SGA News
August 2019
Number 45

SGA 2019 Glasgow

Plenary Speakers

Geoscience vision for future exploration and resource extraction

Cam McCuaig, Principal Geoscientist, BHP.

Responsibility in Mining: How to make difficult decisions

Sarah Gordon, Satarla Ltd, UK.

Hydrothermal Origins of Brucite, Banded Iron Formations, Transition Metal Sulfides and Life

Mike Russell, Jet Propulsion Laboratory, CalTec.

Keynote and invited speakers

Co-evolution of Life and Ore Deposits

Geobiology of northern Australian mid-Proterozoic Sedex Zn-Pb-Ag deposits

Peter McGoldrick (Keynote), University of Tasmania.

Biomineralisation in modern seafloor hydrothermal chimneys, implications for life behaviour in ancient VMS deposits

Siyu (Shirley) Hu (Invited), CSIRO, Perth.

Mineral resources for green growth

Recipes for Rare Earth Deposits

Frances Wall (Keynote), CSM, UK.

Isotopic constraints on ore-grade enrichment of rare earth elements in carbonatites

Philip Verplanck (Keynote) USGS, Denver, CO, Sponsored by SoS RARE.

Challenges of critical element recovery as by-products

Sarah Hayes (Keynote), USGS, Reston, VA, Sponsored by SoS TeaSe.

Tracking the magmatic-hydrothermal transition in the phosphorus-rich Gatumba pegmatite dyke system (Rwanda) and its role on Sn mineralization

Niels Hulsbosch (Invited), Katholieke Universiteit Leuven, Belgium.

Advances in understanding hydrothermal processes

Same, same, but different: recent advances in our understanding of modern seafloor hydrothermal systems

Sven Petersen (Keynote), GEOMAR Helmholtz Centre for Ocean Research Kiel, Germany.

Textures in mineral exploration: smoking gun or red herring?

Reimar Seltmann (Keynote), The Natural History Museum, London, IAGOD Distinguished Lecturer.

Synvolcanic gold at the Archean – recent contributions to genetic and exploration models, with examples from the southern Superior province, Canada

Patrick Mercier-Langevin (Invited), Research Scientist – Geological Survey of Canada.

New Techniques for ore discovery

To make better tools, we first need to understand ore deposits

Tim Ireland (Keynote), First Quantum Minerals Limited.

How will technology facilitate Agile Discovery

James Cleverley (Keynote), Global Product Manager, Imdex Limited.

Hydrothermal apatite as an indicator of porphyry Cu deposit fertility

Matt Loader (Invited), The Natural History Museum, London.

Contents

Isotope geochemistry of groundwaters in mineral exploration – the tip of the iceberg?

James Kidder (Invited), Queen's University, Ontario.

New discoveries – new views – Advances in the science of mineral exploration

Title TBC

Cam McCuaig (Keynote), Principal Geoscientist, BHP.

Isotopic and geochemical indicators on volcanic-hosted massive sulfide prospectivity: a review

David Huston (Keynote), Principal Research Scientist at Geoscience Australia.

Magmatic-hydrothermal systems: from Porphyry to Epithermal

Fertility Assessment in Porphyry Copper Exploration – An Industry Perspective on the Current State and Future Directions

Christian Ihlenfeld (Keynote), Anglo American.

Arc and backarc magmatic and tectonic processes in the formation of giant porphyry and epithermal deposits on Andean-type margins

Suzanne Kay (Keynote), Cornell University, USA.

Chlorimetry of Porphyry Copper Forming Magmas, Why Does it Matter?

Cyril Chelle Michou (Invited), ETH Zurich, Switzerland.

Magmatic sulfide and oxide systems

Pathfinder mineral geochemistry for magmatic oxide and sulfide mineralization: insights from trace elements in Fe-oxides determined by laser ablation ICP-MS

Sarah Dare (Keynote), Université Du Québec À Chicoutimi.

Reactivation and enrichment of a Gondwana margin Ni-Cu-PGE-Au-Te mineral system during the breakup of Pangea

Marco Fiorentini (Keynote), University Of Western Australia.

Gold – from orogenesis to alluvial

Metabasalts as sources of gold in Archean greenstone belts

Iain Pitcairn (Keynote), Stockholm University.

Concepts and Revised Models for Phanerozoic Orogenic Gold Deposits

Jim Mortensen (Keynote), MDRU, University of British Columbia.

Linking fluid flow to gold mineralization in the Senoufo Greenstone belt, northern Côte d'Ivoire

Lynnette Greyling (Keynote), Independent Consultant, UK, SEG Invited Speaker.

Economics of ore deposits

Economic challenges for mineral deposits

John Thompson (Keynote), PetraScience Consultants Inc., Vancouver, Canada.

The changing face of metal extraction – geology, biology and geometallurgy

The development and future impact of biotechnologies for mineral processing and metal recovery

Barrie Johnson (Keynote), Bangor University, UK.

Geometallurgy – what's new and what's next

Julie Hunt (Keynote), University of British Columbia.

Scaling the operational mineralogy toolkit: From monthly composites to full operational support

Chris Brough (Invited), Petrolab Ltd., UK.

Sustainable development of ore deposits

Sustainable mining through recycle, reuse and optimization

Rob Bowell (Keynote), SRK Consulting

Engagement and Emotional Response of the Narrative of Social Licence in Traditional and Social Media

Michael Hitch (Keynote), Tallinn University of Technology.

