



## The raw material potential of SW-Germany - A brief overview

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SW-Germany is considered poor in raw materials by the population and most politicians. However, this view is fundamentally wrong since SW-Germany is a primary producer of salt, limestone or sand and gravel, and has the largest fluorite resources of central Europe (Werner 2012; Kimmig et al., 2020). This article provides an overview of the knowledge on metallic and non-metallic raw material resources of SW-Germany with focus on the federal state of Baden-Württemberg. Mining of different commodities has a long tradition since the Neolithic in various places of SW-Germany (Fig 1). Today mining is focused on aggregates and industrial minerals, metal mining has almost stopped. This is largely related to permanent conflicts of land use, a not-in-my-backyard attitude, the political, economic and societal decision to stop metal mining in Germany since the 1980s and the resulting lack of the relevant industry. Furthermore, mineral exploration with modern methods is very weakly developed compared to international standards and restricted to the few localized brown field sites. For example, no modern exploration geophysical data at province-scale, district-scale or prospect-scale is available. This is in spite of significant reserves and resources for industrial minerals and aggregates (fluorite, baryte, anhydrite, gypsum, halite, high-purity limestone, natural stone, sand and gravel; Werner 2012; Kimmig et al., 2020). Moreover, resources are known for silver (Ag), gold (Au), copper (Cu), lithium (Li), zinc (Zn), gallium (Ga), cadmium (Cd),

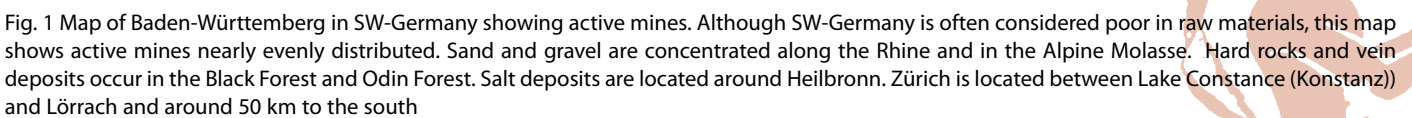
germanium (Ge), antimony (Sb) and thallium (Tl) in vein-type deposits or various other deposit types. Resources of iron (Fe), manganese (Mn), molybdenum (Mo), lead (Pb) and uranium (U) also exist, but they are, to date, not of interest, because of low grades or the political decision to stop nuclear power generation in Germany. Speculative resources exist for tin (Sn), tungsten (W), bismuth (Bi), cobalt (Co), niobium (Nb), tantalum (Ta), rare earth elements (REE), hafnium (Hf), phosphate (P), nickel (Ni) and PGEs (Pt, Ru, Rh, Ir, Os, Pd).

The Upper Rhine Graben with thick Quaternary beds of quartz sand and gravel terraces is a major mining district of SW-Germany, producing 38 Mt every year (Fig 1; Werner 2012; Kimmig et al., 2020). Gravel and sand are exploited in numerous open pits via float dredges by various companies (e.g. Holcim GmbH and Heidelberg Materials; Kimmig et al., 2020). Some of the pits also produce placer gold (Rhine gold) as by-product. Resources and reserves of sand and gravel are confidential, but are the largest in central Europe. Gold resources are not systematically determined.

The Middle Triassic Muschelkalk contains evaporites at 200-300 m depth, which locally host up to 100 m thick halite sequences. They are mined underground in the area of Heilbronn and close to Rotweil by Südwestdeutsche Salzwerke AG and Wacker Chemie AG (Fig 1). Baden-Württemberg alone is the largest producer of rock salt in the EU with 3.2 Mt annually (ISTE, Werner 2012; Kimmig et

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al., 2020). Sulfate rocks (gypsum and anhydrite) form deposits in Keuper and Middle Muschelkalk mainly in the districts Schwarzwald-Baar-Heuberg, Stuttgart, Neckar-Alb und Heilbronn-Franken (Fig 1). They are mainly mined in open pits, but locally also underground. Europe's largest sulfate rock mine is the Obrigheim underground mine of Heidelberg Materials, the former HeidelbergCement (Werner 2012; Kimmig et al., 2020; Fig 1). The mine has been active since 1847 and produces ~300 Tt raw gypsum annually (Heidelberg Materials; Werner 2012; Kimmig et al., 2020). Sulfate rock resources and reserves are confidential or not determined.

Granite and gneiss quarries in the crystalline rocks of the Black Forest and Odin Forest produce raw materials (e.g. grit) for road construction at a large scale by small scale companies (e.g. VSG GmbH & Co Kg; Schotterwerk Blessing, Schotterwerk Schrammberg GmbH). In total 45.1 Mt natural stones are produced per year in Baden-Württemberg. A minor volume (140-150 Tt per year) of dimension stones is additionally produced. Mining of carbonate rocks for the chemical and cement industry, dimension stones and gravel is widespread (~36.6 Mt per year) in the Muschelkalk and Middle to Upper Jurassic rocks throughout SW-Germany by small to large scale producers (e.g. Heidelberg Materials; Lukas Gläser GmbH & Co Kg; Holcim GmbH; Kimmig et al., 2020; Fig 1).

The industrial minerals fluorite and baryte have been mined in the Clara Mine in Oberwolfach (Fig 1), Baden-Württemberg, by Sachtleben Bergbau for 125 years. Between 100 and 130 Tt of ore are mined annually (BMW 2018; Kimmig et al., 2020). The ore is processed 13 km south of the mine in Wolfach by gravity separation and flotation, resulting in high-quality fluorite and baryte products. Silver and copper are produced as by products. The Käfersteige Mine produced 1.96 Mt fluorite and 40 Tt baryte between 1935 and 1996. Measured resources are ~ 5 Mt ore at 50% fluorite and inferred resources are > 10 Mt fluorite (Werner 2012; Kimmig et al. 2020). Production stopped in 1996 because of low fluorite price on the world market. However, world-market prices have at least doubled since then. This deposit hosts the largest fluorite resource in Europe and is one of the largest vein-type deposits globally (Werner 2012). In the Wieden district 1.26 Mt fluorite were produced, indicated resources are 620 Tt ore with 50-70% fluorite and 4-10% baryte (Werner 2012).

More than 1000 unconformity-related hydrothermal veins were mined in the Black Forest and Odin Forest historically for their variable base and precious metal ores (Fig 1). Like the Clara Mine, they often host fluorite and baryte resources. The Schauinsland Deposit hosts 500 Tt indicated fluorite resources. Historically 1.2 Mt fluorite have been produced. From the same deposit also 1.2 Mt of ore at 5.7% Zn, 1% Pb and 10 ppm Ag were produced from 1900-1954. Minimum 0.5-2.0 Mt indicated resources have been left behind in the deposit. Moreover, preliminary studies of trace elements in sphalerite of the hydrothermal veins show interesting contents of Ga, Ge and Cd as possible by-products (Werner 2012).

Hydrothermal veins that contain a U-Bi-Co-Ni-Ag metal assemblage (also considered as 5-element veins) are observed in the Odin Forest and the Central Black Forest (Burisch et al., 2017; Scharrer et al., 2019). The Wittichen mining district in the Central

Black Forest was the largest Co and Ag producer in SW-Germany in the eighteenth century (~125 t Co ore, ~5 t Ag; Metz 1955; Staude et al., 2012 and references therein). Exploration campaigns for cobalt (1935-1959) and uranium (1949-1979) were performed, which comprised 16 inclined drill holes with a total length of 4,600 m to discover potential economic-grade mineralization below the ancient mines with limited success (Werner 2006). The veins are thin (typically less than 50 cm thickness) and not of extensive strike extent.

The Krunkelbach Uranium Mine near Menzenschwand operated between 1962-1990 on a several meter-thick, pitchblende-bearing fluorite-baryte vein (Fig 1). Test-mining during that time produced ~100 Tt ore at 0.72% U (Markl and Wolfsried, 2011). Measured reserves are 227 t and indicated reserves are 2000-4000 t U<sub>3</sub>O<sub>8</sub> (Markl and Wolfsried, 2011). Due to the decreasing interest in nuclear fuels and civil protests against uranium mining in the Black Forest, exploration and exploitation were stopped. Today the mine is recultivated.

Nickel was mined at low scale in the Friedrich August Mine (10 Tt ore) near Horbach and the Todtmoos Mätle Mine during the World War II (Steen 2004; Fig 1). The locally massive pentlandite ores with 12% Ni are bound to ultramafic bodies in the Badenweiler-Lenzkirch Zone. The size of the deposits as well as the distribution and average grades are unknown. There are no geochemical data on platinum group elements, which may yield economic grades in magmatic nickel deposits. Thus, there are speculative resources of Ni, Co and PGE in the southern Black Forest. The genesis of these deposits is unknown. Generally the ultramafic rocks are interpreted as tectonically interleaved slices of ophiolite, but the shape of the mineralization indicates a magmatic intrusion.

REE, P and Nb are enriched in the carbonatites of the Kaiserstuhl (Fig 1), with 2000 g/t Nb, 200 g/t Zr, 3000 g/t REE and 3.5 wt.% P in surface samples (Walter et al. 2018). Highest REE contents of > 1% REE have been reported from 500-1000 m depth. However, no systematic resource data is available. Last mineral exploration was performed in the 1950s for nuclear fuels. Approx. 12 Tt niobium ore was mined in the 1930s at max. 7500 g/t Nb (Wimmenauer 2003). Production continued until 1952, but no data is available for the operation after 1939. Mining stopped because of the extremely low recovery rates of 4.5% during ore processing. However, modern processing technologies have been developed that are now able to treat the pyrochlore ores that also host the Nb resource in the Kaiserstuhl. The Kaiserstuhl is on the other hand a protected habitat and therefore mineral exploration and mining are difficult.

In summary, SW-Germany contains resources of sand and gravel, dimension stones, industrial minerals, base and precious metals. Modern mineral exploration together with new technological approaches for mining and processing may lead to the (re-)discovery of new and old mineral deposits in SW-Germany. In particular in the context of the current geopolitical situation with broken or limited supply chains, domestic raw material exploration and production in SW-Germany need to be reconsidered. Reserves and resources remain largely unquantified, although resources of strategic raw materials (Co, Ge, Li, Ni, PGE, REE) and critical raw materials (baryte, fluorite, Nb, P) as defined in the



EU critical raw materials act are known in SW-Germany. Field trips and presentations during the 17th SGA Biennial Meeting in Zürich, Switzerland will introduce this topic further and discuss geology and resource potential further. We hope to meet many of you during the conference and our field trips.

