



SOCIETY OF ECONOMIC GEOLOGISTS, INC.

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Student Chapter Annual Report Cover Page

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Month/Year Reported: From 09/2020 (mm/yyyy) – To 09/2021 (mm/yyyy)

STUDENT CHAPTER:

Check if update needed at segweb.org

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The new committee is reported on the Student Chapter Membership Information form (SCMIF).

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ANNUAL REPORT OF THE SEG STUDENT CHAPTER OF BARCELONA SEPTEMBER 2020 TO SEPTEMBER 2021

The activities organized by the SGA-SEG Barcelona Student Chapter during the last year and for the following year are detailed below.

1. SUMMARY OF ACTIVITIES DURING THE LAST YEAR (2020-21)

1.1. Underground mine work in Menorca

In August 2021, we started a research project on the copper mineralizations at the Menorca island. The mining activity in Menorca has been primarily the exploitation of copper mineralizations in red-bed type deposits, hosted by Triassic sandstones in Buntsandstein facies. Although the last copper mines closed at the beginning of the XX century, the archeological evidences demonstrated that there has been exploitation since prehistory. Some members of the SGA-SEG chapter, with the collaboration of our advisor Dr. Joan Carles Melgarejo, made a geological exploration of the La Rubia and Adela mines, being La Rubia the main focus due to its extension and state of preservation. The objectives in La Rubia mine were to determine the structure and mineralogy of the deposits, as well as an approximation to the model of deposit. With this project, our goal is to produce a scientific article with publishing possibilities and a collaboration project with the Geological Museum of Menorca.

Firstly, our group made a topographic map of the 4 levels of the mine. Each level has different tunnels following the stratabound ores, and the exploitation was done following

the method of pillars and chambers. Each level is connected with the other by ramps. The geological structure was obtained after geological mapping of the galleries and ramps, with special care with the disruptions of the levels produced by tectonics (mainly Alpine thrusts and faults). Geological sections are being traced perpendicularly to the structure, to get a 3-D vision of the mine. It is aimed to develop a 3D model of the mine by using the available programs (in particular, Leapfrog). Once obtained the structure, the following task for every level was the sampling of the different copper mineralizations. In particular, sampling was more dense in case of coal beds, which were strongly mineralized in primary copper minerals. Pretty samples of plant fossils, partly replaced by copper minerals, were taken, and many of them will also be used for the CLONING PROJECT, because this material is very didactic.

The Adela mine has more reduced dimensions. It was also mined in prehistoric times and is protected by its archaeological value. Therefore, sampling was carried out only in the copper outcrops found in the vicinity. The deposit is also stratabound, in Buntsandstein sandstones. Despite its reduced dimensions, the mine has a noteworthy interest because the ores are only a few meters from the sea coast. Therefore, it is a good place to study the secondary copper minerals that can be produced in a coast line. We hope to find new outcrops in future to carry out more sampling.

Therefore, the next objectives to achieve in Menorca are the following:

- a) To determine the mineral composition and textural properties in the thin/polished section in La Rubia mine case, by using the petrographic microscope (transmitted/reflected light). Eventually the samples will be analysed with SEM-BSE-EDS and
- b) To carry out a second field trip for further study and sample collection of the mineralizations around the mine Adela.

1.2. SGE Virtual field trip competition

Last June, we created a short virtual economic geology video about the Gavà Neolithic mining complex for the Student Chapter Virtual Field Trip competition organized by SEG. The Neolithic Mining Complex in Gavà was devoted to the exploitation of green variscite used in the crafting of ornaments. Archaeological works indicate that this mining activity was carried out 6000 years ago. We had the opportunity to go inside some entrances and observe the variscite mineralizations. There are two different types of variscite mineralization: one comes in the form of replacement of thin fluorapatite beds, interbedded with pyritic organic-rich black shales of Silurian age and the other appears as veins cross-cutting these materials. This complex constitutes one of the earliest known examples of underground mining in Europe, the earliest example of large-scale mining for ornamental use, and the earliest of the application of complex geological and mining concepts. Joan Carles Melgarejo and some archaeologists from the museum accompanied us. We also had the opportunity to observe the new archeological excavations, where they are searching for new entrances to the mine. The video result is now available on the SEG Youtube channel.