Increasing Value and Decreasing Environmental Risk by Reprocessing and Stabilizing Tungsten Tailings at Cantung Mine, NT, Canada

Heather Jamieson (Invited), Queen's University, Ontario.

Supergenes, gems and non-metallic ores

Opal: a supergene gem and implications for geological history

Boris Chauviré (Keynote, University of Grenoble Alpes, France.

Single and Multiple Weathering-Erosion Cycles in Supergene Ore Genesis

Paulo Vasconcelos (Keynote), University of Queensland, Australia.

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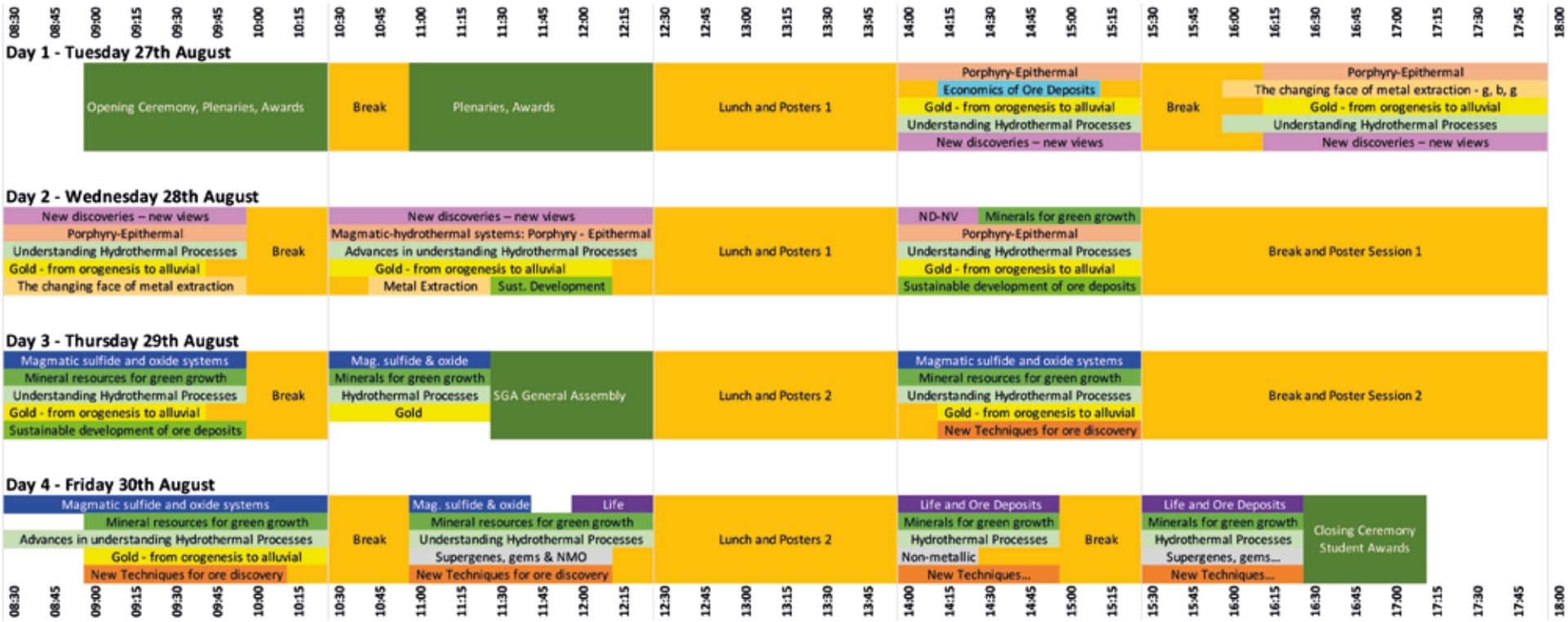

Themes	Posters
Advances in understanding hydrothermal processes	Poster Session 1
Economics of ore deposits	
Magmatic-hydrothermal systems: from Porphyry to Epithermal	
New discoveries – new views: Advances in the Science of Mineral Exploration	
The changing face of metal extraction - geology, biology and geometallurgy	
Co-evolution of Life and Ore Deposits	Poster Session 2
Gold - from orogenesis to alluvial	
Magmatic sulfide and oxide systems	
Mineral resources for green growth	
New Techniques for ore discovery	
Open Session (Poster Only)	
Supergenes, gems and non-metallic ores	
Sustainable development of ore deposits	

SGA 2019 Glasgow - Provisional Programme

15th SGA Biennial Meeting
Glasgow 2019

The University of Glasgow
27-30 August, 2019
Life with Ore Deposits on Earth

www.sga2019glasgow.com

The story so far……

- More than 620 registrations from 58 countries
- More than 200 students
- Student-Industry Event
- More than 300 talks over 4 days
- 200 posters with formal presentation events
- 35 International Keynote and 3 Plenary Presentations
- 12 Themes
- 7 Short Courses
- 4 International Field Trips
- All this in one of the UK's most vibrant and welcoming cities

Registration still open for Meeting – Come and join us!

Registration for Field Trips now closed.

Last chance for most Short Courses!

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News of the Society

SGA Ordinary Council Meeting, Pamukkale, Turkey, April 15, 2019

Jan Pašava[1] (SGA Executive Secretary)

[1] Czech Geological Survey, Geologická 6, 152 00 Praha 5, Czech Republic, jan.pasava@geology.cz

Gülcan Bozkaya (host of the Meeting) welcomed all Council members on behalf of the Pamukkale University. Karen Kelley (SGA President) welcomed all Council members and thanked G. Bozkaya for organization of the meeting. Then Council approved suggested agenda

Minutes of previous Council Meeting (October 22, 2018, Würzburg, Germany)

After checking the actions, the Minutes were unanimously approved.

