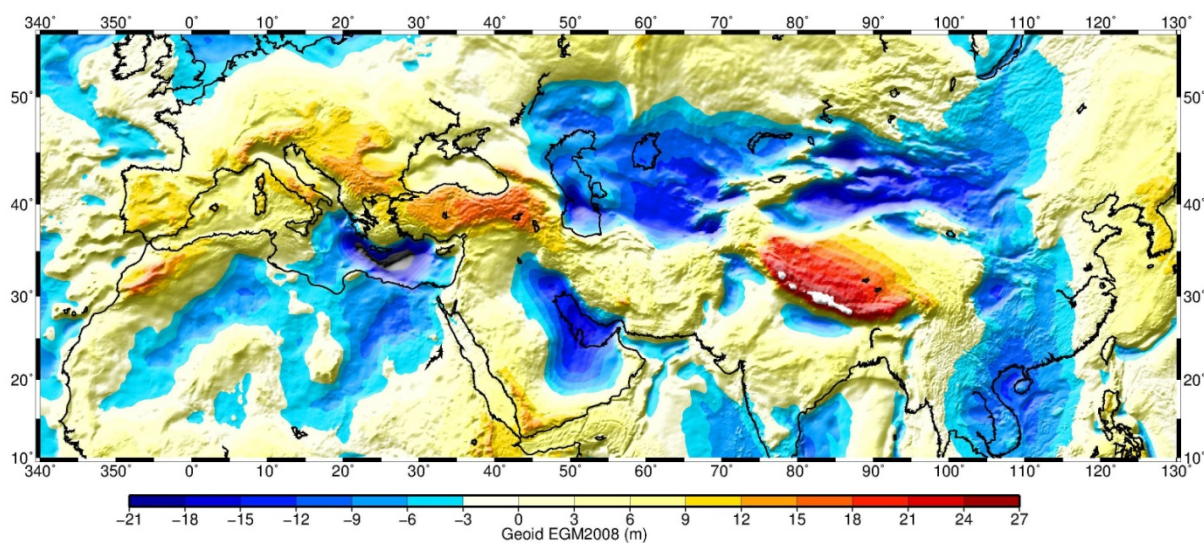




# UBC SEG-GAC Student Chapter Annual Ore Deposit Fieldtrip to Eastern Europe

May 7<sup>th</sup> – May 18<sup>th</sup>



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## **1. FIELD TRIP OVERVIEW**

The University of British Columbia's student chapter of the Society of Economic Geologists and Geological Association of Canada (UBC SEG-GAC) seeks to promote better understanding and deeper interest in the science of economic geology. Our activities are aimed at advancing our members' comprehension of mineral deposits and how geological science is applied to exploration, evaluation and production. With this goal in mind, we organize courses, meetings, field trips, lectures and literature. We place a great value in the experience of our fellow geologists and strive to develop stronger ties between students and professional geoscientists in the industry, academia and government.

Over the past twelve years the annual UBC Ore Deposits Field Trip has enjoyed great success, creating an opportunity for enthusiastic students and industry participants to interact and experience world-class geology. It is also an opportunity to visit a variety of mineral deposits and regions while gaining a hands-on understanding in a short period of time. The 2013 Eastern Europe fieldtrip participants are twelve UBC-SEG students and eleven international members of industry, ranging from Turkey, Singapore, Australia, and Canada.

The focus of the 2013 trip is to gain an understanding of the geology and metallogeny related to the intense tectonic history of Eastern Europe. This will help us build a geologic framework in which to place the many varied mineral deposits of the region. To realize this goal we will visit a variety of deposits in Serbia, Romania, Bulgaria, and northern Greece. We will be visiting Rio Tinto's Jadar Deposit (lithium borate pegmatite), the Bor deposit (open pit Cu-Au porphyry), Gabriel Resources' Rosia Montana deposit (Epithermal Au), Dundee Precious Metals' Chelopech deposit (porphyritic cupiferous massive pyrite), the Sapes project (high sulphidation epithermal gold), the perama hill project (stratabound sediment hosted gold deposit) and the stratotoni deposit (replacement mixed sulphides).

Upon our arrival in each country, we will be hosted by a university and given an introductory presentation on the geologic and metallogenic setting of the region. We will also spend at least one tourist day in each country to see other sites of interest.

