FIELD TRIP TO THE GOLD SYSTEMS IN THE BOHEMIAN MASSIF

September 25th - 30th 2017

BUCHAREST STUDENT CHAPTER

Authors:

M.Sc. Student Eduard-Costin Ghinescu (President)
B.Sc. Student Ilie Tudor Gănescu (Vice President)
B.Sc. Student Cristina-Mihaela Nastasi (Secretary)

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INTRODUCTION

Bucharest Student Chapter organized its annual field trip in one of the most important metallogenetic district of Czech Republic, the Central Bohemian Plutonic Complex (CBPC) (Fig. 1) and surrounding areas, including the Neoproterozoic Jílové Belt (JB) and the most important gold deposits along our colleagues from Brno SEG Student Chapter and Sofia SEG Student Chapter.

Apart from visiting the most important deposits in the Central Bohemian Plutonic Complex, at the suggestion of our czech hosts, we also visited the Erzgebirge (Krušne hory) region at the border between the Czech Republic and Germany (Fig. 2) in order to see one of the most important deposits and the type locality of the Li-mica mineral-Zinnwaldite. While in Germany, we also visited Terra Mineralia in Freiberg.

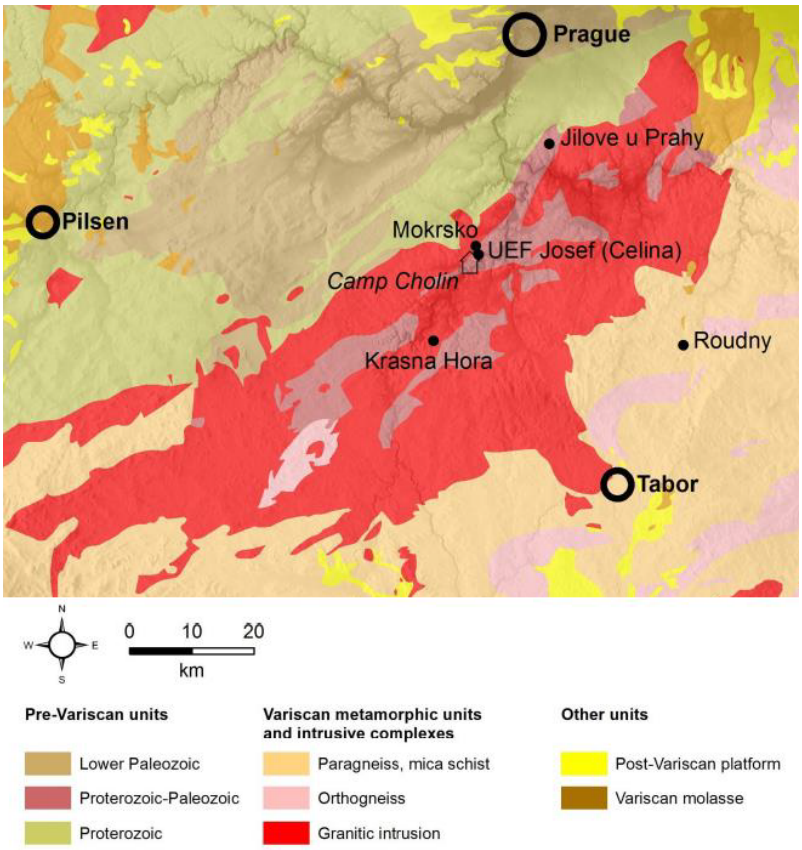

Fig. 1 - Geological map of the CBPC

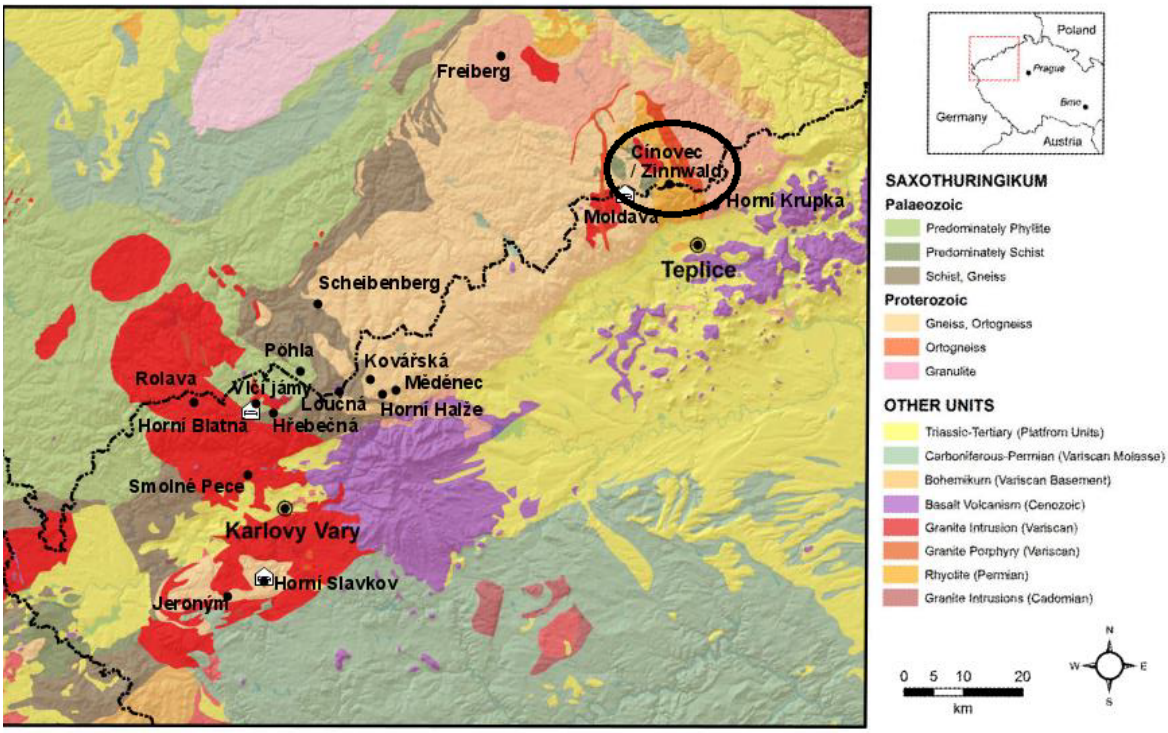

Fig. 2 - Geological map of the Erzgebirge

CENTRAL BOHEMIAN PLUTONIC COMPLEX

Overall geology

The Bohemian Massif is one of the largest continuously outcropping fragments of the originally vast Variscan orogen that crops out from the basement of younger Epi-Variscan Platform sediments. The comparatively extensive Variscan orogen was formed gradually in the course of joining the peri-Gondwana fragments to Laurussia, to the more northerly situated continent created as the result of Caledonian convergence between Laurentia and Baltica.

Based on the current concepts of development of continents, which start from the application of principles of plate tectonics, the Bohemian Massif can be interpreted as a heterogeneous unit composed of separate regional domains. Each of them is defined especially by a specific stratigraphic content, tectomagmatic development and tectonic limitation in relation to its surroundings. In spite of the fact that the above-mentioned units are separated by significant sutures and tectonic zones, they have a number of common features especially regarding the Neoproterozoic and, in part of them, also the Cambro–Ordovician development; on the contrary, they differ markedly in terms of the early stage of Paleozoic development during the Variscan orogeny. After the end of the Variscan orogeny, the Bohemian Massif was gradually transformed into a platform unit. During the Carboniferous, it gradually became dry land. In the most of the area, with the exception of intramontane depressions, deep erosion of the Variscan basement took place. Erosion and continental sedimentation were interrupted only for a short time by a marine transgression over part of the area in the Jurassic, Cretaceous and Neogene Periods. In addition to the deposition of sediments in the depressions, various types of volcanic bodies of Cretaceous to Quaternary age provided the finishing touches to the surface of the platform cover of the Bohemian Massif.