Reports of officers on Council

3.1. Report from President
3.2. Report from Executive Secretary
3.3. Report from Treasurer
3.4. Report from Promotion Manager
3.5. Report from Chief Editor, SGA News
3.6. Report from Chief Editors, Mineralium Deposita
3.7. Report from Chief Editor SGA Special Publications
3.8. Report from the Chief Editor SGA website
3.9. SGA Educational Fund
3.10. to 3.16. Reports from Regional Vice Presidents (Asia, Australia/Oceania, Europe, North Africa and Middle East, Sub-Saharan Africa, North and South America)

Council was sorry for missing Report of the Regional Vice President North Africa and Middle East.

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

H. Frimmel to inform Ch. Linge about Council's wish for her participating at the upcoming SGA Biennial Meeting to help with SGA finances, booth and promotion (SGA will cover her travel expenses).

J. Pašava to prepare a draft of Minutes for upcoming SGA News.

J. Relvas to send pdf files of newly designed banners for SGA promotion to All Council Members and Chapters. They can print them out and use them where appropriate.

J. Relvas in collaboration with S. Decrée and G. Bozkaya to identify the most effective procedure for securing production of needed traditional and new promotional items introduced at the Council meeting.

J. Relvas in collaboration with Council and Chapter Members to secure SGA promotion and booth manning at the SGA 2019 in Glasgow.

J. Relvas to provide a master copy of updated SGA banner, acknowledging sponsors of SGA Educational Fund to Local Organization Committee for print out and for making a display at Opening Ceremony.

J. Pašava to provide photos of SGA Award holders to J. Relvas for the production of banners, which will be displayed at the Conference.

J. Relvas to contact S. Goodchild (Springer) and discuss terms and conditions of a joint booth at SGA 2019 Glasgow and a possible SGA promotion via Springer booth at the 36th IGC (New Delhi, India, 2020).

J. Relvas to continue looking after distribution of SGA promotional items upon request of SGA Regional Vice Presidents and possibly other Council members and SGA Student Chapters organizing SGA major and/or co-sponsored geo-events.

All Council Members, who help in promoting SGA and signing up new SGA members, to make sure that the latest applications forms including GDPR and credit card payment requirements are used. In particular, the name of the applicant MUST BE THE SAME as the name of the credit card holder. We cannot process payments in the future, for which we do not have the explicit authority of the credit card holder. It is also important to use latest version of application forms (attached to website), asking for 3 digit credit card security code.

J. Kolb to remind A. Boyce on a summary paper on geology and mineral deposits of UK to be published in SGA News 45 (deadline May 1, 2019).

J. Kolb to arrange that all submitted contributions for SGA News will get acknowledged by the SGA News office.

B. Lehmann and G. Beaudoin to talk to S. Goodchild and other Springer officers to discuss a possible decrease in fees for open access publication in Mineralium Deposita for SGA members.

All Council Members to help B. Lehmann and G. Beaudoin to identify suitable theme and authors for "milestone papers" for Mineralium Deposita.

J. Slack to continue editorial efforts associated with 2 SGA Special Publications, which are at different stages of preparation and report to next Council Meeting (Isotopes in Mineral Exploration and Supergene Mineral Deposits) and one Springer Briefs Book Series on Mineral Deposits. All Council Members to help D. Huston to identify a suitable author, who could contribute to K-Ar and Ar-Ar isotope systems in mineral deposits.

N. Koglin to work jointly with I. Pitcairn on setting up a storage place for SGA documents at SGA website for Council members (access via password).

N. Koglin in collaboration with I. Pitcairn to adapt SGA website to make SGA-IUGS-UNESCO activities more visible.

N. Koglin in collaboration with I. Pitcairn to update a form on donations to SGA Educational Fund and also present versions of online SGA membership application forms to enable members to donate sponsorship money to SGA Educational Fund.

N. Koglin in collaboration with I. Pitcairn and J. Kolb to adapt SGA website for e-submission of contributions to SGA News.

N. Koglin to reserve www.sga2023.com, www.sga2025.com and www.sga2027.com addresses for future SGA Biennial Meetings.

H. Chen with X. Sun and other Chinese SGA members to continue promoting SGA at suitable geo-events and to try to set up a new Student Chapter in China.

R. Skirrow to work jointly with D. Huston and other Australian SGA members on SGA promotion at the 6th International Archean Symposium (Perth, July 2020) and SGA sponsorship of a session on Archean mineral systems.

D. Huston and R. Skirrow to prepare a draft of a schedule and budget of the planned SGA field conference/workshop at Mt. Isa, Queensland, Australia (estimated timing July/August 2020) and report to next SGA Meeting.

All Council Members to provide D. Huston with names of relevant officers in mining companies, who should be contacted to consider donations to SGA EF.

S. Decrée to continue her deserving SGA liaison activities with EAG and GS and keep SGA Executive Council informed on any progress.

S. Decrée to address chairs of sessions 03i, 05b, 05l, 05m and 05n to inform them that SGA agrees to sponsor SGA student participation and also SGA keynote speakers, and to work jointly with session chairs on identification of suitable persons (must be SGA members). A. Vymazalová and Ch. Linge will be responsible for the distribution of financial contributions (total budget of up to EUR 3,000 approved).