### References:

- BMWi Bundesministerium für Wirtschaft und Energie (2019) Kommission „Wachstum, Strukturwandel und Beschäftigung“. Abschlussbericht: S. 1–278, Frankfurt a. M. <https://www.bmwi.de/Redaktion/DE/Publikationen>.
- Burisch M, Gerdes A, Walter BF, Neumann U, Fettel M, Markl G (2017) Methane and the origin of five-element veins: Mineralogy, age, fluid inclusion chemistry and ore forming processes in the Odenwald, SW Germany. *Ore Geology Reviews* 81:42–61
- Kimmig B, Köster M, Wittenbrink J, Werner W (2020) Rohstoffbericht Baden-Württemberg 2019. LGRB Informationen 31:196 p
- Markl G, Wolfsried, S (2011) Das Uran von Menzenschwand. Christian Weise Verlag Münschen:143 p
- Metz R (1955) Der Silber–Kobaltbergbau im Wittichener Revier und die Kinzigtäler Blaufarbenwerke. *Alemann Jb* 3:224–262
- Scharrer M, Kreissl S, Markl G (2019) The mineralogical variability of hydrothermal native element-arsenide (five-element) associations and the role of physicochemical and kinetic factors concerning sulfur and arsenic. *Ore Geology Reviews* 113:103025.
- Stade S, Werner W, Mordhorst T, Wemmer K, Jacob DE, Markl G (2012) Multi-stage Ag–Bi–Co–Ni–U and Cu–Bi vein mineralization at Wittichen, Schwarzwald, SW Germany: geological setting, ore mineralogy, and fluid evolution. *Mineralium Deposita* 47:251–276
- Steen H (2004) Geschichte des modernen Bergbaus im Schwarzwald: Eine detaillierte Zusammenstellung der Bergbauaktivitäten von 1890 bis zum Jahr 2000. *BoD–Books on Demand*:485p
- Walter BF, Parsapoor A, Braunger S, Marks MAW, Wenzel T, Martin M, Markl G (2018) Pyrochlore as a monitor for magmatic and hydrothermal processes in carbonatites from the Kaiserstuhl volcanic complex (SW Germany). *Chemical Geology* 498:1–16
- Werner W (2006) Erzprospektion im Revier Wittichen in der Zeit zwischen 1935 und 1979—Ergebnisse und lagerstättengeologische Schlussfolgerungen. *Erzgräber* 20:1–64
- Werner W (2012) Schätze unter dem Boden: Was wissen wir über die tiefliegenden Rohstoffe in Baden-Württemberg? *Berichte der Naturforschenden Gesellschaft zu Freiburg i. Br.* 102:37–92
- Wimmenauer W (2003) Geologische Karte von Baden-Württemberg 1: 25.000 Erläuterungen zum Blatt Kaiserstuhl. Freiburg i. Br.: Geologisches Landesamt Baden-Württemberg

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# News of the Society – Council Meeting

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The hybrid Council Meeting was organized on April 26, 2023 from 9.00 to 17.00 CET in the building of the University of Stockholm by Iain Pitcairn (Chief Editor, SGA website). Twelve Council members were present in person, 8 members joined the meeting virtually and the rest of the Council members sent their apologies.

David Banks (SGA President) and Jan Pašava (SGA ES) welcomed SGA Council and thanked Iain Pitcairn from the University of Stockholm for hosting the meeting and providing hospitality. The SGA President introduced a distinguished guest – Dr. Jennifer Craig, who has been appointed as Executive Director of SEG and participated on-line. After introduction of participating SGA Councilors, a joint discussion confirmed the willingness to revisit ongoing and possibly extend/improve future collaboration between both societies to the benefit of their respective memberships.

## Roll call and Apologies

Present: T. Aiglsperger, D. Banks, G. Beaudoin, S. Decrée, H. Frimmel, D. Holwell, K.D. Kelley, S. Mikulski, J. Pašava, I. Pitcairn, J. Slack, and A. Vymazalová.

Guests: J. Craig (appointed SEG Executive Director for part of the meeting)

Present on-line: C. McCuaig, P. Garofalo, G. Bozkaya, P. Ledru, F. Mbingeneeko, P. Mercier-Langevin, S. Petersen, and N. Saintilan.

Apologies for absence: G. Graham, C. Conde, T. Christie, E. Ferrari, A. Idrus, J. Kolb, B. Lehmann, E. Naumov, B. Orberger, D. Schlatter, Y. Song, and X. Sun.

## 1. Minutes of previous Council meeting (November 30, 2022) – J. Pašava

After checking the actions by the SGA Executive Secretary (with some of the items pending), the minutes were unanimously approved.

## 2. Reports of officers on Council

2.1. Report from President

2.2. Report from Executive

2.3. Report from Treasurer

SGA holds two accounts, one for the day-to-day business of the Society and one for the SGA Educational Fund (SGA-EF). The former account is with Credit Suisse. The SGA-EF account used to be also with Credit Suisse but was moved to PostFinance, also in Switzerland. Following recent major turbulence on international banking sector, it was decided to transfer € 250,000.00 from the SGA account with Credit Suisse to the SGA-EF account with PostFinance in order to reduce the potential risk for our society's money.

2.4. Report from Promotion Manager

2.5. Report from Chief Editor, SGA News

2.6. Report from Chief Editors, MD

2.7. Report from Chief Editor SGA Special Publications

2.8. Report from the Chief Editor SGA website

2.9. Report from the Chairman of the SGA Educational Fund

2.10. to 2.16 - Reports from Regional VPs (Asia - missing, Australia/Oceania – presented on-line by RVP, Europe – presented by D. Holwell, North Africa and Middle East – presented by J. Pašava on behalf of S. Bouhlel, Sub-Saharan Africa – presented on-line by RVP, North America – presented by J. Pašava on behalf of RVP, South America – missing)

Council expects to receive full missing reports at the next Council meeting.

After discussion, Council approved the presented reports with great thanks and suggested the following motions:

DAVID BANKS to inform SEG President about approved draft of MoU between SEG and SGA (members of SGA and SEG can register and attend the events of the other society at the costs advertised for mem-



Fig. 1 Participants of the SGA Hybrid Council Meeting (April 30, 2023 Stockholm, Sweden). Standing from left: Stanislaw Mikulski (SGA VP), Karen Kelley (Chief Editor, Mineralium Deposita, North American Office), Anna Vymazalová (SGA VP for Student Affairs), David Holwell (SGA RVP-Europe), Georges Beaudoin (Council member), David Banks (SGA President) and Iain Pitcairn (Chief Editor, SGA website and host of the meeting). Sitting from left: Sophie Decrée (SGA Promotional Manager), Hartwig Frimmel (SGA Treasurer), John Slack (Chief Editor, Special Publications) and Thomas Aiglsperger (Council member). On-line participating Nicolas Saintilan (Co-Chair, LOC, SGA 2023), Sven Petersen (Council member), Philadelphia Mbingeneeko (SGA RVP-Sub-Saharan Africa), Paolo Garofalo (Council member), Patrick Mercier-Langevin (Council member), Gülcan Bozkaya (Council member) and Patrick Ledru (Council member). Photo taken by Jan Pašava (SGA ES)

bers of the organizing society - applicable to conferences, workshops, short courses and fieldtrips).

SOPHIE DECRÉE to reduce the text of SGA advertising poster for SGA 2023 Meeting (Zürich).

SOPHIE DECRÉE (with help of ANNA VYMAZALOVÁ) to adapt all Roll-ups (used in Quebec) – move info on SGA-Newmont Gold Medal to the top.

ANNA VYMAZALOVÁ to update info on student support from SGA EF (include data from Glasgow 2019 and Rotorua 2022 SGA meetings).

SOPHIE DECRÉE to secure printing of roll-ups and flyers.

IAIN PITCAIRN to ask the SGA (regular members only) who plan to participate in the upcoming SGA Biennial Meeting in Zürich and would be willing to help with evaluation of the best oral/poster presentations. ANNA VYMAZALOVÁ will coordinate assessment process.

SOPHIE DECRÉE to order sufficient number of mugs and safety jackets (in Switzerland) so that they can be given to all SGA members participating in the SGA 2023 Meeting (Zürich). NICOLAS SAINTILAN to secure sufficient space for storing these promotional items and also secure printing and distribution of coupons to conference bags for all participating SGA members.

SOPHIE DECRÉE to send a package of different SGA promotional items to Philadelphia Mbingeneeko who will be organizing the SGA promotion at the 29<sup>th</sup> Colloquium of African Geology (September 26-29, 2023 Windhoek) for which SGA Council approved 250 EUR for an SGA booth.

SOPHIE DECRÉE to ask Springer Representative (Nishita Gajendragadkar nishita.gajendragadkar@springernature.com) to ship a package of MD copies to Zürich (Nicolas Saintilan) and to Windhoek (Philadelphia Mbingeneeko) for SGA promotion.

ALL COUNCIL MEMBERS to provide Jochen Kolb with planned contributions to the upcoming SGA News (53) by April 30, 2023.

IAIN PITCAIRN to advertise Council decision on creating a new category of SGA members who could be exempt from further SGA membership fees provided they have reached a minimum age of 70 years and have been fully paid-up members of SGA for at least 30 years – pending motion.

STANISLAW MIKULSKI to send a revised list of companies (help from CAMPBELL MCCUAIG) that could be potential sponsors of SGA to Council members for their input. Campbell McCuaig to work with Stanislaw Mikulski on defining vision and preparation of letters requesting annual donations to SGA EF. It is important that this activity is well coordinated with efforts by LOCs of future Biennial Meetings.

### 3. The 17<sup>th</sup> SGA Biennial Meeting – update

The report was presented by N. Saintilan on-line. To date, LOC received 335 abstracts and as of April 17, 2023, a total of 51 registrations were received. All authors who submitted abstracts will be notified on their acceptance by May 1, 2023 and corrections and final submissions will be due by May 15, 2023. A detailed discussion resulted in the following motions:

- to plan Council dinner on Wednesday, August 30, 2023 (Jan Pašava to provide expected number of participating Council members);
- to plan for SGA General Assembly to be held on Wednesday, August 30, 2023 from 11,00 to 12,00;
- to reserve larger space for Gala dinner (for at least 250 people);
- to secure invitation of SGA students and Council members to student-industry event;
- to secure two standard 9-m2 booths for SGA and Springer;
- to prepare SGA Proceedings Volumes which must comply with rules of Clarivate Analytics (Jan Pašava to send to Nicolas Saintilan and Cyril Chelle-Michou relevant info on requirements for coverage by WOS);
- to provide updated version of the Conference budget to SGA Treasurer.