Čelina, Mokrsko-West and Mokrsko-East deposits

Also known as the Psi hory gold-bearing ore district, these three deposits are situated approximately 50 km south of the city of Prague. This gold-bearing ore district was formed by the contact zone of the Variscan Sazava intrusion and the Neoproterozoic volcano-sedimentary rocks of the Jilove Belt and it consists of three main ore bodies - Čelina, Mokrsko-West and Mokrsko-East (Fig. 3). The largest and the most significant is the Mokrsko-West gold deposit, well known for its typical gold-bearing structures - a system of massive parallel sheeted thin quartz veins developed along E-W striking microfissure system. The Mokrsko-West deposit is the largest of the three, with proven reserves of 90 tonnes of gold, while the Mokrsko-East deposit has a reserve of 29 tonnes of gold and Čelina about 11 tonnes of gold.

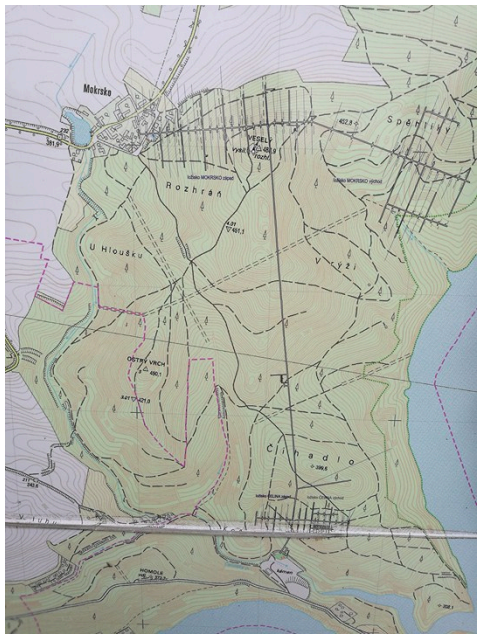

Fig. 3 - Map of the Celina, Mokrsko East and Mokrsko West deposits

Fig. 4 - Celina mine entrance

Fig. 5 - Quartz veins inside the Celina mine

Roudny gold deposit

The Roudny deposit is located approximately 60 km SE from Prague. Geologically it lies in the northern part of the Blanice Graben on its crustal-scale brittle tectonic zone. The broader area of Roudny deposit consists of various rocks of Drosendorf unit. The most abundant are sillimanite-biotite and biotite paragneiss. Gneisses contain numerous small bodies of quartz-gneisses, quartzites, calc-silicate rocks, amphibolites and skarns. Veins of small younger aplites and pegmatites are also frequent. The horizontal length of the Roudny ore body along its strike varies between 75 and 130 m, with a thickness of 4 – 6 m. The presence of gold ores was verified to the depth of 520 m. The ore mineralization is tied especially to the Main vein (0.1-1.5 m thick) and surrounding stockworks, some areas with ore impregnation in altered rocks are also present. Gold is present as pure element or dispersed in pyrite and arsenopyrite. The Au content usually varies between 4 – 25 g/t, but some sections were very rich with record value of 10.3 kg/t.