G. Tourigny to collaborate with SGA Chapter Ivory Coast and to work jointly with B. Orberger and LOC on preparation of the 6th Short Course on African Metallogeny. Council greatly appreciated reported sponsorship to date.

G. Graham to work with K. Kelley, G. Beaudoin and other SGA North American members to identify the most suitable economic geology events in North America to promote SGA.

E. Ferrari to continue his deserving efforts related to SGA Chapters in the region of South America and to identify in collaboration with other South Anerican SGA members the most appropriate meetings, where the Society could be promoted (with help of Chapters) and attract new membership.

SGA 2019 – update (A. Boyce et al.)

The Report was delivered by A. Boyce and his co-workers via GO TO platform communication. The follow up discussion of present Council members and A. Boyce, I. Butler and A. Fischer resulted in the following motions:

- to reserve a larger booth for SGA/Springer at prominent site,
- payments of student grants to people from the third countries will be made in cash (responsibility of SGA officers) upon providing cash money from the Conference Account,
- based on provided list of applications for student grants by A. Vymazalová, LOC to mark, which abstracts were accepted (until April 29, 2019),
- to mark student presentations (both oral and poster) in the Conference Programme,
- to adapt timing for Opening Ceremony (SGA needs 1 hr for presentation of awards),
- to rename Closing Ceremony to Closing Ceremony with Presentation of Student Awards,
- to prepare and send to J. Kolb by May 1, 2019, a summary paper on geology and metallogeny of Scotland/UK to be published in SGA News (45),
- to send to G.Beaudoin/B.Lehmann 1 page advertisement for SGA 2019 to be published in Mineralium Deposita,
- to send ½ page SGA 2019 advertisement to Brian Hoal for SEG News,
- to make sure that copyright on all SGA 2019 published documents (Proceedings, Field trip guides etc.) is with SGA,
- to make sure that all needed bibliographic information will be on published Proceedings from the SGA 2019 Meeting (use an example of the Proceedings of the 14th SGA Biennial Meeting, Québec City, Canada). This is very important for inclusion of SGA Proceedings on the list of Conference Proceedings by ISI Thompson Reuters,
- to provide 3 different scenarios for running Technical Program for Council evaluation (asap.).

Council highly appreciated all efforts by the Local Organization Committee and approved presented report with great thanks.

SGA 2021 – update (T. Christie)

The brief report was presented by J. Pašava. After discussion, Council approved the report with great thanks and the following motion:

T. Christie to prepare the first circular – an invitation to the 16th SGA Biennial Meeting (2021) to be distributed to participants of the SGA 2019 meeting in Glasgow and also a brief presentation to be presented at the SGA 2019 Closing Ceremony with Presentation of Student Awards.

T. Christie to plan for SGA 2021 booth at the SGA 2019 Meeting in Glasgow (will be provided free of charge).

T. Christie to launch a SGA 2021 website so that it would be available at the time of SGA 2019.

Progress report on membership drive from the last SGA Council Meeting (J. Relvas et al.)

The report was presented by J. Relvas. During the reported time period (October 1, 2018 to March 17, 2019), SGA received 276 new members: 11 regular and 41 student members, between October 1 and December 31, 2018; and 1 senior, 15 regular and 208 student members, between January 1 and March 19, 2019. This asymmetry between the last trimester of 2018 and the first trimester of 2019 relates with the recurrent increase of our membership in the odd years (biennial meetings). About 84% of the new student members were brought to the SGA by the student chapters, especially the Lima (103), the Baltic (23), the Laval (16) and the Barcelona (13) student chapters. Also, the 5th Short Course on African Metallogeny organized by SGA and the SGA-supported 8th Russian Young Scientist School were responsible for the recruitment of a number of new members. In terms of nationalities, the larger contributors of new student members were Peru (103), Russia (18), Canada (16), Ivory Coast (14), Spain (13), Sweden (10), Poland (10), UK (9), Germany (8), USA (7) and Australia (7). The 26 new regular members are from UK (5), Russia (3), Colombia (2), Ivory Coast (2), Switzerland (2), USA (2) and Argentina, Belgium, Canada, Czech Republic, Finland, Germany, Chile, China, Poland and South Africa, with one new member each. One new senior member comes from the USA. There is a long-term trend of increasing number of student members and regular members with on-line subscription of Mineralium Deposita at the expense of regular members with printed Mineralium Deposita. It is important to attract student members to become regular members and to make regular membership more attractive. After discussion, Council approved the report with great thanks and the following motion:

T. Aiglsperger to prepare a draft of SGA Mobility Grant, which would enhance collaboration between regular SGA members and send it to Jan Pašava by April 29, 2019. J. Pašava will organize Council discussion so that the document will be ready for approval at next Council Meeting (August 26, Glasgow).