## 2. LIST OF PARTICIPANTS

|                        |   |                                  |
|------------------------|---|----------------------------------|
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| Barry Penner           | Undergrad Student, UBC                        | barrypenner@me.com               |
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| Greg McKenzie          | MSc Student, UBC                              | cflisthebest@hotmail.com         |
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| Mark Pudovskis         | Principal Geoscientist, BHP Billiton          | Mark.A.Pudovskis@bhpbilliton.com |
| Renato Bobis           | Principal Geoscientist, BHP Billiton          | Renato.Bobis@bhpbilliton.com     |
| Phu Bui                | Principal Geologist, HDI                      | pvanbui@azaleageoservices.ca     |
| Ali Riza Colakoglu     | Eldorado (Chief Project Generation Geologist) | alirizac@tuprag.com              |

## 3. TRIP ITINERARY

### Important Notes

**Please keep your boarding passes with you and give them to Brian.** We will collect all the boarding passes from students and industry members for the tickets that were purchased by the UBC-SEG Student Chapter. We require boarding passes for receipt/accounting purposes. If you purchased your own flight, you may keep your boarding pass.

Upon arrival we will meet at the Hotel Royal in Belgrade. For those of you who have arranged your own flights, please meet us there on the evening of May 6<sup>th</sup>.

We will be hosting a “meet and greet” at \_\_\_\_\_ on the evening of May 6<sup>th</sup>, so members of the field trip can get acquainted. Also, we’ll be inviting local geologists from Belgrade to join us, so if you have contacts in Belgrade you’d like to catch up with, please invite them as well 😊

We will bring the SEG Student Chapter cell phone and we will purchase a SIM card in each country we visit, to use for mine contact or in case of emergencies.

Our contacts in each country are:

**Serbia:**

Vladimir Simic (University of Belgrade)

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[elitsas@intern.ethz.ch](mailto:elitsas@intern.ethz.ch)

**Greece:**

Vasilios Mefos (Aristotle University of Thessaloniki)

[mefosv@geo.auth.gr](mailto:mefosv@geo.auth.gr)

## 4. LIST OF HOTELS

## 5. LIST OF HOSPITALS

| City         | Hospital name  | Address   | Tel  |
|--------------|--|---|--|
| Belgrade     | <i>Clinical Center of Serbia</i>   | Emergency Center, Pasterova 2   | +381 11 3618 444   |
|              | <i>BEL MEDIC Health Center</i>   | 1 Palmira Toljatija St., Belgrade, Serbia, (Across New Belgrade Municipality) | + 381 11 309 1000  |
|              | <i>BEL MEDIC General Hospital</i>  | 87 Koste Jovanovića St., Belgrade, Serbia, (Across FC "Red Star" Stadium)     | + 381 11 309 1000  |
|              | <i>BEL MEDIC Outpatient Clinic</i>   | 1 Viktora Igoa St., Belgrade, Serbia (Across Belgrade Fair)                   | + 381 11 309 1000  |
| Cluj-Napoca  | <i>Emergency Clinical Hospital Cluj - Spitalul Clinic Judetean de Urgenta Cluj</i>     | Cluj-Napoca, str. Clinicilor nr.3-5, cod postal 400006                        | (264) 592771   |
| Brasov       | <i>Emergency Clinical Hospital Brasov - Spitalul Clinic Judetean de Urgenta Brasov</i> | Str. Calea București, Nr. 25-27, BRAȘOV                                       | 0268 320022  |
| Sofia        | <i>Tokuda hospital Sofia</i>   | 51b, "Nikola Vaptsarov" Blvd. 1407 Sofia, Bulgaria                            | +359 2 403 4112  |
| Melnik       | <i>Mbal SV. Vrach</i>  | Sandanski, Parkova Zona Bulgaria  | +359 74 634 342  |
| Kavala       | <i>Central Hospital of kavala</i>  | General Hospital of Kavala, St Sillas, P.C. 65500 KAVALA                      | (0030)2513-50-1100;<br>(0030)2513-50-1773 -<br>Emergency |
| Thessaloniki | <i>Prefectoral General Hospital</i>  | Elenis Zografou 2, 54634 Thessaloniki   | +30 231 332 2100   |

## 6. GEOLOGICAL AND METALLOGENIC OVERVIEW

Within Europe the three main zones of metallogenic significance for gold are the Carpathian Arc, the Baltic Shield and the Iberian Pyrite Belt.

The Carpathian Arc comprises Tertiary-age volcanic rocks which form the western tip of the Tethyan Metallogenic Belt. This prospective zone stretches from , through Hungary, Romania, Bulgaria, and into Turkey.