1.3. Study of mineral deposits (Bachelor's thesis)

Several BSc thesis on different styles of mineral deposits of critical elements will be carried out by members of the Student Chapter this year, directed by Dr. Joan Carles Melgarejo, Dra. Esperança Tauler and Dra. A. Canals (Univ. Barcelona):

- a) BSc of Judit Blasco. The aim is to determine the model of formation of sulphides in the Eureka Uranium mine, a case deposit of Cu-U-V-hosted in Triassic sandstones in the Pyrenees (Catalonia, Spain). Ore sampling of several recently discovered galleries and outcrops was carried out to complete the study of the mineral associations. However, the main goal is an approach to the sources of S in the mineralization and the study of fluid inclusions. Hence, a detailed sampling was carried out on possible fluid inclusion carriers (quartz, carbonates) in the different styles of ores (stratabound, veins); in addition, gypsum samples of the Keuper facies, sulphides in the black shales of Silurian age were collected in order to check the possible sources of S. Samples of the organic matter were obtained to try to distinguish possible differences about the source of the reducing agent. Finally,

outcrops of diabases in the vicinity were collected in order to determine the P-T conditions during the Alpine deformation and metamorphism.

- b) BSc of Robert Rodríguez Oterino on the stratabound Co mineral deposits in the area of the Betics in Almeria (Spain). Co-(Ni) arsenides, sulpharsenides and sulphides, associated with a complex paragenesis including tetrahedrite-group minerals and sulphosalts, are richly scattered in many outcrops in different thrust areas in the Betic domain in Almeria. Deposits used to be associated with Triassic dolostones, in the vicinity of evaporates that could supply source and ultrabasics that could supply the metals. Hence, Robert carried out a representative sampling in the most important deposits, in particular, those at Huércal-Overa, to study the primary mineral associations (some produces abundant erythrite and other asbolane, thus suggesting differences in the primary Co minerals). However, Robert also sampled the different sulphides in the ores and evaporitic sulphates as the possible sources, in order to check the isotope values of S. Samples of ultrabasic rocks were also taken in the Macael quarries, to study its viability as possible sources of ores.

- c) Bsc of David Ruiz Corominas on Sb mineral deposits in the Pyrenees. The job done up to date has been to carry out a geological mapping and geological sections of the Campelles mine in the Pyrenees (Catalonia, Spain). These are small mines, but a complex paragenesis with tetrahedrite-group members and Pb-sulphosalts can be present, thus producing a complex variety of secondary minerals.

The representative samples obtained in these preliminary studies will be analyzed in thin/polished sections under the petrographic microscope with transmitted and reflected light, as well as by SEM-BSE-EDS, EMP, XRD and, when necessary, Raman, to determine the mineral paragenesis and the textural relations. The source of sulphur will be traced with use of S isotopes.

1.4. Project of the International Repository Store for Cloning Mineral Collections

The restrictions because of the pandemic made field trips difficult in large distances, therefore, this year, most of the trips were carried out close to Barcelona. Some members of SGA-SEG Student Chapter, along with Dr. Joan Carles Melgarejo, made different field trips to collect samples for the Repository, among them the following:

- 1.1.1. 2 Day trip to the Iberian Range in Spain, to collect secondary copper minerals (azurite, “bindheimite” and other) in the Pardos mines and U ores (torbernite) in Pobo de Dueñas in Guadalajara, as well as Fe minerals (ankerite, hematite) in Ojos Negros mine in Teruel.
- 1.1.2. 2 visits to the Fluorite mines in the Montseny massif (Catalonia)(4 students).
- 1.1.3. 1 visit to the Socau Mine in Figaró (Catalonia), a magnetite-grossular skarn (2 students).
- 1.1.4. 1 visit to outcrops of sedimentary series in the Sant Feliu de Codines area (2 students, calcite as component of Tertiary reefs, quartz in Paleogene litharenites),
- 1.1.5. A 5-day field trip to the South East of Spain (2 students, through the area of Almeria). We went to the mines of Huercal-Overa (Cobalt) taking samples of Cu-Co minerals (erythrite, asbolane, chalcocite, tetrahedrite, azurite). Also, we visited the Rodalquilar area (gold mines) and we have been collecting samples of very good examples of hydrothermal alterations in high sulphidation domains (primary and secondary alunite, jarosite, mordenitized tuffs, chloritized rocks, primary fresh rock, opal, kaolinite, montmorillonite). Meanwhile, we collected several samples of sanidine in trachytes, kaersutite as xenocrysts in alkaline basalts, olivine-rich dunites and xenoliths in alkaline basalts, alabaster, albite-chlorite and almandine in schists, talc in talcschists, chrysotile in serpentinites, etc.
- 1.1.6. The trip in Menorca (2 students) allowed sample chalcocite replacing fossil wood, as well as phosphate rock in Miocene outcrops.
- 1.1.7. Vein quartz mines in the Montseny mountains (Catalonia) (quartz crystals)
- 1.1.8. Enclusa area (Catalonia): secondary copper minerals (azurite, malachite), glauconite in sandstones (6 students).
- 1.1.9. Calella de Palafrugell (1 student): kaersutite crystals in camptonites.
- 1.1.10. Tossa (1 student): chiastolitic andalusite.
- 1.1.11. Anapaite outcrops in Cerdanya (1 student)
- 1.1.12. Quartz in rhyolite outcrops in Grèixer (1 student)