J. Relvas to address all Regional Vice Presidents with a request for their collaboration regarding non-renewing members.

Status of development of SGA Student and Young Scientist network (A. Vymazalová)

The report was presented by A.Vymazalová. SGA has 16 student Chapters (Baltic, Barcelona, Black-Forest-Alpine, Brazil, Colombia-Bucaramanga, Colombia-Bogota, Laval, Morocco, Nancy, NW-Russia, Peru, Prague, Siberia, Turkey, UK and Western Cape). She also presented a proposal for a new Chapter Côte d'Ivoire and two applications to create the Chapters Russia – Moscow and Urals. She also presented the Chapter's Annual Reports (apart from Nancy Chapter) summarizing their activities in 2018 and plans for the following year and financial requests from SGA. After discussion Council approved all reports with great thanks and the following budgets:

Baltic	4,000 EUR
Black Forest-Alpine	2,000 EUR
Bogota-Colombia	2,500 EUR
Bucaramanga-Colombia	3,000 EUR
Laval	1,000 EUR
Morocco	1,000 EUR
NW-Russia	2,500 EUR
Prague	4,000 EUR
Peru	1,000 EUR
Siberia	2,500 EUR
Turkey	1,500 EUR

New Chapters (Côte d'Ivoire, Moscow and Urals) were approved each with a budget of EUR 1,000 for 2019. In total EUR 28,000 was approved by the Council for student chapter support in 2019.

Action: A. Vymazalová to inform new Chapters on Council approval including 2019 budget and existing Chapters on approved 2019 budgets.

SGA Awards – update and discussion on introduction of more awards (I. Pitcairn)

The report was presented by J. Pašava. With the nomination deadline of March 31st 2019, it is clear that we have a very strong list of nominations for the SGA awards to be presented at the 15th SGA Biennial Meeting in Glasgow in August. In total, we received 11 nominations, 2 for the SGA-KGHM Krol medal, 4 for the SGA-Newmont Gold Medal and 5 for the SGA Young Scientist Award. In addition, B. Lehmann and G. Beaudoin presented on behalf of the Mineralium Deposita Editorial Board two proposals for the Best Paper Mineralium Deposita Award. After discussion Council approved the report with great thanks and suggested the following motions:

J. Pašava to distribute all SGA award nominations for electronic Council vote with a deadline of April 26, 2019 and to inform SGA President on the result of Council vote.

K. Kelley to inform all awardees (including Best Paper in Mineralium Deposita) and ask nominating persons for citations and awardees for their replies, which will be presented at the Opening Ceremony of the SGA 2019.

B. Lehmann to prepare a certificate and cheque for the purpose of presentation of Mineralium Deposita Best Paper and SGA Young Scientist Award.

H. Frimmel to ask nominating person for a text for certificate for SGA-Newmont Gold Medal.

Requests for sponsorship

- XXVth ECROFI Meeting (June 25–27, 2019 Budapest) – a total budget of up to EUR 1,500 approved by Council to support SGA keynote speaker (Matthew Steele-MacInnis),
- GOLDSCHMIDT 2019 (August 18–23, 2019 Barcelona). - Resources "theme" 05: Minerals and Energy for High Tech Societies" includes following mineral deposits-related sessions:
  03i: Origin and Evolution of Continental Mantle Lithosphere and its Resource Endowment
  05b: New Mineral Exploration Challenges
  05k: Ore Deposits Formed at or Near the Seafloor: A Perspective from Ancient and Modern Examples
  05l: Understanding Strategic and Critical Resources: Genesis and 4D Evolution
  05m: Critical Raw Materials Based on Marine Minerals: New Frontiers and Challenges
  05n: Biogeochemical Cycles, Life Evolution and Ore Deposits

Following our Memorandum of Understanding, S. Decrée proposed that EUR 3,000 requested to be spent (1) to cover the travel expenses of an invited speaker and (2) to sponsor SGA student participants, which would need to be nominated by session chairs. Council approved the request.

- MAESA 2019: Earth Sciences and Sustainable Development (30 November – 1 December 2019, Novotel Hotel, Yangon)

Action: J. Pašava to inform Khin Zaw on approved collaboration, only on the basis of in-kind activities without any financial obligations (e.g. exchange of logos; promoting MAESA activities via SGA website and/or News etc.).

- Conference on Information Technologies in Earth Sciences and Applications for Geology, Mining and Economy ITES&MP-2019 (October 14–19, 2019 Moscow, Russia) – EUR 1,000 approved by Council for SGA student participation or SGA keynote speaker (SGA promotion will be coordinated by E. Naumov)

Council appreciated additional information by E. Naumov on the acceptance of terms and conditions of SGA sponsorship by Local Organization Committee.

- 9th Russian young-scientists scientific school «New knowledge in ore-forming processes (November 25–29, 2019 Moscow, Russia) – asking EUR 700 for student participation and EUR 700 for SGA keynote.

The request was presented by J. Pašava. Council approved regular future sponsorship of SGA student members with a total budget of up to 1,000 EUR and advised Local Organization Committee to come back with request(s) for additional support for SGA keynote speakers if needed.

Action: J. Pašava to inform Local Organization Committee on Council decision.

Any other business

- SGA new initiatives – update (D. Huston, K. Kelley, R. Skirrow)

The report was delivered by D. Huston. Council approved the report with great thanks and asked for a draft of budget and time schedule for this event.

- Report on SGA – GS and SGA – EAG partnership including our role in Goldschmidt 2019 – Barcelona - update (S. Decree, K. Kelley)

The report was delivered by K. Kelley and S. Decrée and was also covered in the report of the President and Regional Vice President Europe. Council greatly appreciated all activities and approved the report with great thanks.

- The 6th Short Course on African Metallogeny – Ivory Coast - update (B. Orberger)

The report was presented by J. Pašava. The Course title is "Gold deposits: from Exploration to Mining" and the first circular was already distributed. Council greatly appreciated efforts by B. Orberger and G. Tourigny and their Local Organization Committee, which resulted in securing important industrial sponsorship to this event. Council expressed great thanks to L. and D. Barataux and other members of Local Organization Committee for their invaluable help in the preparation of the course and approved the report with great thanks.