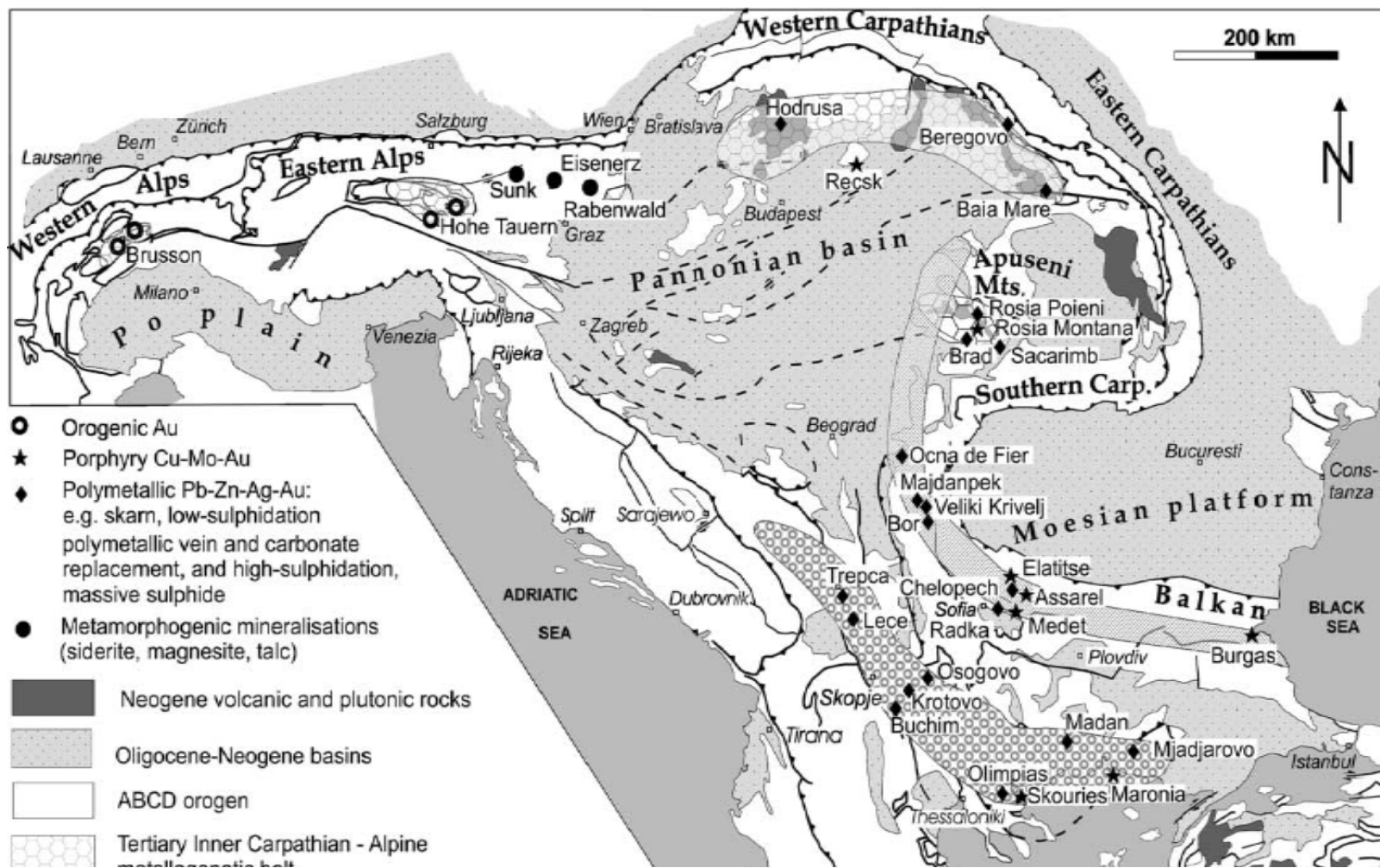
*The following text is from Heinrich, 2002*

The Alpine-Balkan-Carpathian-Dinaride (ABCD) belt is one of the world's oldest mining areas and played a major role in the history of European civilizations, from well before the peak of the Greek and Roman civilizations up until the present day. Today, it is Europe's premier Cu-Au (-Pb-Zn-Ag) province, especially for gold-rich deposits associated with calc-alkaline magmatism, which have become a focus of renewed exploration interest after the political change in the eastern part of Central Europe.