Fig. 6 - Former settling pond at Roudny gold deposit

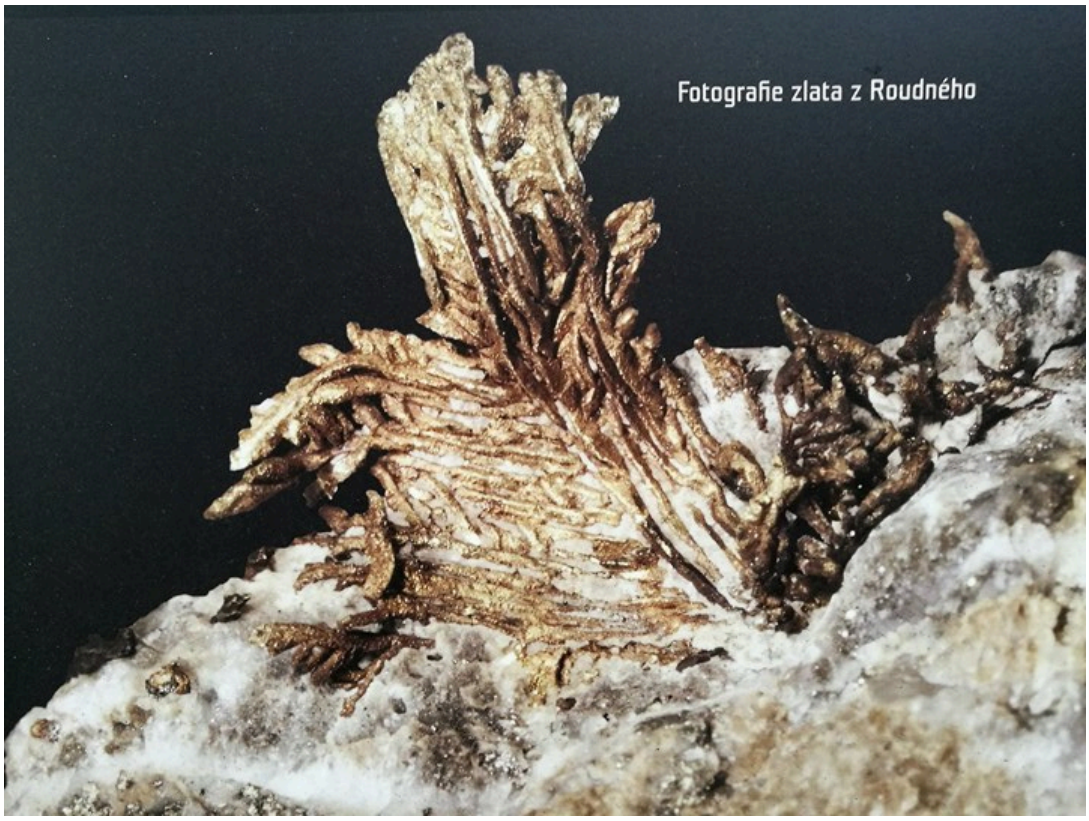

Fig. 7 - Gold specimen from Roudny

Fig. 8 - Former shaft at Roudny gold deposit (18th century)

Krasna hora Au-Sb deposit

The Krasna hora Au-Sb deposit is situated in a central part of the Central Bohemian Pluton (Variscan I-type granitoids). The geological setting is very similar to that known from Mokrsko or Jilove Belt – in low grade metamorphosed Proterozoic and Early Paleozoic volcanosedimentary assemblages intruded by younger Variscan granitoids. Au and Sb vein-type mineralization is also adjacent to lamprophyres, porphyrites and mylonite zones. The main ore mineral in the east and central part of the deposit is stibnite, which contains scattered gold grains (> 1 mm). Another ore mineral is aurostibite which occurs as pinkish reaction rim up to 3 mm thick around the gold grains. Besides stibnite and aurostibnite, other minerals known at the deposit include common sulphides: pyrite, arsenopyrite and accessory pyrrhotite, molybdenite, galena, sphalerite, chalcopyrite, antimony, chalcostibite, tetraedrite and Sb-sulphosalts.

The underground workings are not suitable for visit due to forbidden access. It is possible to visit one of the main waste dumps where, among the common sulphides and molybdenite, it is also possible to find stibnite or even visible gold with halo of aurostibnite.

Fig. 9 - Krasna Hora mine Entrance

Fig. 10 - Gold sample for Krasna Hora

Jilove gold deposit

The Jilove gold district is located in central Bohemia approximately 20 km south of Prague. The Jilove gold district, asa part of regional-scale Jilove greenschist belt, hosts many of medieval to 19th century underground workings.