1.1.13. Gypsum in Eocene evaporites in Osona (1 student)

1.1.14. Low-T-P metamorphic minerals in metadiabases in the Pyrenees (2 students):
epidote, scolecite, pumpellyite, prehnite

1.5. Last year's talks

The informative talks are a series of short conferences in which the members of our Chapter or external professionals are invited to talk about their research project, their professional experience as geologists or any other activities they developed (e.g. field work). However, since march 2020, with COVID-19 pandemy, it was impossible to carry out in person all of these sessions. All the talks that we mention are these:

October 2th - Dr. Leduar Ramayo gave a talk entitled "Geophysics for explorers" an introduction to geophysical methods applied in mineral exploration.

November 17th - Dr. Joaquín A. Proenza gave a talk about Conventional and Unconventional PGE Deposits.

1.6. Short courses

January 20th and 21th - Dr. José María González jiménez, from the Department of Mineralogy and Petrology of the University of Granada (Spain) gave us a short course of Nanomineralogy applied to Mineral Deposits, with a special focus on Nanomineralogy in PGE Deposits.

March 9th - Dr. David A. Holwell (SGA Regional Vice President for Europe) gave us a short course about Magmatic Ore Deposits named "RECIPES FOR MAKING A MAGMATIC NI-CU-PGE DEPOSIT: EXAMPLES FROM GREENLAND AND AFRICA". The course consisted of a one-day short course that included a theoretical part and a more interactive part, where we will be able to observe in detail some samples in 3D and to discuss them.

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1.7. Congress

July 1st - The Chapter president, Pol Suñer Castillo, presented at the CIDUI Congress (International Conference on University Teaching and Innovation) the article published last year “*Com trobar elements rars de la taula periòdica a Catalunya?*” [*How to find rare elements of the Periodic Table in Catalonia?*] focusing on the realization of a scientific investigation with a teaching innovation promoting the teaching methodology of Learning-Service (ApS).

1.8. SEG Student Chapters Earth Day Symposium 2021

Ada Rodríguez (vice president) and Pol Suñer (president) contributed to SEG Student Chapters Earth Day Symposium 2021 with a short video explaining their story, motivation and passion to become an economic geologist.

At the same time, Malena Cazorla (ex-president) and Laura Gemmrich (ex-member) gave a technical talk about the resources of critical elements in Bolivian tin belt deposits (focus on sulfides, sulfosalts and oxides).

2. ACTIVITIES PLANNED FOR THE FOLLOWING YEAR (2021-22)

On account of the CoVid-19 pandemic we have been forced to make certain changes in our activities planned for the past year 2020/21. Therefore, below, we point out all the activities that we have been preparing for the following year 2021/22.

In addition, in 2022 will be our Chapter 10th anniversary. For these reason, all the activities we are planning for next year will have a special meaning. This anniversary will

be culminated by the Iberian Peninsula international fieldtrip in September 2022 (See 2.6).

2.1. Enclusa hill research project

Some of the members of the BCN SGA-SEG Student Chapter decided to accomplish a scientific research. The aim of this project is to study Cu stratabound deposits in detrital series of Lower Eocene age at the Enclusa Hill (Osona, Catalonia, Spain).