Council highly appreciated all efforts by the LOC and approved presented report with great thanks.

### 4. The 18<sup>th</sup> SGA Biennial Meeting – update

The report was presented by K. Kelly. The 18th SGA Biennial Meeting will be held on the Colorado School of Mines (CSM) campus in Golden, Colorado, USA, from August 3-7, 2025. The first LOC meeting

took place in February, 2023. Consensus was derived for the following decisions: lunch will be provided on-site each day of the conference, assuming the budget will allow; face to face conference will be offered only (no virtual); and only standard SGA abstracts (with wording of “up to 4 pages”) will be accepted. The Mt. Vernon Canyon Club was voted as the Gala dinner venue and it has been tentatively reserved.

The LOC is preparing to do the following by the time of the 2023 Conference in Zürich:

1. The SGA2025 circular will be available to hand out at the SGA booth in Zürich, and will be available on-line;
2. The conference website for SGA2025 will be in operation immediately after the SGA2023 conference;
3. K. Kelley will give short presentation at the SGA2023 Conference during the Closing Ceremony, with information about the 18th SGA Biennial Meeting;
4. K. Kelley will prepare a report (submit flyer) about the upcoming Conference to go into SGA News (to appear in the January 2024 issue).

Council highly appreciated all efforts by the LOC and approved presented report with great thanks.

### 5. The report from the Chairman of the Award Committee

The report was presented by I. Pitcairn (Chairman of the Award Committee). The deadline for the nominations for the SGA awards 2023 passed on the 31st March 2023. We received an excellent set of nominations for all of our awards. The complete nominations were distributed to the council via a file link.

Council voted via secret vote, sending an email to both Jan Pašava (jan.pasava@geology.cz) and Iain Pitcairn (iain.pitcairn@geo.su.se) listing chosen candidates for 1) the SGA-Newmont Gold Medal 2023, 2) The SGA-KGHM Krol Medal 2023, and 3) the SGA Young Scientist Award 2023. The Award for the best paper in MD was submitted by Chief Editors, MD for Council approval. The deadline for votes for all SGA awards was midnight on Monday 24th April 2023. Based on calculated votes, four recipients were recommended for the SGA Awards 2023 (they will be officially

announced in due time).

Council highly appreciated all efforts by the Award Committee and after discussion decided that future selection process should be via secret ballot before particular Council meetings and that Award for the Best paper in MD will stay independent of Council approval (the best paper in MD will be selected only by the Chief Editors in collaboration with MD Editorial Board). Hartwig Frimmel provided a brief update on the situation regarding the future of the SGA Gold Medal which has to be newly designed.

#### ACTIONS:

DAVID BANKS to inform all awardees (including Best Paper in MD) and ask nominating persons for brief citations (up to 5 minutes) and awardees for their replies (up to 5 minutes), which will be presented at the Opening Ceremony of the SGA 2023.

HARTWIG FRIMMEL to provide an update on proposed layout for the new SGA Gold Medal at the next possible opportunity.

HARTWIG FRIMMEL to ask nominating person for a text for certificate for SGA-Newmont Gold Medal and prepare a complete set for presentation of the medal.

BERND LEHMANN to prepare a certificate and cheque for presentation of the MD Best Paper Award.

### 6. The report from the Chairman of the Nominating Committee

The report was presented by Sven Petersen (Chairman of the Nominating Committee). All nominated officers eligible

for re-election confirmed their interest to continue except of the Chief Editor, SGA News. Three new Council members and persons for the position of SGA President, Vice-President, RVP-Asia, RVP-North Africa and Middle East and RVP-South America were nominated whereas RVP-North America is still open.

Council highly appreciated all efforts by the Nominating Committee and accepted report with great thanks.

#### ACTIONS:

KAREN KELLEY, JOHN SLACK, GEORGES BEAUDOIN, PATRIC MERCIER-LANGEVIN to help the Nominating Committee to find the most suitable candidate to become a new RVP-North America.

SVEN PETERSEN to finalize the list of nominating officers and inform SGA Council by the end of May, 2023.

### 7. Annual report on membership drive

The report was presented by Sophie Decrée. Since April 2022, SGA has got new student members (265 in total), mainly thanks to the promotion made by the Chapters in Colombia, Czech Republic, France, Peru, Spain and Turkey, and for new Chapter in Germany and Kazakhstan. Number of regular members with electronic access to Mineralium Deposita is increasing with decreasing number of regular members subscribing to the print version. After discussion, Council approved presented report with great thanks.

Chapter name	Approved budget for 2023 (EUR)
Baltic	1000
Barcelona/SEG	0
Black Forest-Alpine	1500
Colombia-Bogota/SEG	2100
Colombia-Bucaramanga	3500
Cordoba - Argentina	650
Laval	0
Moscow	0
Nancy	1000
North-West Russia	0
Peru	1000
Prague	3500
Senegal	500
Siberia	0
Turkey	0
United Kingdom	0
UWA-Australia/SEG	500
Kazakhstan	1000
Erlangen	1000
Total	17250

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## 8. Status of development of SGA Student and Young Scientist network

The report was presented by Anna Vymazalová. In 2023, SGA has 24 chapters and there are two requests to create new ones (Kazakhstan and Erlangen). However, neither reports nor a list of members were received from Berlin, Brazil, Ivory Coast, La Plata, Urals, Cameroon and Namibia chapters. Only the student chapters in Brazil and Urals provided information on no activities (others have not sent anything even after several reminders). It was suggested that we list in SGA News and on Society website only those chapters that sent their reports (17 + 2 new). The most active groups are in South America, in particular the Colombian groups. In Europe, Prague and Baltic chapters have the most activities. Other groups possibly have still some problems to recover from restricted activities during Covid-19. It was suggested to approve both application forms for creating new SGA Chapters in Kazakhstan and Erlangen with initial budget of 1000 EUR.

Student program – 17<sup>th</sup> SGA Biennial Meeting in Zürich, 2023

In total, 92 applications were received for travel grant from the following countries (in total from 31 countries): Argentina (1), Australia (12), Austria (2), Brazil (2), Bulgaria (1), Canada (9), Colombia (8), Côte d'Ivoire (1), Germany (3), France (3), Georgia (2), Greece (1), India (1), Ireland (2), Italy (3), Mexico (1), Morocco (5), Myanmar (1), Nigeria (1), Mauretania (1), Peru (3), Poland (5), Russia (1), Serbia (1), Slovakia (1), South Africa (7), Spain (3), Sweden (3),

Switzerland (4), Ukraine/France (1), UK (1), and Uzbekistan (2).

There are 26 applications for free field trips and 27 applications for free short courses.

After discussion, Council approved presented report and suggested budgets for SGA Chapters with great thanks.

Actions:

ANNA VYMAZALOVÁ to inform representatives of both Kazakhstan and Erlangen chapters on their approval and initial budgets (each 1000 EUR) and also all other representatives of SGA Chapters on approved budgets for 2023.

## 9. Requests for sponsorship

No requests were received.

## 10. Any other business

SGA Mobility Grant – update (T. Aiglsperger)

The update was given by Thomas Aiglsperger. Three applications are expected to be submitted in the near future and a list of participating labs needs to be displayed at the SGA website. After discussion Council approved presented report with great thanks and recommended to highlight at the website that this grant is primarily in support of regular members who can document record of student membership for at least 2 years and regular membership for at least one year. Possible combination of limited funding of analytical works within the SGA Mobility grant was also discussed.

Action:

THOMAS AIGLSPERGER and DAVID BANKS to prepare a proposal for adapted SGA Mobility

Grant which would include limited funding of analytical work for the next Council meeting.

- Limited funding of analytical work for the final year of BSc honours and MSc students (D. Banks)

This item was introduced by David Banks and was discussed within the previous item – SGA Mobility Grant.

## 11. Date and place of the next SGA Council meeting

August 28, 2023 from 9.00 to 16.00 in Zürich, precise venue to be announced in due time.

## 12. Informative list of past activities

- Virtual seminar on “Can Africa reach net C-neutrality by 2050?” (Third week in September and November 23, 2022) – B. Orberger et al.
- Mineral Deposits Studies Group, 44th Annual Winter Meeting (January 4-6, 2023 Leicester UK) – SGA sponsored (Holwell et al.)

## 13. Informative list of future activities

- The 13<sup>th</sup> International Congress of Prospectors and Explorers 2023 (May 8-10, 2023 Lima, Peru) – SGA sponsored - providing one-year SGA membership and the registration to the 17<sup>th</sup> SGA Biennial Meeting to the best student presentation
- GAC/MAC/SGA meeting (May 24-27, 2023 Sudbury, Ontario, Canada) – Leshner et al. – G. Graham and S. Perroudy SGA links – SGA booth



SGA Mobility Grant

# Open for Application The SGA Mobility Grant

Get ready for SGA networking! Do you know about a SGA member who runs a laboratory that could answer open questions of your research? Then the SGA Mobility Grant can help to bring you together! The SGA Mobility Grant offers an opportunity for regular SGA members to apply for money to travel to a facility with SGA background.

Applicants have to be in good standing for at least 3 continuous years (i.e. paid up membership fees; up to 2 years of student membership count) and apply by sending their request following a template to the SGA Mobility Grant coordinator (thomas.aiglsperger@ltu.se).

The application template is available at <https://e-sga.org/home/>.

**Learning and sharing! That's the spirit of the SGA Mobility Grant.**



- III. Symposium on Precambrian geology and metallogeny (May 25 to 29, 2020 in San Ignacio de Velasco, Bolivia) – USD 2,500 approved by SGA Council to support SGA keynote speakers – postponed
- International Platinum Symposium (July 4-7, 2023 Cardiff, UK) – SGA sponsored
- Goldschmidt 2023 (July 9-14 Lyon, France) – MoU with EAG
- Inaugural SGA Field Conference Mount Isa and Cloncurry, Queensland (20-24 July 2023) – D. Huston and V. Lisitsin
- 17<sup>th</sup> SGA Biennial Meeting (August 28-September 1, 2023 Zürich, Switzerland) – N. Saintilan, Cyril Chelle-

Michou et al.

- IAEG 50 Meeting (September 8-10, 2023 Galway Bay Hotel, Galway County, Ireland) – D. Banks et al - SGA keynote presentation by S. Decré

Actions:

SOPHIE DECREÉE to prepare 1-page advertisement of SGA for IAEG 50 Meeting to be sent to Collin Andrew.