Action: B. Orberger and G. Tourigny to continue seeking sponsorship for the course and to work with Local Organization Committee on the preparation of the course.

- ***Programme of the SGA General Assembly – August 29, 2019, Kelvin Gallery, University of Glasgow (11.30 to 12.30) – J. Pašava***

Council approved suggested Program for SGA General Assembly:

1. Report of the President (K.D. Kelley)
2. Report of the Treasurer (H. Frimmel)
3. Report of the SGA Vice-President on SGA Educational Fund (D. Huston)
4. Report on activities of SGA Chapters (Representatives of Chapters)
5. Various

Date and place of the next SGA Council meeting

August 26, 2019 Glasgow, U.K. (the precise venue and timing will be announced in due time).

Informative list of past activities

- Workshop on „Seafloor Resources“ (October 24th 2018, Karlsruher Institute of Technology – KIT) – L. Richter – EUR 520 approved for SGA keynote by SGA EC,
- 8th Russian young-scientists scientific school «New knowledge in ore-forming processes (November 26–30, 2018, Moscow, Russia) – requested EUR 1,400 (700 student support + 700 SGA keynote speaker A. Vymazalová),
- Freiberg Short Course in Economic Geology (December 2018, Freiberg, Germany) – M. Buritsch et al. – EUR 3,000 approved for SGA student support,
- PACRIM 2019 (April 3–5, 2019, Auckland, New Zealand) – SGA sponsored via promotion in SGA means,
- Annual workshop series on ore deposits 2019/Mines “The Geology of Hydrothermal Ore Deposits” (January 3–7, 2019, Golden, Colorado USA) – SGA sponsored – D. Leach et al.

Informative list of future activities

- XXXVI UNESCO-SEG-SGA Curso Latinoamericano de Metalogenia (23–25 May 2019, Lima, Peru and Field trip, 26–29 May), the PUCP university (directly after PROEXPLO 2019),
- XXVth ECROFI Meeting (June 25–27, 2019, Budapest) – a total budget of up to EUR 1,500 approved by Council to support SGA keynote speaker (Matthew Steele-MacInnis),
- 15th SGA BIENNIAL MEETING (August 27–30, 2019. Glasgow, Scotland, U.K.) – A. Boyce et al.,
- SEG 2019 (October 7–10, 2019, Santiago, Chile) – K. Kelley et al. - free booth and SGA speaker confirmed by Local Organization Committee,
- Conference on Information Technologies in Earth Sciences and Applications for Geology, Mining and Economy ITES&MP-2019 (October 14–19, 2019, Moscow, Russia) – EUR 1,000 approved for SGA student participation or SGA keynote speaker (SGA promotion will be coordinated by E. Naumov),
- The 6th Short Course on African Metallogeny (October 28 – November 1, 2019, Yamoussoukro, Ivory Coast),
- 38th IGC (March 2–8, 2020, New Delhi, India) – SGA sponsors Theme 28: “Ore Forming Processes and Systems“ – J. Pašava - SGA link,
- SEG 2020 (Whistler, Canada),
- 16th SGA BIENNIAL MEETING (November 14–18, 2021, Rotorua, New Zealand) – T. Christie et al.

SGA Ordinary Council Meeting held on April 15, 2019 at the Pamukkale University (Pamukkale, Turkey). From left: D. Huston (SGA Vice President), J. Pašava (SGA Executive Secretary), B. Lehmann (Chief Editor, Mineralium Deposita), S. Decrée (SGA Regional Vice President Europe), S. Petersen (SGA Council member), E. Naumov (SGA Council member), J. Relvas (SGA Promotion Manager), J. Slack (Chief Editor, SGA Special Publications), K. Kelley (SGA President), S. Mikulski (SGA Council member), H. Frimmel (SGA Treasurer), G. Bozkaya (SGA Council member), D. Banks (SGA Council member), A. Vymazalová (SGA Vice-president for student affairs) and T. Aiglsperger (SGA Council member). The photograph was taken by Cüneyt Tahir Başpehlivan.

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Reports from the SGA student chapters

SGA chapter	President	E-mail	Website	Chapter e-mail	Foundation
Prague	Štěpán Jaroměřský	jaromers@natur.cuni.cz	http://sga.cuni.cz/ https://www.facebook.com/SGA-Student-Chapter-Prague-155355499351/	chapter_prague-usergroup@natur.cuni.cz	2002
Baltic	Krzysztof Foltyn	krzyfoltyn@gmail.com	http://www.sga.agh.edu.pl/ https://www.facebook.com/groups/balticsga/		2009
Siberia	Anna Devyatiyarova	anna13502@gmail.com	www.sib-sga.com	SiberianChapter@yandex.ru	2011
Barcelona	Ariana Carrazana di Lucia	ariana.carrazana@ub.edu	www.bcn-sga-seg.cat/index.php https://www.facebook.com/Bcn-SGA-SEG-Student-Chapter-520047141415889/	student.chapter.ub.sga@gmail.com	2012
Colombia-Bucaramanga	Juan Pablo Jaimes Bermudez	juanjaimesb21@gmail.com	https://www.facebook.com/capitulosgauis/	sga.uis.bucaramanga@gmail.com	2012
Nancy	François Le Gaillard	francois.legaillard1@gmail.com	sganancy.wordpress.com		2013
Peru	Raíd André Merino Ortíz	rvelascog@uni.pe	https://www.facebook.com/SGAPeruStudent-Chapter/	sgastudentchapter.peru@gmail.com	2013
Colombia-Bogota	Pablo Enrique Porras Hernandez	peporrash@unal.edu.co	http://www.sgabogota.org/ https://www.facebook.com/sgaunalbogota/	sga.unalbogota@gmail.com	2015
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Graduate Short Course on Seafloor Resources in Karlsruhe

