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UNIVERSITY OF LEEDS

University of Leeds SEG Student Chapter
International Field Trip to Romania 9th – 15th June 2019



Gold dendrites exposed at the Romanian National Gold Museum from Brad

***Subject of the Stewart R. Wallace Grant awarded by the Society of
Economic Geologists***

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I. Acknowledgements

We would like to start this report by showing our gratitude to the Society of Economic Geologists for awarding our chapter with the Stewart R. Wallace Grant. The grant was used to cover the local transport in Romania, the accommodation for the last night of the trip and local entrance fees, thus, reducing significantly the overall cost of the trip for the students involved.



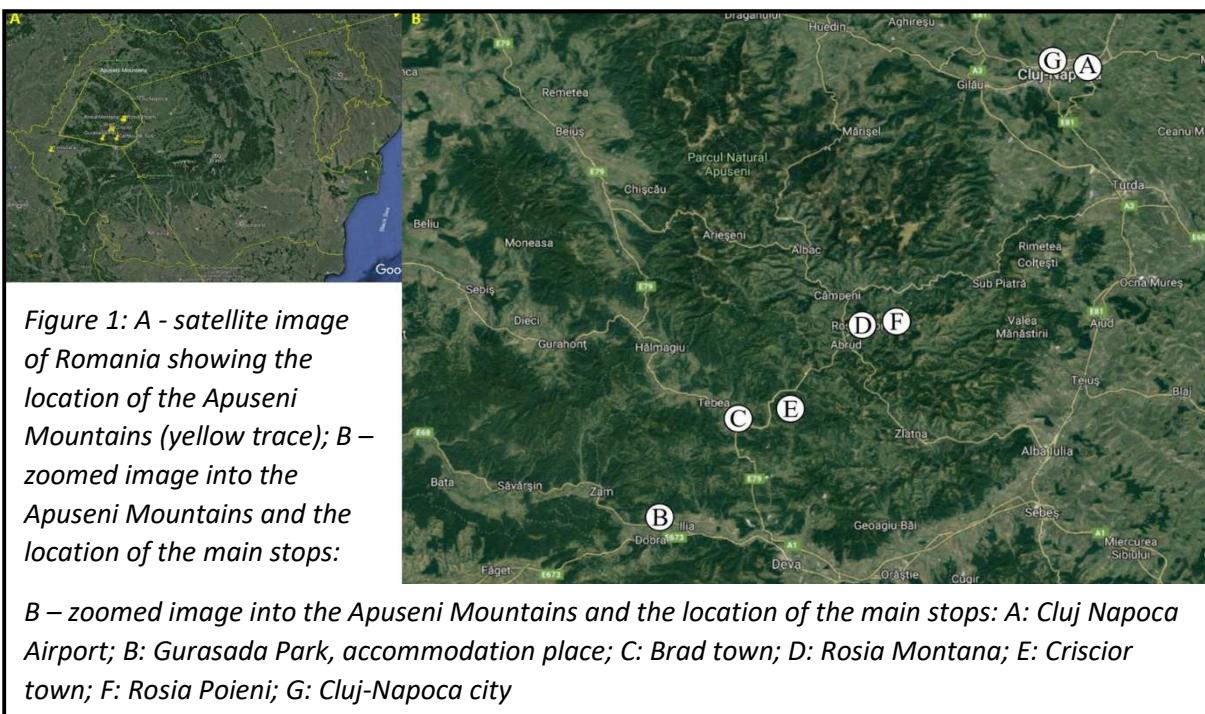
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We would also like to show our recognition and respects to our Romanian collaborators, **Belevion** (*geological, geophysical & mining consulting company*) and **Samax Romania** (*mining company*). We extend a special thank you to Filip Onescu (chief geophysicist, Belevion), Mircea Negulici (Senior Geologist, Belevion), Dr. Soring Halga (General Director, Samax), Albert Fuer (Senior Exploration Geologist, Samax) and Peterfi Sandor (Project Geologist, Samax) for taking time out of their busy schedules to show us their work and to teach us about geophysical and geological techniques used in the exploration for porphyry style mineralisation.



II. Introduction

From the 9th to 15th of June 2019, the University of Leeds SEG Student Chapter visited the Apuseni Mountains of Romania (Fig.1 A &) on a geological field trip. The main aim of the trip was to provide the participants with education in porphyry Mo-Cu and Cu-Au mineralization types and their distinguishing mineralogy in the Apuseni Mountains and in the Banatitic Magmatic and Metallogenetic Belt of Romania.