- SGA-UNESCO-IUGS-SEG Short Course on African Metallogeny (October 8-13, 2023 Johannesburg, CIMERA South Africa) – B. Orberger/F. Mbingeneeko et al.

This item was introduced by Jan Pašava who greatly appreciated all efforts by Beate Orberger and her team and emphasized the importance of this very suc-

cessful geo-educational event. Filadelfia Mbingeneeko (RVP-Sub-Saharan Africa) gave a short overview on the preparation of this well deserving activity in 2023, which is organized under financial sponsorship of UNESCO and IUGS and in collaboration with other societies.

Action:

BEATE ORBERGER to provide updated budget on the planned 2023 course to SGA Treasurer when available.

## Invitation to the SGA General Assembly (Zürich, August 30, 2023 from 11.00 to 12.00)

Jan Pašava<sup>1</sup> (SGA Executive Secretary)

<sup>1</sup>Czech Geological Survey, Geologická 6, 152 00 Praha 5, Czech Republic, jan.pasava@geology.cz

The SGA General Assembly will be held on August 30 (Wednesday), 2023 between 11.00 and 12.00 during the 17<sup>th</sup> SGA Biennial Meeting in Zurich (Switzerland). The suggested program is as follows:

1. Report of the President (D. Banks)
2. Report of the Treasurer (H. Frimmel)
3. Report on activities of SGA Chapters (Representatives of Chapters)
4. Other business

Welcome all SGA members at this important Society event!



# REPORTS FROM THE SGA STUDENT CHAPTERS

SGA chapter	President	E-mail	Foundation
Prague	Jiří Klepp	kleppj@natur.cuni.cz	2002
Baltic	Adam Tomczak	tomczakadam88@gmail.com	2009
Siberia	Anna Deviatiiarova	SiberianChapter@yandex.ru	2011
Barcelona	Alejandro Guevara	jandro.guevara.ub@gmail.com	2012
Colombia-Bucaramanga	Angie Paola Uribe García	angieuribe.g@gmail.com	2012
Nancy	Rocher Océane	oceane.rocher@univ-lorraine.fr	2013
Peru	Medaly Pamela Vicuna Guerra	medaly.vicuna.g@uni.pe	2013
Colombia-Bogota	Juan David Palma Montealegre	jupalmam@unal.edu.co	2015
Laval	Rita Rodrigues	ulavalinrs@gmail.com	2016
North-West Russia	Evgenia Borisova	jenyaborisova98@gmail.com	2017
Turkey	Fatih Ozbas	fatih.ozbas@istanbul.edu.tr	2017
Black Forest-Alpine	Simon Hector	Simon.Hector@kit.edu	2017
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Moscow	Maria Komarova	ivanchenko.marija@gmail.com	2019
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UWA-Australia	Jerry Dunga	jerry.dunga@research.uwa.edu.au	2021
Cordoba - Argentina	Delgado Richard Gregorio Nicolás	gregorio.delgado.richard@mi.unc.edu.ar	2021
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Erlangen	Frederik Börner	frederik.boerner@fau.de	2023



# Resources of the oceanic crust – story of a successful meeting

S. Hector<sup>1,2</sup> and K. Perthenová<sup>3</sup>

<sup>1</sup>President of the Black Forest Alpine SGA Chapter

<sup>2</sup>Institute of Applied Geosciences, Chair of Geochemistry and Economic Geology, Karlsruhe Institute of Technology, 76131 Karlsruhe, Germany

<sup>3</sup>Vice-President of the Prague SGA Chapter

It is time! After three years where meetings and seminars were mostly held online, we are glad to present you the report of our last seminar: “Resources of the oceanic crust”, which was held at the Karlsruhe Institute of Technology (KIT) in Karlsruhe, Germany the 27-28th March 2023. The origin of this seminar comes from an idea of members of the Black Forest Alpine SGA Chapter and a will to take advantage of the geographical setting of Karlsruhe to organize an international seminar. To our greatest pleasure, we gathered 35 participants from more than 10 nationalities, with a total of 11 speakers from the KIT, University of Strasbourg, University of Bern, University of Grenada and Helvetica Exploration Services GmbH (Fig. 1). The Prague SGA Chapter sent 8 bachelor and master students to attend the seminar, their help to set up the seminar room was very much welcome. Prof. Gianreto Manatschal and Prof. Larryn Diamond kindly agreed to give keynote lectures in order to introduce the following sessions. The seminar was divided into 4 sessions, 3 dedicated to the oceanic crust, its minerals resources and important magmatic-hydrothermal processes, and an additional session: 1) Ultramafic setting and associated mineralization, 2) Mafic oceanic crust, 3) Felsic environments, 4) More ore, more fun! (Tab. 1).

The first session started with a comprehensive keynote lecture about hydrothermal fluids, mass transfer and mineralization in rift systems from a tectonic point of view from Prof. Gianreto Manatschal. This lecture focused on the oceanic crust - continental crust transition, onset of mantle exhumation, control of hydrothermal circulation and related mineralization. The keynote was a perfect introduction for the following presentations, which focused on more specific aspects of the ultramafic oceanic crust. Several talks addressed volcanogenic massive sulfides (VMS) hosted in ultramafic rock, which are one of the “hot-topics”



Fig. 1 Group picture of the seminar participant

in ore geology now. Dr. Rémi Coltat presented a recent review paper where ultramafic-hosted VMS are re-evaluated and explained the diversity of their geological setting along detachment faults in oceanic core complexes. Following talks presented ultramafic-hosted VMS in the Liguria ophiolite (Italy), the Platta Nappe (Switzerland) and on the MARK area of the Atlantic mid-oceanic ridge. Additional talks focused on magmatic and hydrothermal processes in the ultramafic oceanic crust, which are critical to understand ore deposit formation. For a touch of exoticism, Dr. Marc Ulrich presented the processes leading to H<sub>2</sub> formation during serpentinization and potential industrial application. The session was followed by a discussion-rich poster session before a nice evening at the Oxford Pub to conclude the day.

The second day was divided into 3 shorter sessions. The first one on the mafic oceanic crust, started with a keynote from Prof. Larryn Diamond presenting the Se-mail ophiolite (Oman). He presented the cartography and the use of ASTER satellite imagery, the VMS deposits and their relationship to regional-scale hydrothermal alteration. It was followed by a presen-

tation by M.Sc. Robin Wolf presenting a new method for determining an alteration index of altered mafic oceanic crust. The second session was related to VMS deposits in felsic arc environments and metal transfer mechanisms. M.Sc. Simon Hector presented the mineralization of the Kolumbo volcano (Greece) and the role of a magmatic input. Dr. Clifford Patten presented how metals are transferred from a magma to a hydrothermal system by formation of magmatic sulfide-volatile complexes and evidences from the Kolumbo and Nea Kameni volcanoes (Greece). The last session was an opportunity to explore other types of deposits and travel to a bit colder place, Greenland! Dr. Denis Schlatter and M.Sc. Michael Eigler introduced us to Zn-Pb deposits of northern and western Greenland, revealing us the geological potential of this underexplored part of the world. A second poster session concluded this seminar for a last round of discussion. We would like to thank every participant for coming to Karlsruhe to share their work and the rich exchange that followed. It was a great pleasure to have you all here and we look forward to see you all again!



Tab. 1 Program of the seminar

27/03/2023  Ultramafic setting and associated mineralizations	10:30 - 10:45	Introduction	
	10:45 - 11:30	Prof. Gianreto Manatschal	Keynote : Hydrothermal fluids, mass transfer and mineralisation in rift systems
	11:30 - 12:00	Dr. Rémi Coltat	Ultramafic-hosted VMS deposits: an overlooked sub-class of VMS deposit forming in complex tectonic environments
	12:00 - 13:30	Lunch Break and Coffee	
	13:30 - 14:00	M.Sc Mélanie Ballay	Partial melting and mantle-melts interactions at the Diamantina zone: insights on the mantle evolution during lithospheric break-up
	14:00 - 14:30	Dr. Rémi Coltat	Origin of Fe-Ca metasomatism at oceanic core complexes: implications for the formation of seafloor massive sulphide deposits (MARK area)
	14:30 - 15:00	Dr. Flora Hochscheid	The Sr isotope geochemistry of oceanic ultramafic-hosted mineralizations
	15:00 - 15:30	Coffee Break	
	15:30 - 16:00	Dr. Marc Ulrich	Natural H <sub>2</sub> production: What can be learned from serpentinization processes?
	16:00 - 16:30	Dr. Clifford Patten	Overview of ultramafic-hosted volcanogenic massive sulfide deposits from the Liguria ophiolites, Italy
	16:30 - 18:00	Poster Session	
	18:30	Social meeting in a local pub	
28/03/2023 Mafic oceanic crust	9:00 - 9:45	Prof. Larryn Diamond	Keynote : VMS deposits in the Semail ophiolite and their relationships to regional-scale alteration
	9:45 - 10:15	M.Sc Robin Wolf	Determination of an alteration index for hydrothermally altered rocks by combining petrography, microprobe analyses and quantitative XRD
	10:15 - 10:45	Coffee Break	
Felsic environment	10:45 - 11:30	M.Sc Simon Hector	Magmatic metal contribution to volcanic arc seafloor massive sulfides: case study of the Kolumbo volcano
	11:30 - 12:00	Dr. Clifford Patten	Sulfur and chalcophile metal transfer via sulfide-volatile compound drops during magma mixing: evidence from the CSK volcanic field
	12:00 - 13:30	Lunch Break and Coffee	
More ore, more fun !	13:30 - 14:00	Dr. Denis Schlatter	The giant Citronen Zn-Pb deposit in North Greenland (83.08605 N) and preliminary geological data from the High Arctic Zn-Pb belt
	14:00 - 14:30	M.Sc. Michael Eigler	Mechanism of Paleoproterozoic hydrothermal Zn-Pb-Ag-rare metals mineralization at Black Angel and Kangerluarsuk, West Greenland
	15:00 - 17:00	Poster Session	


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# Field Trip to the Kaiserstuhl Volcanic Complex

M. Eigler<sup>1</sup>

<sup>1</sup>Black Forest Alpine SGA student chapter, Karlsruhe Institute of Technology