The Alpine-Balkan-Carpathian-Dinaride metallogenic and geodynamic province is part of the Alpine-Himalayan orogenic system which extends from western Europe through Iran and the Himalayas to China and Malaysia. This orogenic system is the result of convergence of the African, Arabian and Indian plates and their collision with Eurasia, mainly from the Cretaceous to the present. Along the Alpine-Himalayan system, major calc-alkaline magmatism is associated with certain segments only, whereas other segments are characterised by extensive regional metamorphism. This is a reflection of the complex geometry of the collision interface, with interfering microplates giving rise to several discontinuous sutures, highly diachronous magmatism, and transient subduction of continental crust leading to variable crustal thickening followed by extension and orogenic collapse. These interfering processes led to a very complex arcuate trace of the orogen, especially in the ABCD segment.

The three spatially and temporally distinct metallogenic belts are:

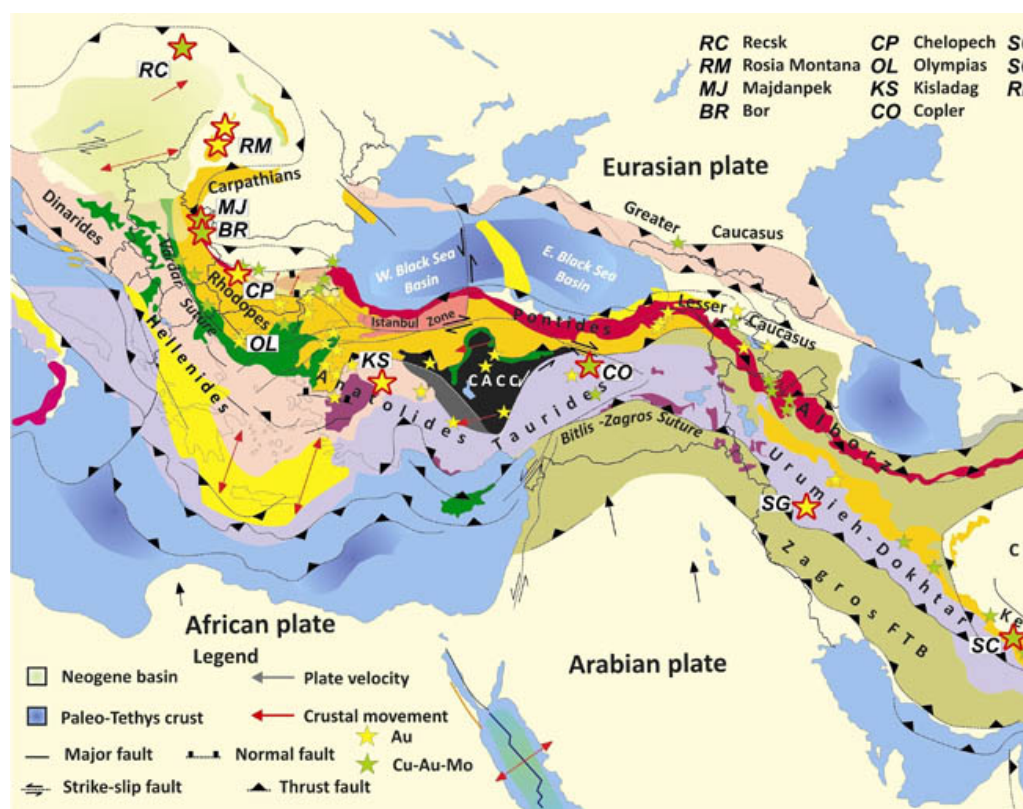
- 1) Cretaceous arc magmatism and early continental collision: porphyry related Cu-Au
- 2) Oligocene-Miocene Serbomacedonian-Rhodope Pb-Zn and Cu-Au belt
- 3) Oligocene-Neogene deposits of the inner Carpathian-Alpine orogen





The following text is from Ciobanu, 2002

The most important ore-bearing igneous belt of calcalkaline signature in the Alpine–Balkan–Carpathian–Dinaride realm (Mitchell 1996; Jankovic' 1997) has been redefined as the Banatitic Magmatic and Metallogenic Belt, BMMB (Ciobanu, 1998; ). The BMMB extends through south-eastern central Europe, with a north-south orientation in Romania through Serbia (Yugoslavia), and an east-west orientation in Bulgaria (Fig. 1). Despite gaps in the exposure of magmatic rocks and very scattered ore deposits, the BMMB can be considered almost continuous along a length of 1,500 km, with a width of 30 to 70 km. The L-shaped belt, and its contained magmatic and metallogeny, have a long-debated history since the connection between 'banatitic' and 'rosian' adjacent deposits was first recognised in Banat and Timok in the 19th century (Ciobanu, 1864). Banatite, named after the Banat province in south-western Romania, is a collective term for these Late Cretaceous intrusive and volcanic rocks including tholeiitic and alkaline, but mostly calc-alkaline, high-K calc-alkaline to basaltic compositions.