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On the 24th October 2018, the Black Forest-Alpine SGA Student chapter and the Karlsruhe Institute of Technology hosted a successful workshop on the topic of 'Seafloor Resources', with 32 attendees including students, postdocs, faculty staff and a science communicator. Talks and posters from Chapter members and students from nearby institutes showed the diversity of research being undertaken on volcanogenic massive sulphide (VMS) systems. These included numerous posters and talks on the computer modelling of seafloor hydrothermal systems (Samuel Weber, University of Bern), the influence of tectonic setting on VMS metal endowment (Dr. Clifford Patten, Karlsruhe Institute of Technology) and exploration approaches for ophiolite-hosted VMS deposits (Thomas Belgrano, University of Bern). The main event of the workshop was an afternoon of lectures by Dr. Sven Petersen (GEOMAR, Kiel): focusing on marine mineral resources including manganese nodules, Mn-(Co)-rich crusts and seafloor massive sulfides. The lecture offered theoretical background into the distribution and genesis of seafloor-related ore deposits, the economic importance of seafloor resources, the state of seafloor mining techniques and the potential environmental impact of seafloor mining. Furthermore, the participants benefited from Sven's insight from countless exploration and research cruises.

The combined poster–talk–lecture workshop format effectively facilitated exchange across the different levels of academia and institutes present and helped the Chapter attract several new members. Following the success of this event, we are planning to run similar workshops on an annual basis and welcome contact from SGA members, who are in the area and would be willing to collaborate (contact Lars Wihanto: larswiha@hotmail.de).

Fig. 1: Participants of the Seafloor Resources short course (Photo: Qasid Ahmad).

SGA Student Chapter Prague traditional autumn field trip (heritage stone, mineral and metal deposits of Slovakia)

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Our chapter organizes a traditionally larger field trip for a bigger group of student members (20+) every year during the autumn months. This year, we chose to visit Slovakian deposits, which were not visited during our previous field trips to Slovakia in the last years (2012, 2013 and 2016) and some localities on the way in the Czech Republic. Twenty-one student members attended this four-day field trip led by Bc. Jakub Mysliveček.

1st day:
Our first two stops were on the Czech side. Firstly, we visited an operational open pit mine in Dřínová next to Tišnov town. In this mine, an important contact of the Svratka gneiss with slightly metamorphosed Devonian limestones structurally above the gneisses is located, which is strongly mylonitized and penetrated by aplitic veins. This whole complex of rocks is known as the parautochtonous Brunovistulian unit, on which the Moravic nappe (graphitic phyllites) is thrust to the east and which forms common duplex structures.

In the Dřínová quarry, we were also collecting interesting mineralogical samples, such as fluorite, malachite and druses of baryte and calcite. After this, we moved to the mineralogical gallery "Patriot" in the near town Tišnov, where it is possible to see many excellent samples from around the world, but also from some localities in Slovakia, which we were planning to visit.

2nd day:
We travelled to the area of Špania Dolina in central Slovakia, which is famous for its mining of copper and silver from 1254 to 1888, when mining declined, but during the twentieth century, they continued to produce ore from the nearby deposit of Richtárová. We tried to find some samples of celestine around the Ludovik gallery and then moved to Piesky valley, which is famous for medieval mining of copper ore, where it is also common to find secondary copper minerals like azurite and malachite. Then, we moved through historical heaps to the valley of Richtárová, which is the type locality for devilline.

Our next stop was in the historical mining town of Dobšiná located in the eastern part of Slovakia, where iron and copper were mined from the 13th century onwards, and from the 18th to the 19th century nickel and cobalt were also mined. The deposit in Dobšiná is represented by hydrothermal veins in complex Variscan segment-hosting, high grade Ni-Co-Fe-As ores, which are also currently explored. Thanks to this, it was possible for us to see drill cores from the source rock. Until recently serpentinite for asbestos (chrysotile) was also mined. Dobšiná is generally well known also for its nice mineralogical specimens, like: chrysotile, aragonite, andradite (demantoid, topazolite), azurite, erythrite, lizardite, nickeline, etc.

Fig. 3: Hand specimen of goethite from the Gretla locality. Photo by J. Mysliveček.

3rd day:
In the morning, we visited the Gretla iron ore deposit. Iron ore is comprised mostly of hematite (specularite type) and goethite. The ore also contains copper mineralization and its secondary minerals. In a short time, we had collected a large amount of specularite

Fig. 1: The Dřínová quarry with common duplex structures. Photo by J. Mysliveček.

Fig. 2: Richtárová heap. Photo by J. Mysliveček.

samples, sometimes with malachite and less frequently high-quality goethite. Our following destination was the Novoveska Huta ore deposit. Since prehistoric ages, copper had probably been exploited in this village. In the last century, the deposit had again been mined for its stratiform molybdenum and uranium mineralization. Recently, the gypsum reserve has been extracted here. The gypsum mining operation is unfortunately closed on the weekend, so we had visited nearby historical molybdenite and uraninite mining operations. The main site of interest was the heap of the Bartolomej gallery, where we collected common secondary copper minerals, especially one of the European-best tyrolite. The site is famous for its chalkosite, clonoclase, malachite and azurite samples.