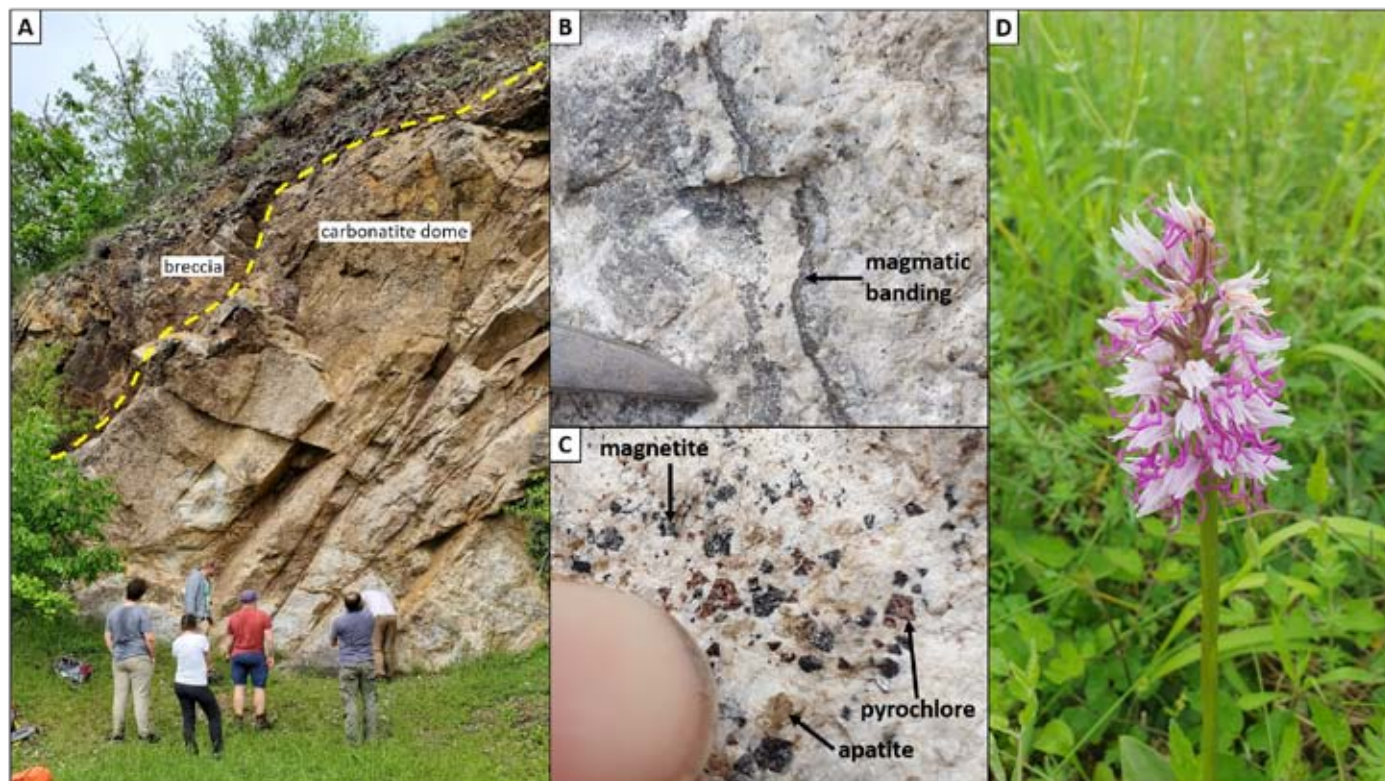


Fig. 1 A) Dome-shaped carbonatite intrusion with surrounding breccia exposed at Ohrberg quarry, central Kaiserstuhl. B) Magmatic banding traced by magnetite and following the doming, Ohrberg Quarry. C) Euhedral, red-brown pyrochlore with apatite and magnetite in the calcitic carbonatite at Ohrberg quarry, Dr. Benjamin Walter index finger for scale. D) Rare monkey orchid (*Orchis simia*) growing on calcium-rich soil of Ohrberg quarry

To celebrate the comeback of Spring, the Black Forest Alpine SGA student chapter organized a field visit to the Kaiserstuhl Volcanic Complex in the southern Upper Rhine Graben, Germany. The trip to this warm and sunny winegrowing region with its abundance of peculiar volcanic and intrusive rocks was led by Dr. Benjamin Walter (KIT) for an international audience of PhD students from the Karlsruhe Institute of Technology (Germany), University of Strasbourg, University of Rennes (France) and University of Torino (Italy). The excursion was focused on the world-famous carbonatites in the centre of a Miocene volcano and their associated REE mineralization. The carbonatites were tested in the 1930s for niobium and later for uranium, but the mineralization was ultimately not economic. Nevertheless, the old quarries gave us the perfect opportunity to study the processes of carbonatite melt emplacement and the impact

of xenoliths on REE fertility (Fig. 1-A). We observed how extremely saline brines exsolving from a rising carbonatite melt created a path for the melt as it fractures the wall rock by boiling. With rapid successive fluid boiling events, the carbonatite melt can thus quickly 'jackhammer' its own path through the crust, eventually reaching the surface and forming a carbonatite volcano. In the Ohrberg quarry, we observed a dome-shaped, subvolcanic carbonatite body hosting pyrochlore and apatite REE ore (Fig. 1-B and C). The REE-enrichment is linked to the absence of xenoliths. Assimilation of xenoliths by a carbonatitic melt removes REEs from the system. The absence of xenoliths is thus crucial for REE mineralization and is an important exploration indicator for REEs in carbonatite complexes. In the western part of the volcanic complex, we were able to catch a glimpse of some of the rarest rocks on the planet: carbonatite lava flows and carbon-

atite lapilli tuffs. The carbonatite intrusions and their extrusive equivalents are hosted by a tephritic stratovolcano complex, that formed on an older shield volcano of basanitic composition. Together with foid-monzogabbro, phonolite and foid-syenite dykes, the igneous rocks of the Kaiserstuhl form a nice bundle of strongly alkaline and silica-undersaturated rocks. The geology of the Kaiserstuhl is further complicated by subsequent graben tectonics of the Upper Rhine Graben. The fertile volcanic soil gave rise to an assemblage of rare endemic flora in this outpost of Mediterranean climate in southern Germany. Especially the flower enthusiasts among us were excited to spot rare and colorful orchids, German iris and white campion (Fig. 1-D).

# Sampling for thermochronology in a skarn-type deposit and in a phosphorous and REE prospect: short course and field trip report

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During the year 2022, the SGA Bogotá Chapter has been hard at work on various activities and has demonstrated its passion for geology. As part of its annual routine, a short course on thermochronology has been given, with the collaboration of international guests, followed by a field trip to two geological localities with economic potential in the department of Tolima.

The course, entitled "Interpretation of geochronological data and use of the QTQt software", was held on 5, 6 and 7 October and was given by professors Dr. Marc Poujol, Dr. Kerry Gallagher (author of the software) and Dr. Nathan Cogné of the University of Rennes. SGA Bogota formed a logistics committee to support the organisation of the course, which aimed to improve the skills of students, researchers and geoscience-related professionals in the management of geoscience data in the public and/or private sector, through practical exercises using real data and the QTQt software. In addition, the course is expected to deepen cooperation between professionals from different areas of expertise in data management and interpretation.

Topics covered in the course include: in-

troduction to thermochronology, double dating in apatite U/Pb and fission tracks, processing and interpretation of results, thermal modelling, introduction to QTQt software and U/Pb geochronological systems. A meeting was held between the professors of the University of Rennes and the directors of the Geosciences Department of the National University of Colombia to establish cooperation and academic

alliance that will benefit undergraduate and postgraduate students (Fig 1).

The course was initiated by geologists from the Colombian Geological Survey, Dr. Amed Bonilla and Dr. José Franco, both former members of the SGA. It was organised by the Grupo de Estudios en Geología Económica y Mineralogía Aplicada (GEGEMA) and the SGA team.

On the first day of our trip, we set off from Bogotá to visit the old copper mine of Río Frío (4.295129, -75.125209), located near the small mining town of Payandé in the department of Tolima. Payandé lies on the eastern flank of the central mountain range and has a diverse and beautiful geology. The Grenvillian basement is covered by Triassic marine limestones of the Payandé Formation. These successions are intruded by an apophysis of the Ibagué Batholith (Jurassic) of quartz dioritic-tonalitic composition, known as the Payandé Stock. The magmatic activity that penetrates the calcareous rocks generated a Cu skarn-type mineralised body, composed of iron oxides such as magnetite and specularite, sulfides such as chalcopyrite and bornite, secondary carbonates such as malachite and azurite, and gangue minerals such as garnet,



Fig. 2 Mineralised samples showing the mineralogical zonation in the Payandé skarn



Fig. 1 Organizers, speakers and participants of the thermochronology course





Fig. 3 Mineralised sample with wollastonite, garnet, chalcopyrite and malachite (exoskarn)



Fig. 4 Members of the field trip to the former Río Frío mine. Photo by: Jonathan Hernández



Fig. 5 The landscape of Quebrada Talora near Piedras, Tolima. Photo by: Juan Felipe Correa

calcite, chlorite, wollastonite, quartz, epidote and actinolite (Figs 2 and 3).

During our visit, the SGA team collected samples showing particular characteristics, chamosite as evidence of the retrograde stage of mineralisation, the colour variation of the garnets (green in the vicinity of marble and red in the vicinity of the intrusive body), the appearance of mushketovite as a product of the pseudomorphic substitution of specularite and, the marked zoning and substitution of garnet by magnetite. Professors Dr. Marc and Dr. Nathan collected samples of large garnet for geochronology in their laboratory in France. The group was able to learn about the spatial and temporal zonation of a skarn deposit and observe its mineralogy (Fig 4).

On the second day of our expedition, we left the Municipality of Piedras in Tolima, heading east in search of the Quebrada Talora (4.535152, -74.845699), a beautiful stream that crosses Upper Cretaceous rock formations, such as the Upper Lidita Formation (Fig 5). Our objective was to collect phosphorite samples from this stratigraphic interval and measure their radiation. These samples were identified as benthic foraminiferal packstone with high phosphatisation and radiation counts up to 0.581  $\mu\text{Sv/h}$  (Fig 6). Subsequently, we took the samples to the laboratory to prepare thin sections, analyse their geochemical composition by XRF and examine their mineralogy by XRD. The results of this research will be presented in two papers at the 17<sup>th</sup> Biennial Meeting in Zurich exposing up to 800 ppm in rare earth elements and yttrium. Quebrada Talora is located in a tropical rainforest and offers a highly didactic section for the study of stratigraphy, sedimentology, palaeontology and biology: quite a setting for science.

On the third day of our trip, we visited the ruins of the Municipality of Armero (4.962007, -74.902624). On the night of 13 November 1985, an eruption of the Nevado del Ruiz volcano triggered a highly viscous mudflow that destroyed practically the entire town of Armero and devastated a large rural area on both sides of the old and present riverbeds of the Lagunilla river and the Santo Domingo stream. According to official estimates, the event caused between 22,800 and 25,000 deaths and 4,250 to 5,000 injuries, while between 7,100 and 9,000 unharmed survivors were left homeless.