Throughout the entire period of the trip the students were introduced to the regional geology and the metallogeny of the Apuseni Mountains, which is notably Europe's largest gold district, and to the 1,500-km-long Banatitic Magmatic and Metallogenetic Belt (BMMB) of Romania, Serbia and Bulgaria. The students had the opportunity to log cores from multiple porphyry copper and gold deposits with emphasis on alteration halos, stockwork mineralization and associated skarn mineralisation. Furthermore, they attended a one day course regarding the geophysical techniques used for the exploration of ore deposits.



III. List of Participants

Thirteen students from three different universities have attended the field trip: 9 students from the University of Leeds (UK), 2 students from the University of Cardiff (UK) and 2 students from the Colorado School of Mines (USA).

University of Leeds

Issey Tajima – BSc

James Ball - Bsc

Bogomil Georgiev (Bobby) – BSc

Jefferson Andres Carranco Lopez (Andres) - Msc

Hugh Graham - PhD

Georgian Manuc - PhD

Lucia Savastano - PhD

James Shaw - PhD

Carl Spence-Jones – PhD

University of Cardiff

Christopher Dix - BSc

James Mills - Bsc

Colorado School of Mines

Garrett Gissler – PhD

Miranda Lehman - MSc

IV. Itinerary

➤ Day 1 (9th of June) – Travel day

The trip started from Luton Airport, London, the meeting place for the UK students. From here we flew to Cluj-Napoca (Fig.1) where we met the students from the Colorado School of Mines and our minibus driver. From Cluj, we went to Gurasada Adventure Park, our place of accommodation (Fig.1). After everyone settled into their rooms, we had dinner and started to get to know each other.

➤ Day 2 (10th of June) – Roşia Montană Mining Galeries, the Gold Museum and the Agate Museum

The first day introduced the students to the past and current situation of the mining industry in Romania and also to different mineralisation styles that can be found in the Apuseni Mountains.

The first stop of the day was at the Roşia Montană Roman mining galleries. The Roşia Montană deposit (Fig.2) is located in *The Gold Quadrilateral (GQ)* of the Metaliferi Mts., South Apuseni Mts., Romania. At the beginning of the 20th century, the district was known as the European El Dorado. Due to its richness, the area has been known for centuries. Early mine workings have been shown to coincide with the Roman Empire. Remnants can be seen today at Roşia Montană, Barza, Stăniţa and Vîlcoi-Bucium. The main commodity here was gold, exploited from high-grade deposits. During the middle Ages other deposits were discovered, such as Săcărâmb ore deposit, the type locality of five tellurides: nagyagite, krennerite, petzite, stuetzite, and munthmanite.



Figure 2 – Model of the Roşia Montană mining site, showing the two existing quarries and the surrounding mountains.

The Roşia Montană Roman galleries (Fig.3) are both historically and geologically important. Roşia Montană is a breccia-hosted, low sulfidation, epithermal Au-Ag deposit and was once set to become Europe's largest open pit mining operation (Lead by Canadian company, Gabriel Resources) until the Romanian government applied for the area to become a World Heritage Site. The galleries exhibit a unique glimpse into the mining techniques used by the Romans: archaeological finds from the underground tunnels include writing tablets and ancient water wheels that regulated water flow within the mine.



Figure 3 – Visit into the “Alburnus Minor” Roman gallery.

In the second part of the day we have visited the newly founded (2019) Agate Museum from Criscior (fig. 4&5) and the Brad Gold Museum, also known as the Mineral Collection of Brad (the village where the museum is located). The gold museum was founded over 100 years ago and contains over 2000 specimens from across the world gathered by geologists and amateur mineral hunters. Specimens of native gold from the Metaliferi Mountains are among the most spectacular specimens (picture from the first page of the report). The museum also provides an insight into the history of Romania through its collection of archaeological artefacts from

the Brad-Criscior area. These findings indicate the presence of humans in Romania up to 5000 years ago and that mining activities were occurring over 2000 years ago.



Figure 4 – Agate from the Apuseni Mountains exposed at the Agate Museum from Criscior.

➤ **Day 3 (11th of June) – Visit at SAMAX Romania**

On the third day of the fieldtrip, 11th June 2019, the students had the pleasure of visiting SAMAX Romania, a subsidiary of the EuroSun mining company. The day began with a short presentation (Fig. 5) delivered by general director Sorin Halga on the Rovina Valley project, which comprises three Cu-Au and Au-Cu porphyry deposits (Rovina, Colnic and Ciresata) that are aligned over a 7.5 km N-NE trend. In detail, the presentation covered the tectonic setting of the Apuseni Mountains, the geological characteristics of the three porphyry bodies, and the exploration methods used which ultimately led to the discovery of the deposits.