The Jilove gold mining district is formed by volcano-sedimentary complexes of low-grade metamorphism penetrated by Variscan contaminated I-type granites. Typical rocks of the Jilove Belt are: metabasalts and metaandesites, turned to greenshists and locally metamorphosed to hornblende-biotite hornfels, so called Spilite Group of the Jilove Belt and different varieties of I-type granitoid of the Central Bohemian Pluton such as individual stocks to complicated vein systems in reverse faults or extension fractures and/or stockworks in dykes and sheeted vein systems penetrating both intrusive and upper crustal rocks,. The Jilove district is situated in the northernmost part of this narrow, about 70 km long strip, trending NE-SW to NNE-SSW. Gold bearing impregnations in the Jilove Belt rocks are formed of composite lodes and of quartz-pyrite impregnations of quite irregular shapes without sharp contacts.

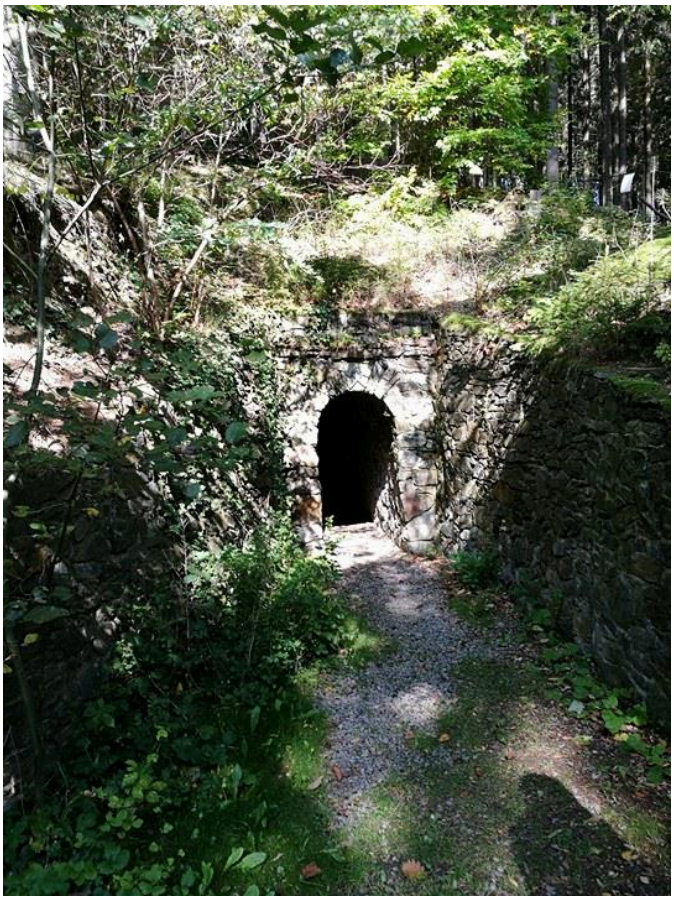

Fig. 11 - Jilove Adit entrance

Fig. 12 - The participants at the Jilove Adit

ERZGEBIRGE/KRUŠNÉ HORY AREA

Overall geology

The whole area of interest lies in central Europe, along both sides of state border between northwestern Czech Republic and Germany. From the geological point of view, it belongs to the Bohemian Massif, one of the biggest and best preserved fragments of the Variscan orogen in Europe. More precisely, that part of the Bohemian Massif is called Saxothuringicum or Saxo-Thuringian zone.

Probably the most important, exploited and studied deposits of the Krušné hory/Erzgebirge are greisen Sn-W-Li (Sc, Rb, Cs, Mo, Nb, Ta,…) deposits, which are genetically related to granite-exsolved fluids either auto-metasomatizing the elevated granite cupolas (eg. Zinnwald, Horní Slavkov) or escaping to surrounding metamorphic country rocks and precipitating the ore in form of exocontact greisen veins and stringers (eg. Rolava, Vlčí jámy) or Sn-enriched skarns (eg. Pöhla). The granite magmatism took place between 330 and 295 Ma and two genetic types of granites can be distinguished: The A type (meta-aluminous to slightly peraluminous granites with stronger involvement of quartzo-feldspatic source) and S type (strongly peraluminous granites with metasedimentary (metapelitic) source). Both granite types show contemporaneous geochemical evolution and both contain older barren facies and younger ore bearing facies.