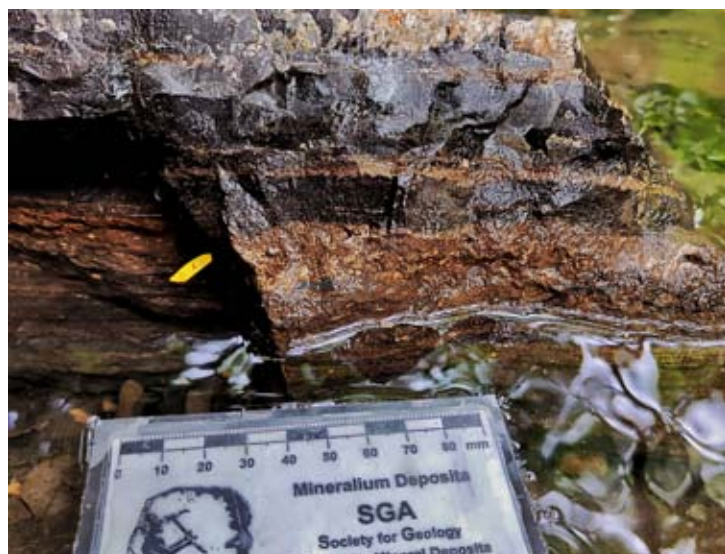


Fig. 6 Intercalations of phosphorite (beige) and silicified mudstone (black)



Fig. 7 Aerial photograph taken on 20 November 1985. Camila Martínez, passionate about volcanoes and glaciers, explaining the geology behind the Armero tragedy

During our visit, the group discussed the nature and dimensions of the geological phenomenon that caused this tragedy as well as the social implications left in its wake. This volcanic disaster, considered the fourth worst in the history of mankind, could have been avoided if the Colombian state had listened to the scientists' warnings. The Armero tragedy is a lesson that marked the beginning of systematic investigations of volcanic hazards in Colombia and left a task that is still pending: geologists have the responsibility to make their work visible and disseminate it to the communities, people need to be able to appropriate scientific knowledge, the more science belongs to all of us, the safer we are (Fig 7).

# SGA News

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# SGA UIS-Bucaramanga Colombia 10<sup>th</sup> anniversary

Angie Uribe<sup>1</sup>, Rafael Comas<sup>1</sup>, Camilo Gutierrez<sup>1</sup>, Ana Mantilla<sup>1</sup>, Luis Paez<sup>2</sup>

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The SGA UIS-Bucaramanga Colombia during 2022 celebrates its 10<sup>th</sup> anniversary. In honor of the 10 years of the founding of the chapter, the board of directors of the chapter held the following events.

## Field Trips

During 2022 the student chapter organized field trips to different mineral provinces along the Colombian territory, visiting two of the major world class deposits in the country, the Western Emerald Belt (WEB) and the Salt Cathedral of Zipaquirá / from March 18 to 21, 2022. Twenty members participated in this field trip. Three emerald mines were visited near Peñas Blancas in Boyacá (Fig 1). The visit was led by different mine geologist in each mine, where formation of the emerald deposit was explained in detail. One of the key facts is the hydrothermal alteration of sedimentary cretaceous sequences. Hydrothermal breccias called "Cascoche" are a good pathfinder for emerald. During the visit of the Salt Cathedral, the students were able to identify folded evaporitic sequences that suffered different stages of deformation. This is a place where geology, architecture, art and religious culture coexist.

Vetas and California Mining District / June 11, 2022.

Thirty members participated in the field trip. Formalization of small-scale mining in Colombia has been identified by large-scale companies as an alternative to coexist with artisanal small miners (Fig 2). The student members had the opportunity to visit one of the small Au mines in the Vetas and California Mining District, where they see different textures and complex structural arrays that control the low to intermediate sulfidation epithermal veins (Fig 3). The formalization of small mining following international occu-



Fig. 1 Western Emerald Belt (WEB) and Salt Cathedral of Zipaquirá field trip / From March 18 to 21 March 2022



Fig. 2 Vetas and California Mining district field trip / June 11<sup>th</sup>, 2022

pation, health and safety procedures allows positive development in the region.

Bucaramanga-Pamplona-Silos Road reconnaissance field trip / From July 5 to 6,

2022.

Five members participated in the reconnaissance field trip to the Pamplona – Silos area. The student members were able to identify a variety of sedimentary, igneous and metamorphic rocks that host mineral occurrences (Fig 4). Outcrops with the presence of coal associated with Cretaceous sedimentary sequences were visited as well as outcrops with quartz + kyanite hydrothermal veins associated with metapelitic rocks of Silgará Schists. This is a place with fault-related rocks, where the students have the chance to practice their knowledge in structural geology, measuring lineaments, fold hinges, axial planes and identifying different deformation events.

Middle Cauca Metallogenetic Belt / From September 2 to 30, 2022.

Sixteen members participated in this field trip. The Middle Cauca Belt in west-central Colombia contains several porphyries, low to intermediate sulfidation epithermal and intrusion-related Au deposits.

The students had the opportunity to visit two of the most important gold and copper projects in the country, Gramalote (Au) and Quebradona (Cu-Au-Mo) (Fig 5). Gra-





Fig. 3 Host rock, alteration and veins at Trompetero Mine, Vetás



Fig. 4 Bucaramanga-Pamplona-Silos Road reconnaissance field trip / From July 5 to July 6, 2022



Fig. 5 Visit to the Gramalote and Quebradona projects

malote, is classified as an intrusion-related gold deposit, structurally controlled, and hosted in tonalite and granodiorite of the Antioquia Batholith. Field stations were made in outcrops of the Antioquia Batholith (Fig 6). The Minera de Cobre Quebradona project is the most important Cu project in the country. The students have the opportunity of being in touch with cores and identify the different ore and alteration minerals. Also, the students could be in touch with geologist from B2gold and Anglo Gold Ashanti increasing they network.

El Vapor Mining District / From November 25 to 27, 2022.

Twenty members participated in the reconnaissance field trip. A 3-day field trip along the El Vapor Mining district, which hosts one of the most prolific intrusion-related Au vein systems in the Antioquia Batholith, with different field stations in the host rocks and Au quartz veins (Fig 7). The students also identified the geomorphological evidence of the Palestina fault. This was an amazing opportunity to practice structural geology knowledge applied in a mine, where students realized the importance of mine geologists in artisanal mine operations. In addition, the metallogeny of the district, social problems in the area and their influence on mining, and an ancestral activity in this sector were discussed.



Fig. 6 Field stations along the middle Cauca metallogenetic belt  
**Activities during 2022**

Our student chapter cooperates with the SEG (Society of Economic Geologist), AAPG (American Association of Petroleum Geologist) and the SEG (Society of Exploration Geophysicists) student chapters of the Industrial University of Santander (UIS) in the First Energetic Congress. The SGA-UIS chapter had the opportunity to show parts of our collection of geologi-





Fig. 7 El Vapor Mining District field trip / From November 25 to November 27, 2022



Fig. 8 Mineral identification courses using the SGA-Bucaramanga student chapter collection

cal and mineral samples, talk about our short courses, workshops and field trips. Mineralogy identification courses (Fig 8) were done for all our active members. During these short courses, the last year students guide the first-year members in

mineral identification in hand specimens. The SGA-UIS chapter currently has more than 120 mineral and rock samples with different kinds of alteration and ore minerals that have been donated or have been collected during the field trips.

### Short courses and workshops

Python short course applied to geosciences (May 31): The use of computer tools to search new exploration targets has increased over the years, this is why it is extremely important to train chapter members in specialized programs and programming languages such as Python, which allow the development of new methodologies for the mining industry. In the Python course, algorithms were developed to classify rocks, create ternary diagrams, among others.

The use of geological compass (June 17): Our members had the opportunity to collect structural measurements using the Brunton Geo, Brunton Axis Pocket Transit 0-360 and Silva compasses in the field.

Epithermal systems workshop (August 17): Two of our last year members talk about high, intermediate and low sulfidation epithermal deposits using hand samples collected during their undergraduate thesis, the members were able to identify textures, mineral assemblages and alteration patterns.

Geophoto competition (December 16): This contest was carried out virtually to promote geosciences through photographs of outcrops, landscapes and rock samples of geological interest allowing members to share knowledge of minerals and basic geosciences.

Metamorphic rocks workshop (December 16): Using hand samples, members were able to identify deformation patterns in polymetamorphic terranes and describe samples using international nomenclatures (Fig 9).

### National and International Speakers

Having learned from the Covid 19 situation, virtual conferences and short courses became a powerful tool, allowing our members to be in contact with national and international economic geologist. Some of the short courses and conferences were:

Lecture series: Let's talk about volcanoes.

The first two talks of 2022 were "Volcanology and Volcanoes in Colombia" and "Monogenetic Volcanoes", the first talk was given by Maria Luisa Monsalve who is the coordinator of the Volcanic Group of the Colombian Geological Survey (SGC) and the second talk was given by Ph.D. Hugo Murcia, professor of the department of geosciences of the University of Caldas (Fig 10).

Ore deposits series.

We had the conference "Exploration-porphyry type mineralization" given by MSc. Timoleón Garzón Guzmán, exploration geologists with an admirable career in economic geology in the country, with great discoveries such as La Colosa and Nuevo Chaquiro, two world-class deposits; We received from him exploration tools for the discovery of porphyry-type deposits in our country.

The course "Typological diversity, origin and evolution of fluids in epithermal deposits" was carried out, taught by Dr. Antoni Camprubí, who is editor-in-chief of the Bulletin of the Mexican Geological Society, editor-in-chief of Springer Briefs in World Mineral Deposits, national representative of Mexico in the Commission on Ore Mineralogy of the International Mineralogical Association and member of the Caribbean Lithosphere Research Group.

As part of activities in cooperation with other student chapters, the SGA-Bucaramanga Colombia and the SEG-UIS student chapter together with MSc. Armando Alatorre, geological engineer and president of the College of mining engineers, metallurgists, and geologists in Mexico gave the talk "Industrial Minerals and Lithium" highlighting the importance of industrial minerals for the green transition.

The conference entitled "Compositional analysis of data" was held by P.Geo. and MSc. Ricardo Valls, geologist with more than 37 years of experience in the international mining industry and with a solid research background. In addition, he is the author of various books on geology, geochemistry, compositional analysis of data, QA&QC, artificial intelligence and machine learning; teaching us the need to use compositional analysis in geostatistical issues.