The task will be carried out by 4 groups of students; the task of each group is to study a part of the deposit, with the following tasks:

- a) Mapping of the mineralized unit (already done, mainly by using photo satellite mapping)
- b) Preliminary reconnaissance to select areas for study (already done).
- c) Development of geological profiles of the mineralized beds and series. In every group there are advanced students who teach how to carry the tasks to the students of early courses. The tasks will be supervised by professors of stratigraphy of the University of Barcelona).
- d) Based on these columns, development of representative sampling.
- e) Mineralogy and texture of the samples will be traced with optical microscopy (transmitted and reflected light), SEM-BSE-EDS, EMP, Raman, XRD. Sedimentary petrologists (professors) will give support in the questions related with the cement petrography.
- f) If necessary, samples of the ores and the regional rocks can be studied with S isotope geochemistry in order to trace sources of S.

In order to favour the access of young students to the Faculty, we invited students from an Institute of the vicinity to participate in the project, along with the professor of Sciences (a geologist). Hence, we hope to establish a link with the schools of the area, to create a geosite and establish collaborations with the scientific organisations of the area.

The results will be presented in diffusive papers at the local scale, but we hope also to publish them in an international journal. In addition, we wish to present the used teaching methodology in an international symposium for innovation in university teaching (CIDUI).

2.2. Tona research project

The aim of this project is to study Cu stratabound deposits in detrital series of Upper Eocene age at the Tona area (Osona, Catalonia, Spain). The project will be similar as the Enclusa hill research, as the materials and mineral deposits are analogous. Therefore, it will be carried out with the same objectives and methods as the above project, and similar results are hoped to be achieved.

2.3. Cloned collections Project

Several field trips will take place during the remainder of this year, similar to the ones that were carried out during the past years. The goal of these field trips is to collect the missing samples to complete the Clonations Pilot Project. We selected some places in Catalonia, Spain, Portugal, France, Germany and Italy, which will be covered depending of the available funding. Some professors of the visited areas will gave support in most of these places (see attached file). To complement the Clonations Pilot Project, we want to carry out the characterization of the samples using diverse analytical techniques (including XRD, SEM-BSE-EDS, EMPA, Raman...).

Finally, it is aimed to participate in the preparation of the material (numbers in samples, boxing, etc) and preparation of guidebooks to be used to accompany the collection, where the samples will be described.

2.4. Symposium

Before the end of the year a symposium will take place in the faculty. Students who wish to explain their undergraduate dissertation, master thesis, PhD project or any other project in which they are involved may participate.

The aim of this series of presentations is to involve the current projects of the participants and to promote the interaction among them. It will also be critical for increasing their experience in public presentations, useful for future ponencies in their studies or congress.

The symposium will be designed and adapted following Covid-19 situation at the moment.

2.4. Meteorites short course

Two years ago, the Barcelona SGA-SEG Student Chapter organized the meteorite short course presented by Dr Jordi Llorca and David Allepuz at the Faculty of Earth Sciences of the University of Barcelona. The course consisted of two sessions; a seminar where the classification and characterization of meteorites were presented, and a practical class to be able to visualize different thin sections and put into practice the knowledge acquired during the seminar.

Currently, the members of the Chapter would like to organize this activity again during the second semester of this academic year (2021-2022).

2.5. Regular meetings

Several informal meetings have been organized during this year in order to join all the members and to get to know each other better. The main objectives are to get to know the interests of the members, their opinion about the past activities of the Chapter, and they also get the chance to propose new initiatives and activities. During the CoVid-19 pandemic, some meetings with the members were also organized by means of the ZOOM platform. In them, we, the Council, explained to them the virtual activities that were being planned for the quarantine period, in addition to other topics, such as proposals for the upcoming academic year.

2.6. Barcelona Student Chapter 10th anniversary Fieldtrip

We will culminate our 10th anniversary by doing different field trips (exchange between Barcelona, Moscow and Moroccan Student Chapters) in the framework of: **Research of deposits that contain critical raw materials and rare elements: *The examples of the Iberian Peninsula and the Baltic Shield.***

This Chapter exchange has been organized together with the Moscow Student Chapter. Additionally, some other Student Chapters such as the UNLP SC, the NW Russia SC and the Moroccan SC have decided to join the proposal of exchange. The first part of the exchange will take place by summer of 2022. It will consist of two field trips organized by the Barcelona Student Chapter in the Iberian Peninsula. The proposal for these field trips has already been prepared and sent to the respective Chapters. In addition, during the field trips samples will be collected for the Clonations Pilot Project*.

2.7. Coffee stands

We will keep on organizing several coffee stands, because we think it is a fruitful activity to collect new members. In them, we will explain what activities we do in the Student Chapter, which activities are taking place or will be taking place and how it is beneficial for a student to be part of such an organization.