Figure 5 – Leeds SEG students attending Mr. Sorin Halga’s presentation.

Following the presentation, Sorin Halga, Albert Fuer (chief geologist), and Peterfi Sandor (geologist), led the students into the field to see the mineralized outcrop which led to the discovery of the Colnic deposit (Fig. 6). Here, we identified the main alteration styles associated with the mineralization and collected some excellent samples.



Figure 6 – Group photo in front of the discovery outcrop from the Colnic porphyry deposit.

The afternoon was spent looking at representative drill core from the three deposits (Fig. 7 & 8). The students spent a few hours identifying the main alteration halos associated with mineralization, the different vein types, and the common ore forming minerals and the characteristics of different magmatic bodies. The core logging exercise was led by chief geologist Albert Fuer, who guided us through the core logging process and explained in detail the different vein styles and alteration halos associated with the specific porphyry deposits. The day ended with a visit to a nearby decommissioned porphyry mine (Valea Morii quarry, Fig. 9). Here we have seen an excellently exposed porphyry mineralization with potassic and phyllitic alteration, as well as overprinting epithermal breccias.

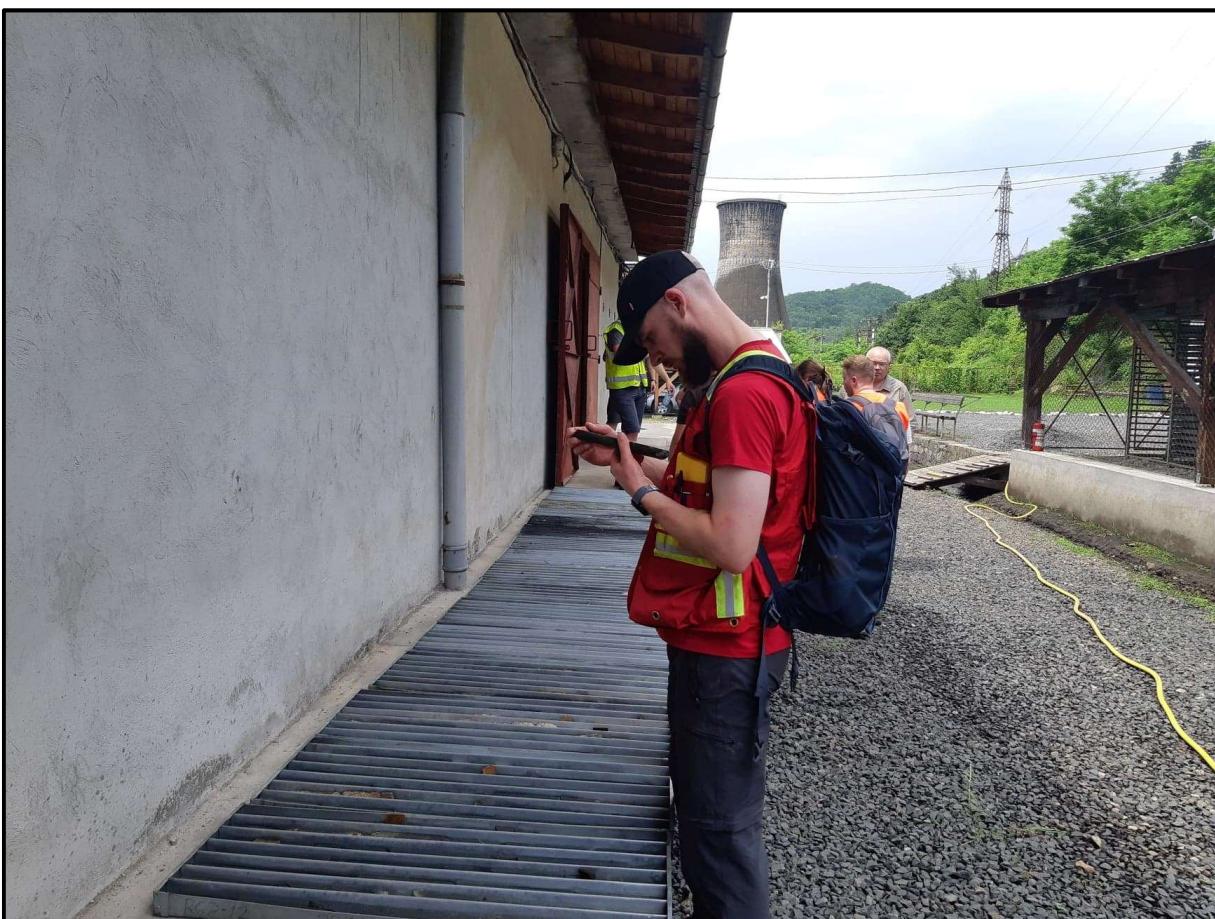


Figure 7 – Core logging exercise.