The conference entitled "Allowable expenses in the geological investigation stages" was presented, given by P.Geo. and Ph.D. Jorge Cruz (Fig 11), who is a



Fig. 9 Metamorphic Rocks Workshop using the SGA-Bucaramanga student chapter collection

mining geologist and economist specialized in prospecting, exploration and exploitation of mineral deposits, president of Fenix Geoconsultant Ltd, Vice President of Exploration of Alicanto Mining Corp and legal representative of Alicanto Colombia SAS.

The conference entitled “The role of mining in the energy transition” was held by the geologist Ph.D. Richard Spencer who has more than 35 years of technical and corporate experience in management and significant discoveries such as the San Carlos porphyry, Mirador and Panantza. He also managed the objectives and the exploration stages of the giant gold and uranium deposits of the Witwatersrand Basin in South Africa, which made us understand the essential relationship between the mining sector and the energy transition on which we depend in the future.

## Relation with exploration and mining companies

### SGA-UIS and Aris Mining Segovia discussion

Together with the mining company Aris Mining, the students were able to participate in the discussion “Let’s talk about Mining”, which took place on Thursday, October 20, 2022, from 2:00 pm to 5:00 pm (Fig 12). The virtually invited panelists for the event belonged to the Aris Mining Segovia exploration group (from Segovia – Antioquia).

### 10<sup>th</sup> Anniversary of the SGA-UIS Chapter Additional Conferences

As part of the academic celebration for our tenth anniversary of the SGA chapter of the Universidad Industrial De Santander, different courses and talks were held during the months of August and September (Fig 13). They were divided into two types of topics: 1) types of mineral deposits; and 2) techniques for the study of different types of mineral deposits and case studies.

#### 1) Types of mineral deposits

The talk “Gaps in Porphyry and Epithermal Type Environments, Genetic Types and Their Origins, a Field Vision” by Dr. Mario Alfaro, who is a consultant geologist for international companies with 57 years of experience in the mining industry, taught us to differentiate and recognize the different types of breccias and their importance to define the mechanisms and processes involved in their formation (genesis) and most importantly their relationship

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Fig. 10 Lecture series: Let's talk about volcanoes

with possible mineralization associated with porphyry and epithermal systems.

In agreement with the company iSE, a virtual platform that offers geology courses, the specialist in porphyry copper deposits, Fernando Rivera, was invited. Basic concepts of metallogeny and formation of porphyries were discussed as well as the location of the main porphyry systems, the relationship between alteration and mineralization and basic tools for exploration in the field.

2) Techniques for the study of different types of mineral deposits and case studies

The course "Fluid Inclusions: Basic Principles and Their Study of Mineral Deposits" by Dr. Antoni Camprubí, who has a degree and doctorate in geological sciences from the Faculty of Geology of the UNAM, ex-



Fig. 11 Ore deposits series: Compositional Analysis of Data and the Role of Mining in the Energy Transition



Fig. 12 SGA Bucaramanga members interacting with exploration geologist from Aris Mining

plained the basic principles established for studies of fluid inclusions, covering the general petrographic criteria, specific petrography for fluid inclusions, basic thermodynamic notions to understand

microthermometric studies, the principles of microthermometry of fluid inclusions and their application at prospective level.

Another tool for exploration of mineral deposits that is currently on the rise is machine learning. To acquire and improve our knowledge and/or skills on this topic, the speaker Aldo David Carlos Villazana, an expert in machine learning applied to geosciences, was invited. The "basic definitions and applications in geosciences" were addressed.

The short course "Metallogeny from the North of Antioquia, A Review of the El Vapor Mining District" by Felipe Arrubla, who is an exploration geologist, independent prospector and mining businessman, who is currently investigating the fertility and distribution of gold deposits in vein the El Vapor vein system, made a theoretical preparation for the field trip to this mining district. We learned about the mineralizing system and the main structures that control the mineralization.

The conference "Metallogeny and Exploration of Neoproterozoic Iron Oxide - Copper - Gold Systems of the Carajás Mineral Province, Amazon Craton, Northern Brazil" by Ph.D Roberto Perez Xavier, who is professor of Economic Geology in the Department of Geology and Natural Resources from the Institute of Geosciences of the University of Campinas (IG/UNICAMP) in

Brazil focused on the formation conditions and basic tools to understand this type of deposits, making a comparison between Brazil and Colombia, analyzing the possible areas of the country where the appropriate conditions are favorable for this kind of systems.

**10° aniversario**

**10° ANIVERSARIO SGA-UIS**

*Programa 1*

<b>VIERNES 24 AGOSTO</b> Brechas en ambientes tipo pórfido y epitermales. Tipos genéticos y sus orígenes. Una sesión de campo - PARTE 1 <b>PhD. Mario Alfaro</b> 12:00 - 2:00 pm	<b>MIÉRCOLES 31 AGOSTO</b> Algoritmos de Machine Learning como herramientas en el imageo geológico <b>Alde Carlos Villazona</b> 12:00 - 1:00 pm
<b>JUEVES 1 SEPTIEMBRE</b> Introducción de los depósitos pórfidos de cobre Conceptos básicos, ubicación de los yacimientos, tipos de depósitos, minerales, herramientas de exploración <b>Esp. Fernando Rivera</b> 10:00 - 11:00 am	<b>VIERNES 2 SEPTIEMBRE</b> Premiación concurso de geofotografías Síguenos en lg como @sgauiasc para saber cómo participar y conocer el premio

**10° ANIVERSARIO SGA-UIS**

*Programa 2*

<b>VIERNES 14 SEPTIEMBRE</b> Superposición de yacimientos minerales <b>PhD. Antoni Camprubi</b> 12:00 - 1:00 pm	<b>LUNES 19 SEPTIEMBRE</b> Metallogeny and exploration of Neoproterozoic iron oxide - copper - gold systems of the Carajás Mineral Province, Amazon Craton, Northern Brazil <b>Roberto Perez Xavier</b> 12:00 - 1:00 pm
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Fig. 13 10<sup>th</sup> Anniversary conferences and short courses schedule





# Finally a face-to-face meeting!

## SGA Student Chapter Peru report on the 2022 National Meeting and field trip to Mina Justa, Peru

Medaly Vicuña Guerra<sup>1</sup> and Johan Ramírez Briones<sup>2</sup>

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<sup>2</sup>Geological Engineering Program, Faculty of Sciences and Engineering, Pontifical Catholic University of Peru, Peru; ramirezjb.js@pucp.pe

After two years of virtual activities due the Covid-19 pandemic, the SGA Student Chapter of Peru was finally able to run the traditional National Meeting in person. The event was held from the 22<sup>nd</sup> to the 23<sup>rd</sup> of October 2022 and included a field trip to the Mina Justa IOCG deposit. The main goal of this meeting was to strengthen the partnership between members of the student chapter which is composed of students from eleven different Peruvian universities all over the country.

The first day, the event was carried out at the Pontifical Catholic University of Peru (PUCP), beginning with a presentation of 2022 highlights along with a discussion of the 2023 work plan. Dr. Fredrik Sahlström provided a talk on general characteristics, genetic models and recent advances in applied techniques to study IOCG and magnetite-apatite deposits (Fig 1). After the talk, Dr. Lisard Torro lead the group in a visit to several PUCP laboratories, including the QEMSCAN, optical microscopy, XRF (X-Ray Fluorescence), XRD (X-Ray Diffraction), Raman and SEM (Scanning Electron Microscope) laboratories (Fig 2). This was an excellent opportunity for the students as they had the chance to discuss the application of the equipment and technology in the study of ore deposits.

During the second day, the group visited the Mina Justa operation. The Lower Cretaceous Mina Justa Cu (Ag, Au) deposit hosts a measured/indicated open pit resource of 346.6 Mt (0.71% Cu, 3.8 g/t Ag and ~ 0.03 g/t Au, at a cut-off grade of 0.3% Cu) and an inferred resource of 127.9 Mt (0.6% Cu). Jurassic andesite and siliciclastic rocks of the Upper Río Grande Formation characterize the geology of the district and host the mineralization. Such types of deposits are well documented in the Cordillera de la Costa of Southern Peru (Chen et al. 2010) and in Chile. In Mina Justa, the magnetite-apatite ore was overprinted by a younger, structurally controlled IOCG event (Rodríguez-Mustafa et al. 2022).

The SGA team received a kind welcome from the Marcobre staff (Marcobre is the operator of Mina Justa). The local geologists provided a complete presentation on the mine geology, mineralization, alteration and details on the mining methods applied at the mine. The team had the chance to see the operation from the open-pit viewpoint



Fig. 1 Masterclass from Dr. Fredrik on IOCG-type deposits



Fig. 2 Guided tour to the Center for Materials Micro-Analysis at PUCP



Fig. 3 Group photo of Peru SGA Student Chapter at Mina Justa



Fig. 4 Viewpoint of the open pit and explanation by mine geologists



Fig 5 Students at the drill core room at Mina Justa

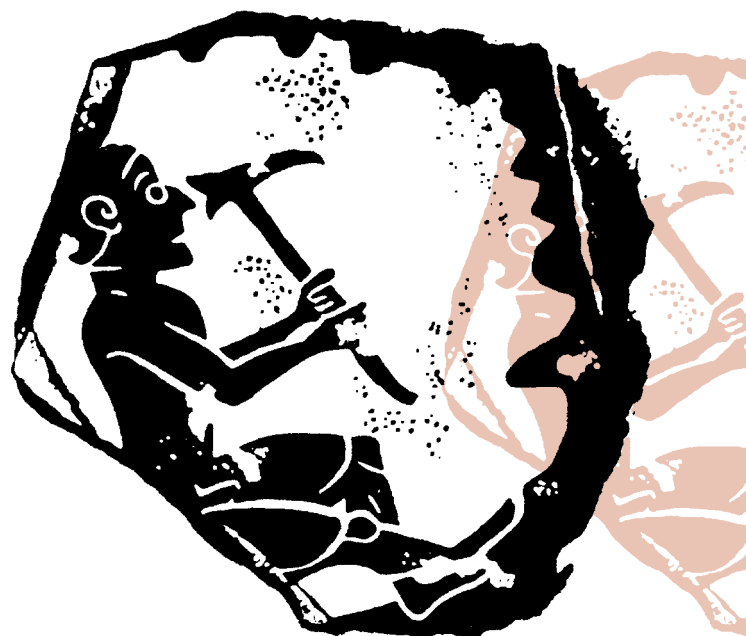
(Fig 3), discuss the location of the mineralized body and the halos of hydrothermal alteration. With geological maps in hand, mine geologists explained the main structural controls of the economic Cu orebody (Fig 4). Finally, we had access to the core shack where mine geologists explained the paragenetic sequence of the economic mineralization and the most important minerals and textures (Fig 5).