## 7. COUNTRY SUMMARIES

### May 6<sup>th</sup>- 8<sup>th</sup> :: Serbia

#### HISTORY OF SERBIA

The region surrounding the modern-day country of Serbia has been continuously inhabited since Neolithic times, approximately 8500 years ago. The Thracian, Dacian, and Illyrian cultures that developed in the region were invaded by a number of other cultures, notably the Greeks under the rule of Alexander the Great (4th c.), the Celtic tribe of Scordisci (3d c.), and the Roman Empire (2nd c.). Constantine the Great, the first Christian Roman emperor, was born in the region of modern-day Serbia. Upon the collapse of the Roman Empire in the 4th century, the region known as *Sklavinia* became a semi-independent state of the Byzantine Empire. Northern Slavic people, migrating from the region surrounding modern-day Ukraine, arrived en masse during the 6th century and introduced an important ethnic group to the region.

A series of tribal dynasties ruled the region (or parts of it) until the Nemanjić dynasty founded the Kingdom of Serbia in the year 1217 and drafted the *Zakonopravilo*, the Kingdom's first constitution. This act ushered in an era of prosperity, and religion, politics, art, culture, and industry all flourished. A succession of strong kings with an eye on national expansion conquered surrounding regions and expanded the young kingdom, until the invasion by the Ottoman Empire slowly overwhelmed the Serbs by the middle of the 16th Century. The lives of Serbian people for the next two hundred years were determined by oscillating conflict between the Ottoman Empire and the Hapsburg Empire.

After two long and violent revolutions, the Serbian people gained autonomy from the Ottoman Empire in the year 1815. Though the Principality of Serbia was formally recognized by European powers and by the Ottoman Empire, antagonistic war continued sporadically throughout the 19th century, until the Congress of Berlin formally and internationally recognized Serbian independence in 1878. A series of internal revolutions and power shifts following independence slowly resulted in the re-establishment of the Kingdom of Serbia in 1882.

Regional tension during the first part of the 20th century resulted in the two successive Balkan Wars. Soon after, Russia's alliance with Serbia following the assassination of Archduke Ferdinand (Sarajevo, June 1914) caused continental tensions to escalate into World War I. Approximately 1m Serbians lost their lives. At the end of the war, King Peter I proclaimed the Kingdom of the Serbs, Croats, and Slovenes (which soon became Yugoslavia), but the kingdom was

plagued by frail leadership and internal conflict. Ethnic tension was severely antagonized in the following years.

In spite of an attempt to remain neutral, the Axis powers invaded Yugoslavia in 1941, and a Croatian puppet state controlled by Nazi Germany governed the region. Axis genocide antagonized regional ethnic tensions; this resulted in heavy persecution of Serbian Jews and Roma. During the final year of World War II, a fragmented and terrorized Serbia fell into civil war, driven by both ethnic and political conflict. Communist partisans gained victory and established the Socialist Republic of Serbia. Ethnic conflict worsened, and notably the region of Kosovo became a locus of Albanian-Serbian conflict.

Serbia remained socialist until 1990. The Federal Republic of Yugoslavia was then established under the influence of Slobodan Milošević; it included Serbia and Montenegro. The Yugoslav Wars immediately followed, with the worst fighting occurring in neighbouring Bosnia and Herzegovina. Soon after, the Kosovo War erupted. UN intervention halted conflict, but today, Serbian politics are tense and trouble over the disputed region of Kosovo continues. Peace talks over Kosovo continue under the watchful eye of NATO. Serbia became an official candidate for European Union membership in March 2012.

## **SERBIAN CULTURE**

Serbia is surrounded by several culturally influential regions, and has historically assimilated aspects of all of them. Though Serbia is religiously diverse, it has a strong Orthodox majority due to the influence of the Roman Empire. Many Orthodox monasteries dot the countryside (including the wealthy Studenica monastery), dating back to the Middle Ages.

Serbian art, literature, and music all enjoy a strong national legacy. Many Serbian monasteries contain elaborate and beautiful frescoes, and Serbian architecture reflects the region's many cultural influences. Serbia also has a love of theatre; the Belgrade International Theatre Festival is one of the largest and most important in Europe.

Serbian cuisine, like its architecture, reflects assimilation of many cultural influences, most notably Mediterranean (Greek), Turkish, and Central European (Austrian and Hungarian). Each region within the country takes pride in its own traditional recipes and variations. Slivovitz, a form of Rakia (brandy distilled from fruit), is the national drink. It is produced via the distillation of damson plums. Slivovitz is used at all important rites of passage in life, by the Orthodoxy in some celebrations, and in traditional folk remedies. This drink invokes a strong sense of national pride, and incurs a high degree of respect as a unifying national symbol.

