopy and spectroscopy techniques)

All activities were attended by academic and technical staff as well as post-graduate candidates of the Earth and Environmental Science Department of BIUST. The Lectures and applied carbonate sedimentology sessions were followed by Questions and Answers time, where the attendees had the opportunity to discuss with Frisia several issues related to their own astrobiology research. The attendees learned the basic principles of facies analysis by using a simple optical microscope, which is accessible to all and is the fundamental tool for any investigation of microbial life preserved in rocks. They learned to describe microfacies and how to use modern analogues to interpret unknown structures in the fossil record of the deep past. They learned the principles behind the “how” we use terrestrial analogues to interpret potential problematic extraterrestrial structures. They have learned how to use facies analysis to interpret past environments with microscopy techniques.

The attendees have also learned the theory of how to use sequentially the optical microscope, the epifluorescence microscope, the scanning electron microscope and the transmission electron microscope, so that they are aware that there is a standard procedure from low to high resolution techniques that must be followed. Finally, they learned how to compare optical microscopy with X-Ray fluorescence through examples. All activities appeared to be well received as per e-mails of appreciation. Overall, the experience has been very positive, the enthusiasm shown, particularly by post-graduate students, about the topics covered in the lectures and the training was extremely rewarding. Prof. Franchi was an exceptional host and his team (student and staff) encapsulates the promise of a future cohort of African researchers in the field of Astrobiology.