We would like to thank the exploration team, led by Miroslav Kalinaj (Corporate Exploration Manager) and Edson Luis Bortolotto Machado (Geology Manager), for the complete and well-organized visit. We look forward to a new exiting and enriching experience in 2023.

#### References

Chen H, Clark A, Kyser K, Ulrich T, Baxter R, Chen Y, Moody T (2010) Evolution of the Giant Marcona-Mina Justa Iron Oxide-Copper-Gold District, South-Central Peru. *Econ Geol* 105:155-185

Rodriguez-Mustafa M, Simon A, Bilenker L, Bindeman I, Mathur R, Machado E (2022) The Mina Justa Iron Oxide Copper-Gold (IOCG) Deposit, Peru: Constraints on Metal and Ore Fluid Sources. *Econ Geol* 2022; 117 (3): 645–666. <https://doi.org/10.5382/econgeo.4875>





# PEOPLE

## In memoriam: Brian G. Hoal

Karen Kelley<sup>1</sup>

<sup>1</sup>Geology, Geophysics, and Geochemistry Science Center, Denver, CO 80225-0046, United States; e-mail [kdkelley@usgs.gov](mailto:kdkelley@usgs.gov)



Brian G. Hoal died March 20, 2023, after a protracted battle with cancer. He was 67. Brian was the first salaried SEG Executive Director, ushering the Society of Economic Geologists into the 21<sup>st</sup> century with unwavering commitment and astute leadership.

Brian received B.Sc. (Hons) and Ph.D. degrees from the University of Cape Town, and an MBA from the University of Denver. From 1978 to 1996, he was employed by the Geological Survey of Namibia as a geologist, rising in the ranks to director. In 1996, he relocated to Denver as managing partner, Corrotoman Geoscience, a consultancy specializing in exploration for gold, diamonds and base metals. In 2000, Brian was appointed Executive Director of the SEG. Under his leadership, membership nearly doubled and with his guidance, the first major SEG stand-alone conference held outside of the United States took place in Perth, Australia, in 2004. Subsequent conferences, which became annual events, took place locally and in diverse international locations.

Those who knew Brian will miss his friendship and counsel and his ability to see his way clearly through challenging situations, often with a well-honed sense of humor. He is survived by his wife, Karin, their two sons, and his mother. Contributions in Brian's name can be made to the SEG General Fund through [www.segweb.org/BrianHoal](http://www.segweb.org/BrianHoal).



# In memoriam: Giulio Morteani (1935-2023)

Bernd Lehmann<sup>1</sup>

<sup>1</sup>Mineral Resources, Technical University of Clausthal, 38678 Clausthal-Zellerfeld, Germany; e-mail: bernd.lehmann@tu-clausthal.de



Professor Giulio Morteani in Mexico in March 2014

Prof Giulio Morteani was born in Trieste, Italy, and grew up in a small village in the Sexten Dolomites, right at the border of Austria and Italy. He studied mining engineering and mineralogy at Technical University of Clausthal, Germany, where he obtained his Dr.-Ing. diploma in 1965. He became custos of the Mineralogical Museum of the University of Kiel and finished his habilitation in mineralogy, petrography, geochemistry and mineral resources in 1969. He was then appointed Professor of Petrology at the Technical University of Berlin in 1972 and moved to the Technical University of Munich in 1983 where he held the Chair of Applied Mineralogy and Geochemistry until his retirement in 2000. He died on 29 January 2023 at the age of 87 in Isen, near Munich, leaving behind his wife Christine Preinfalk.

Giulio started his work on the petrology of polymetamorphic rocks in the Eastern Alps, a topic which accompanied him for about half a century. However, he was a great traveller and picked up a variety of interesting topics in petrology, geochemistry and economic geology all over the world. Some of his favourite topics were rare-metal pegmatites in Brazil and Argentina, carbonatites in DR Congo, ancient gold in Egypt and Sudan, gold in Bolivia, Peru, China and Mongolia, rare earth elements in Brazil and Turkey, platinum-group minerals in Turkey, emeralds in Austria, Australia and Madagascar. The breadth of his work is large, with hydro-geochemical studies on metal mobility (mostly with Peter Möller), fluid dynamics and metamorphism (with Jane Selverstone and Gerhard Franz), the formation of emerald deposits (with Günter Grundmann), and aluminium phosphates (lazulite, dumortierite) (with Dietrich Ackermann). Some may remember the revolutionary reconnaissance study in 1993 on "Sewage sludges: Toxic substances, fertilizers, or secondary mineral resources" (Episodes 16: 329-333; with Bernd Lottermoser), or the book on "Gold Metallogeny: In the Sino-Korean Platform" (Springer, 1992, with Robert Trumbull, Zhiliang Li, Hongsheng Bai).

Giulio's work and career attest to a very educated, open-minded and friendly gentleman, interested in all aspects of science and culture, with a great sense of humour and never ending curiosity. We had the honour to publish his last paper in 2022 on "The Schlaining quartz-stibnite deposit, Eastern Alps, Austria: constraints from conventional and infrared microthermometry and isotope and crush leach analyses of fluid inclusions" (Mineralium Deposita 57: 725-741, with Marta Sośnicka, Stefan de Graaf, David A. Banks, Samuel Niedermann, Malte Stoltnow and Volker Lüders). We miss a great scientist and teacher, and a good friend.





# In memoriam: Nic Beukes

Jens Gutzmer<sup>1</sup>, Albertus Smith<sup>2</sup>

<sup>1</sup>Helmholtz Institute Freiberg for Resource Technology, Chemnitzer Str. 40, 09599 Freiberg, Germany

<sup>2</sup>Department of Geology, University of Johannesburg, Auckland Park Kingsway Campus, South Africa



Nic Beukes during field work in the Goa Iron Ore District, India (2005).

Professor Nicolas Johannes Beukes, or Prof. Nic as most of his students prefer to call him, passed away in Johannesburg, South Africa, after a short illness on 9 January 2023, at the age of 77. Nic Beukes was born and raised in Harrismith in the Free State (then Orange Free State) of South Africa. He studied geology and chemistry at the University in Bloemfontein and, after a brief stint at the Geological Survey of South Africa, moved to Johannesburg to become lecturer at the Geology Department of then newly founded Rand Afrikaans University (now part of the University of Johannesburg). Assuming multiple roles over the next 54 years, he remained an active and very valuable part within the department. He was instrumental in establishing the Paleoproterozoic Mineralization Research Group as well as the DSI-NRF Centre of Excellence in Integrated Mineral and Resource Analysis (CIMERA), both still active today. It would be fair to say that he never retired from “his” Geology Department, given that the last large research project that he managed – the ICDP Moodies-BASE scientific drilling project in the Barberton Greenstone Belt – is still ongoing.

Nic Beukes was an exceptionally talented field geologist, sedimentologist and economic geologist. He was a wonderful lecturer that educated a very large body of students and that supervised more than 100 post-graduate research students - including 40 PhDs. His highly unusual ability to convey enthusiasm for geoscience to students is reflected by the remarkably large fraction of his post-graduate students that went on to develop a successful career in geosciences – either in industry or in academia. Most of these former students, including the two authors of this obituary, will readily admit the profound influence that Nic had on their education and career choices. What stood out, other than his incredible ability as a geologist, was his humility and kindness, which translated into a strong belief in people, always willing to invest his time and resources.

Nic Beukes left an outstanding record of research on many different topics, including South African stratigraphy and environmental evolution from the Early Archean up to the present day and the origin of sediment-hosted ore deposits of iron, manganese, base metals, gold and uranium, to name just a few. The fundament for his prolific and lasting scientific impact has been his spectacular ability to extract a simple yet internally consistent geological history from a rather small set of (field and lab-based) observations. He was literally able to “read the rock record”. Nic received numerous awards and recognitions for his contributions to geoscience, including, but not limited to a lifetime achievement award from South Africa’s Council for Geoscience, the Draper and Jubilee Medals from the Geological Society of South Africa, and election to the National Academy of Sciences in the USA.

Nic is survived by his wife, Tiekie, his four children and six grandchildren. Our community has not only lost an internationally well recognized researcher and a great geoscientist, but also a wonderful mentor and a good friend.



# Guide to authors for the SGA News

Jochen Kolb<sup>1</sup>; chief editor SGA News

<sup>1</sup>Institute of Applied Geosciences, Karlsruhe Institute of Technology, Adenauerring 20b, 76131 Karlsruhe, Germany; editor-sga-news@e-sga.org

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Iain Pitcairn<sup>1</sup>; chief editor SGA website

<sup>1</sup>Department of Geological Sciences, Stockholm University, Stockholm, Sweden; email: iain.pitcairn@geo.su.se

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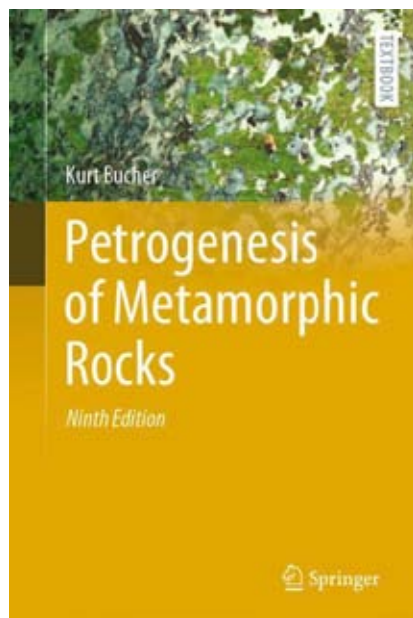
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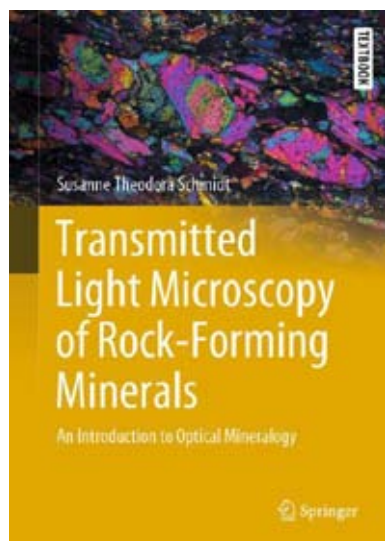


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