Other very important deposit types mined mostly for their Ag (and later U) content are: The Pb-Zn-Ag (In-Cd) veins containing Ag-rich galena and In, Cd-rich sphalerite, which are known from the area of Freiberg, where more than 1100 such veins have been found and the Bi-Co-Ni-As-Ag-U vein deposits (eg. Jáchymov/St-Joachymstaal). The genesis of those deposit types is somehow less clear, than in the case of greisens. They show slightly lower ages, however various evidence suggest at least partial genetic link to late/post-Variscan granitic or lamprophyre magmatism.

Besides the above mentioned, geological diversity of the area is manifested by presence of less important, but interesting deposits: Fluorite-barite veins (eg. Kovářská, Moldava); Fe (magnetite) ± Cu skarns (eg. Měděnec) and quartz veins containing amethyst, chalcedony and sometimes showing really nice textures suitable for polishing as decorative stones (eg. Horní Halže, Ciboušov).

Zinnwald deposit

The Cinovec-Zinnwald deposit is situated on the border of Czech Republic and Germany in the Krušne hory (Erzgebirge) region, which belongs to the Saxothuringian zone of Variscan orogene. Cinovec-Zinnwald is one of the most important deposits of the Bohemian Massif and is the type locality of the Li-mica mineral Zinnwaldite.

The mineralization in the Cinovec-Zinnwald mining district is related to the late-Variscan intrusion of the Krušne hory/Erzgebirge granite batholith, which penetrates the Teplice rhyolite. The country rock of the magmatic complex is two-mica paragenesis of the Krušne hory crystalline complex. The highly differenciated albite-zinnwaldite granite in the apical part of the Cinovec intrusion hosts a quartz-zinnwaldite (topaz, scheelite) vein system with Sn-W mineralization.

Fig. - 13 Zinwaldite samples at Zinnwald mine

Fig. - 14 Zinnwald mine entrance

Terra Mineralia

Terra Mineralia is a permanent exhibition of the TU Bergakademie Freiberg with over 3.500 minerals, gemstones and meteorites from five continents presented in the historical setting of the Freudenstein Castle.

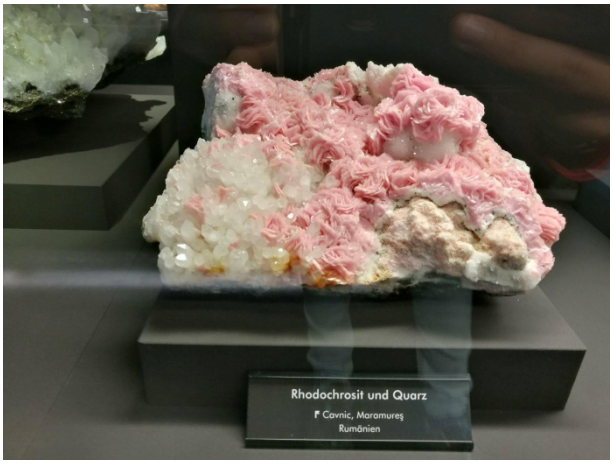

Fig. 15 - Different mineral specimens from Terra Mineralia Museum

PARTICIPANTS

BSC of SEG selected a total of 5 members ranging form Undergrads to Master students (Tabel 1).

No.Crt.	First name	Last name	Year of study	Specialization
1	Andreea-Maria	Bocioacă	MSc.	EBSRM
2	Eduard-Costin	Ghinescu	MSc.	EBSRM
3	Cristina-Mihaela	Nastasi	BSc.	Geophysics
4	Cătălin	Măric	BSc.	Geophysics
5	Cătălina	Lăcătușu	BSc.	Geophysics

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