The Serbian language uses both the Cyrillic and Latin alphabet and is the only European language to do so.

## May 9<sup>th</sup> – 13<sup>th</sup> :: Romania (*România*)

This country was one of the least visited countries in Europe, till 15 years ago. Closed for more than 40 years behind the "Iron Curtain" and almost isolated from the rest of the world by a tough communist regime until 1989, Romania is a land of many genuine treasures that are waiting to be discovered.

Romania is one of the large countries of Europe (the size of the United Kingdom or roughly half of France), with a population of approx. 22 million inhabitants. Along with the Romanians, Hungarians, Germans, Serbs, Turks and other minorities also live in the country. Most of them are of Greek-Orthodox religion, but there are also many Catholics, Protestants, Evangelical, Muslims and others.

This country is located north of the Balkan Peninsula on the western shores of the Black Sea. It is a country of great natural beauty and diversity and a rich cultural heritage. Romania enchants visitors with its scenic mountain landscapes and unspoilt rural areas, but also with its historic cities and its busy capital.

Over the last decade, it has seen significant development and is one of the most recent members of the European Union. Still, it may surprise some of its visitors who are used to Western Europe. Romania is a large country, which can sometimes be shocking with contrasts: some cities are truly Western Europe; some villages can seem to have been brought back from the past. While it has significant cultural similarities with other Balkan states, it is regarded as unique due to its strong Latin heritage. Things for which Romania is famous include: the Carpathian mountains, Constantin Brancusi, wine, medieval fortresses, Mircea Eliade, Dacia cars, Dracula, stuffed cabbage leaves, Nadia Comaneci, the Black Sea, Gheorghe Hagi, sunflower fields, painted monasteries and the Danube Delta.

With a Black Sea coast to the east, it is bordered by Bulgaria to the south, Serbia to the southwest, Hungary to the northwest, Moldova to the northeast and Ukraine to both the north and the east. While its southern regions are usually seen as part of Southeastern Europe (Balkans) Transylvania, its largest region is in Central Europe.



### Facts

|                          |                      |
|--------------------------|----------------------|
| Capital                  | Bucharest            |
| Government               | Parliament Republic  |
| Currency                 | Leu. 1 leu = 0.3 CAD |
| Language                 | Romanian             |
| Electricity              | 220 V                |
| Country Code             | +40                  |
| I Cost of 1 pint of beer | 4.2 leu (1.3 CAD)    |

### Important words!

| English                | Romanian                   |
|------------------------|----------------------------|
| Hello                  | Alo                        |
| Goodbye                | la revedere                |
| Please                 | vă rog                     |
| Thank You              | mulțumesc                  |
| I don't speak Romanian | Eu nu vorbesc limba română |
| Can I have a beer?     | O bere, vă rog             |

Contact: Calin Tamas, professor of the geology department of the Babes Bolyai University of Cluj

Email: [calin.tamas@ubbcluj.ro](mailto:calin.tamas@ubbcluj.ro)

Phone: +40 51 405300 ext. 5216

## May 14th & 15th :: Republic of Bulgaria

Languages: Bulgarian

Ethnic Groups

84.8% [Bulgarians](#)

8.8% [Turks](#)

4.9% [Roma \(Gypsies\)](#)

1.5% rest

Currency: Bulgarian Lev (BGN) 1 = \$0.68 CAD

Population

- 2011 census 7,364,570[2] (98th)

- Density 66.2/km2 (139th)

Calling code 359



### **Economy:**

From a largely agricultural country with a predominantly rural population in 1948, by the 1980s Bulgaria had transformed into an industrial economy with scientific and technological research at the top of its budgetary expenditure.

Local iron, copper, coal and lead deposits are vital for the domestic manufacturing sector. Major industries include extraction of metals and minerals, production of chemicals, machinery and vehicle components, petroleum refinement and steel. The mining sector and its related industries employ a total of 120,000 people and generate about five per cent of the country's GDP. The country is Europe's fourth-largest gold producer and sixth-largest coal producer. Almost all top export items of Bulgaria are industrial commodities such as oil products (\$2.24 billion), copper products (\$1.59 billion), medicaments (\$493 million) and military equipment (\$358 million).