Figure 8 – Group photo at Samax's core shack.



Figure 9 – Group photo in the Valea Morii Quarry.

➤ **Day 4 (12th of June) – Ascutita Mare Cu-Mo porphyry and skarn deposit**

On the fourth day of the trip the students were introduced to the geological setting of the Banatite Magmatic and Metallogenic Belt (BMMB), part of the Tethyan Belt and into the geology of the Ascutita Mare Cu-Mo porphyry and skarn deposit.

In the first part of the day, Mircea Negulici, senior geologist at Belevion provided the students with an overview of the tectonic setting of the BMMB and of the mineralisation types that can be found along the Banatic Belt. After the presentation, the students had the opportunity to log some of the drill core (Fig.10, 11, 12) from the Ascutita Mare deposit. The students were able to identify the ore minerals and alteration associated with the Cu-Mo porphyry mineralisation and the associated skarn. They compared mineralisation and alteration styles from the Ascutite Mare Cu-Mo porphyry with the Cu-Au porphyry they were introduced to by SAMAX; this allowed them to consider the context of the two deposits.



Figure 10 – Students logging the cores from the Ascutita Mare deposit.



Figure 11 – Mircea Negulici teaching the students about skarn mineralisation.



Figure 12 – Group photo after the logging exercise.

➤ Day 5 (13th of June) – Geophysics for Geologists Short Course

Figure 13 – Filip Onescu explaining to the students the differences between the total magnetic map and the first derivate magnetic map.

On the fifth day, chief geophysicist Filip Onescu from Belevion held a one day short course (Fig.13) regarding the geophysical methods used in the exploration for ore deposits, with an emphasis on methods used in the exploration for porphyry copper deposits. The first part of the course covered the theoretical aspects of multiple geophysical methods (electrometry, magnetometry, ground penetrating radar, and shallow seismics), whereas the second part of the course gave an insight into data processing and interpretation methods for magnetometry and electrometry. The interpretation exercises were made on real data acquired by Belevion for different porphyry exploration projects from Romania and from Papua New Guinea.

➤ Day 6 (14th of June) – Travel to Cluj-Napoca

On the last day of the project we travelled back to Cluj-Napoca, but we decided to add two stops to our journey. The first stop represented a cultural visit to the Corvin Castle (Fig. 14), or the Hunyadi Castle, the medieval citadel of Hunedoara. The Corvin Castle is one of the largest castles in Europe and one of the “Seven Wonders of Romania”. The castle was built in 1446 in a Renaissance-Gothic architectural style and represents the largest medieval building with double functionality, both military and civilian, in Romania that is still standing.



Figure 14- Group photo outside the Corvin Castle.

The second stop was at the Turda Salt Mine (Fig. 15) and represented a both geological and cultural stop through which the students had the opportunity to learned about another important mining sector of Romania - salt mining. The Turda Salt Mine is the largest salt mine in Europe and one of the oldest salt mines in the world, dating back as far as 50 BC. From 1992 the mine is acting as a museum and as a treatment facility for asthma disease. In the evening we got back to Cluj-Napoca where we had a big feast (Fig. 16) in a traditional Romanian Restaurant. After dinner we visited the city centre of Cluj-Napoca, the second largest city in Romania and the capital of the historical region of Transylvania.



Figure 15 – Group photo inside the Turda Salt Mine.



Figure 16 – Last night in Cluj-Napoca.



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V. Cost Breakdown

Expenses	Amount	Funds
Transport from UK/USA to Romania	150 USD each for the UK students; ~1000 USD each for the USA students	Covered by each student
Local Transport in Romania (rented minibus)	3600 RON = 830 USD	Covered from the the Stewart R. Wallace Grant awarded by the Society of Economic Geologists
Accommodation and meals at the Gurasada Adventure Park	8400 RON = 1935 USD 646 RON = 150 USD / student	Covered by each student
Accommodation at the Transylvania Hostel, Cluj	845 RON = 195 USD	Covered from the Stewart R. Wallace Grant awarded by the Society of Economic Geologists
Entrance fees at the visited locations	530 RON = 120 USD	Covered by the Leeds SEG Student Chapter