### **Culture:**

Traditional Bulgarian culture contains mainly Thracian, Slavic and Bulgar heritage, along with Greek, Roman, Ottoman, Persian and Celtic influences. Nine historical and natural objects have been inscribed in the list of UNESCO World Heritage Sites: the Madara Rider, the Thracian tombs in Sveshtari and Kazanlak, the Boyana Church, the Rila Monastery, the Rock-hewn Churches of Ivanovo, Pirin National Park, Sreburna Nature Reserve and the ancient city of Nesebar.

### **History:**

A branch of the Slavs merged with the Proto-Bulgarians, a Central Asian tribe, in the late 7th century to form the first Bulgarian state in the Balkans.

In succeeding centuries, Bulgarian and the Byzantine Empires dominated South-East Europe, but by the end of the 14th century the region was overrun by the Ottoman Turks. Bulgaria regained its independence in 1878 largely due to the intervention of Russia, who clipped the wings of the declining Ottoman Empire in Bulgaria and elsewhere, and installed a minor German prince as a ruler of the newly independent country. The country's iconic heroes were all freedom fighters to a man: whether Rakovsky, who mixed revolution and literature, Vassil Levski - the Apostle of Freedom, or Hristo Botev, poet and fighter.

After a series of bloody and brutal Balkan wars, Bulgaria had the further misfortune to be occupied by the losing side in both World Wars, and fell within the Soviet sphere of influence and became a People's Republic in 1946. Communist domination was brought to a swift, but for many people illusory end in 1989; though Bulgaria went on to hold its first multi-party election since World War II, essentially socialist policies were pursued until hyperinflation and economic meltdown drove the old guard out of power in 1997. Today, reforms and democratization have brought Bulgaria into the NATO fold, with EU accession celebrated in 2007.

During Communist times, the Black Sea was a favorite destination for travellers behind the Iron Curtain. Now, increasing numbers of western Europeans travel throughout the country and many have bought vacation houses near the Black Sea or in picturesque villages. During the 2008 global financial crisis, Bulgaria was badly affected by the downturn, where the country entered a recession of 5%, and unemployment lingering near the double digits.

Even though it is among one of the 50 richest countries in the world, Bulgaria remains as the poorest member of the European Union. The Issues facing the country are a weak judiciary system, a moderate level of corruption in the local government, a poor road infrastructure, and a somewhat high unemployment rate. The unemployment has continually lingered near the double digits, an issue the country faces. Another serious problem is the sight of over-development in the country.

## **Drink:**

### ***Non-alcoholic***

There are more than six hundred mineral water springs around the country, so this is something you'd better taste and drink. In some regions tap water is not safe to drink. Ayrian (yogurt, water and salt) and boza (millet ale) are two traditional Turkish non-alcoholic beverages that you can also find in Bulgaria widely.

### ***Wine***

Grape growing and wine production have a long history in Bulgaria, dating back to the times of the Thracians. Wine is, together with beer and grape rakia, among the most popular alcoholic beverages in the country. Some of the well known local wine varieties are Mavrud, Pamid, Gamza (red dry), Melnik, Dimyat, Misket, Muskat, Pelin, Kadarka (red sweet) and Keratsuda (white dry).

### ***Beer***

Beer (bira:) is consumed all around the country. Excellent local varieties like Kamenitza, Zagorka, Ariana, Pirinsko and Shumensko, as well as Western European beers produced under license in Bulgaria like Tuborg, Heineken and Amstel, are readily available mostly everywhere.

### ***Spirits***

Rakia is the Bulgarian national alcoholic drink and is served neat, usually at the beginning of a meal with salads. Its powerful (40% vol), clear brandy that can be made from grape, plum or apricot. In some villages people still distill their rakia at home; it is then usually much stronger (>50% vol). Another quite popular drink is mastika (47% vol), a drink closely related to Greek Ouzo and Turkish Raki. It is usually drunk with ice, with water in a 1:1 mixture. Menta is a peppermint liqueur that can be combined with mastika.

#### **English Phrases**

English Greetings

Hi!

Good morning!

Good evening!

Welcome! (to greet someone)

How are you?

I'm fine, thanks!

And you?

Good/ So-So.

Thank you (very much)!

You're welcome!

Hey! Friend!

What's new?

Nothing much

Good night!

See you later!

Good bye!

Do you speak (English/ Bulgarian)?

What's your name?

I'm lost

Where is the (bathroom/ pharmacy/beer)?

#### **Bulgarian Phrases**

Bulgarian Greetings:

Sdrawei!

Dobro utro!

Dobar wecher!

Dobre doshal!

Kak si?

Dobre,merci!

A ti?

Dobre./ Biva.

Mnogo blagodaria!

Ti si dobre doshal! (Blagodaria)

Sdrasti!Priiatel!

Neshto nowo?

Ne mnogo.

Leka nosht!

Do po-kasno.

Chao.

Govorite li (angliiski/ balgarski)?

Kaks se kaswate?

Sagubih se

Kade e (baniata/aptekata/bira)?

## **May 16<sup>th</sup> - 18 :: Greece**

Currency: Euro

Language: Greek (English Commonly Spoken)

Dialing Code: 30

Useful Phrases: Please – parakaIO

Thank you – ephkharistO

Beer – blra

Airport – aerodhrOmio

Taxi - taksl

### **Overview:**

Greece is located on the Mediterranean Sea at the southernmost tip of the Balkan peninsula. The country is most famous for its ancient culture that has influenced much of the Western World. This long history has also resulted in extensive ancient historical sites throughout the country. These historical sites, coupled with Greece's climate and natural beauty have resulted in it becoming an extremely popular tourist destination.

### **Climate:**

Greece as a whole has a typically Mediterranean climate with warm, dry summers and mild wet winters. For Thessolaniiki, the weather during May is usually pleasant, with an average temperature of around 20 degrees. May is one of the rainier months with an average of 9 days of rain, but most of the time, it's very sunny.

### **People:**

Greeks tend to be fairly laid-back and treat each other with an air of informal politeness. Most Greeks under the age of 40 or those in the tourism/transportation industry will likely speak English to a greater or lesser extent. It is considered polite to let the stranger make the first move. When gesturing, avoid pointing your palm toward people as this is considered a rude gesture.

### **Food and Drink:**

There are many traditional and modern Greek foods that are popular. Seafood, vegetables and lamb comprise the majority of the dishes. A meal in Thessolaniiki can be expected to cost about 12 Euros a person.

Beer (€4), wine(€6/ bottle) and liquor are also available, domestic and imported. Imported beer tends to be expensive. The most famous liquor is ouzo, which is anise flavoured. Greek wines are well thought of and difficult to find outside the country.



## **8. COMMODITY SUMMARIES**

*From "Central and South-Eastern Europe Metallogeny: an overview" cassard.d@brgm.fr*

### **Gold and silver**

A first important period of formation for Au-Ag deposits is during Cretaceous (e.g. Chelopech in Bulgaria, Musariu in Romania, Bor district in Serbia). The dominant period of formation is during the Neogene and Quaternary ages. Quaternary deposits are of placer type, none of them being of economic importance. They are mostly reported in Bulgaria and NE of Greece. Neogene occurrences belong either to the epithermal or porphyry-related type and are linked to the Tertiary volcanic and magmatic events. Some of these occurrences are of large economic size (Kisladag project in Turkey, Kremnica district in Slovakia, Olympias and Skouries projects in Greece).

### **Lead and zinc**

Here again, the maximum period of formation of the Pb+Zn occurrences corresponds to the Cretaceous-Tertiary ages, with an increasing activity from Cretaceous to Neogene. This mineralisation is also magmatic related, with some important hydrothermal and replacement type deposits (Madan, Laki, Madjarovo, and Davidkovo districts in Bulgaria; Kopaonik District in Serbia - with the Stari Trg, Belo Brdo, Novo Brdo, Ajvalija deposits; Asarcik in Turkey). The older and fewer occurrences are of very different type, like the Triassic sedex type of Brskovo ore field (Brskovo, Zuta Prla deposits) in Serbia, and the Cambrian volcanogenic massive sulphide type of Baia Borsa deposit in Romania.

### **Copper**

Cu occurrences are relatively abundant and their time distribution is slightly different from the previous ones, with a peak during Jurassic and Cretaceous, and a decreasing number of occurrences through the Tertiary. Jurassic and Cretaceous copper occurrences mostly belong to the volcanogenic massive sulphide (VMS) type, with all the ophiolite hosted VMS of Albania (Jurassic) and Cyprus (Upper Cretaceous). The VMS type is more rare in the other countries, with only few occurrences in Turkey (e.g. Kure Asikoy, Murgul Maden or Madenkoy). Through Late Cretaceous and Early Tertiary, the volcanic and magmatic events are also responsible of a copper mineralisation associated with Au-Ag-Pb-Zn. The typical deposits are of epithermal, porphyry or skarn-replacement type (e.g. from the Late Cretaceous porphyry and hydrothermal deposit of Bor in Serbia, the Moldova Noua deposit in Romania, both with skarn and porphyry types, the porphyry deposit of Assarel in Bulgaria, to the Eocene epithermal and porphyry deposits of Recsk in Hungary).

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