Following our bus transfer, we went to the most-wanted locality in Dubník near Červenice, which is popular for its precious opal deposit. The tradition says that the opal had been exploited already by Romans, but this is very likely just anecdotal. Mining is known since 1597 and lasted until 1922. In the last years, around 200 g of the high-quality precious opal had been mined per year. The mining itself was terminated because of opening of significantly larger deposits around the world. However, before the era of Australian precious opal deposits, the Dubnik site was the only one opal mining site in the world. Our group was divided into

Fig. 4: Small vein of opal in the Jozef mine, Dubník. Photo by J. Mysliveček.

two, the first group visited the public excursion adit Jozef, and the second group got the chance to visit most of the underground mine and to collect samples, mostly hyalophane, opal and antimonite.

4th day:

The last day was devoted to the andesite open pit mining near Fintice village. The inactive part of the quarry offers an opportunity to collect nice samples of the minerals from the zeolite group, namely stilbite or chabazite. The way back to Prague took us the rest of the day.

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Fig. 5: Group photo. Photo by J. Mysliveček.

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Heritage stones of the eastern part of the Czech Republic

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In November 2019, there was a fourth excursion of the SGA Student Chapter Prague focused on heritage stones of the Czech Republic. There were 13 SGA members participating in this event. We visited several localities in eastern Czechia, mainly in the Železné hory area, which is an important and government protected geological site (since 1991). Within a relatively small area (248 km^2), there can be found more than one hundred rock species of Proterozoic, Paleozoic and Mesozoic ages.

We started our excursion with a visit of the Skuteč-Přibylov quarry (GPS: 49° 51' 39.92" N, 15° 58' 59.99" E). The early mining activities in the surroundings of Přibylov city started in the 19th century. They were mining pale, Turron age, fine-grained calcareous sandstone (light yellow colour), which are partially silicified. Those layers are from 14.3 m to 34.0 m thick and dip 2-7° NW to N. Those layers are not rich in fossilized material. There are rarely encountered pieces of wood, bark etc., which support the theory of forming in a shallow coastal area of sedimentation (Rybařík 1994). This place was mined for almost hundred years until 1910. Since 1974, mining activities were restored by the Sates Čechy, s.r.o. company. Currently the stone is used as building material and for restoration of historical sites (Rybařík, 1994 and Doucek, 2012).

The second locality was an operating mine close to Lipnice nad Sázavou city (GPS: 49° 37' 16.533" N, 15° 24' 41.548" E). Here, they are mining the so-called Lipnice granite, which genetically belongs to the Světelský massif. It is a muscovite-biotite, pale grey coloured granite usually with biotite nodules up to 3 cm in diameter and xenoliths of gneisses. The Lipnice granite is mainly used for cobblestone and polished plates. It has been previously used for example in the Prague metro system or during restoration of the National Theater, and it is also an important commodity for export (Rybařík, 1994).

Fig. 2: Granite cutting in Lipnice nad Sázavou. Photo by M. Tuhý.

We also visited the old open pits in the surrounding of Lipnice nad Sázavou city. Several places were used by the sculptor Radomír Dvořák, and he made his famous „mouth “, „ear “ and „eyes“ in wall statues. The last place we visited was the glass-work company Bohemia Crystal Glass in Sázava city. This company is well known as an exporter of high-quality bohemia crystal glass.

Acknowledgements

The financial support from Severočeské doly, a.s. and Kotouč Štramberk, spol. s. r.o. through the Český komitét pro mezinárodní geovědní programy UNESCO (ČNK-IGCP, project IGCP 637 – Heritage

Fig. 1: Skuteč-Přibylov quarry with layers of calcareous sandstones. Photo by M. Tuhý.

Fig. 3: Heap of granite in the Lipnice nad Sázavou mine. Photo by M. Tuhý.

Stone Designation) is gratefully acknowledged. We would like to also thank to RN Dr. Barbora Dudíková Schulmannová from the Czech Geological Survey for organizing this excursion, Mgr. Marek Chvátal from the Museum of Vysočina in Havlíčkův Brod and RN Dr. Daniel Smutek from Water Sources Chrudim, spol. s.r.o.

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Fig. 4: Sculpture of granite ear made by Radomír Dvořák. Photo by M. Tuhý.

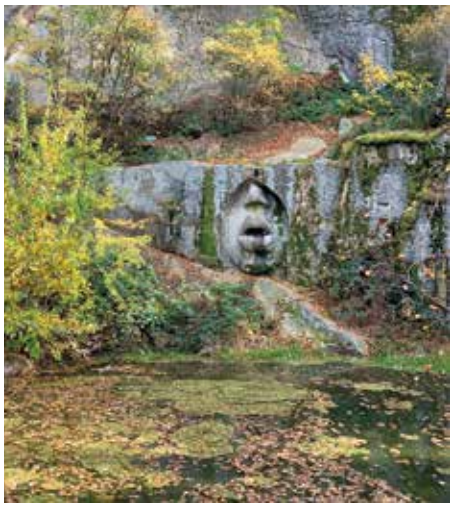

Fig. 5: Sculpture of granite mouth made by Radomír Dvořák. Photo by M. Tuhý.

A Fieldtrip to Kola Peninsula

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The North-West Russian SGA Student Chapter organized a week long trip through the Kola Peninsula, from 15-20 September 2018, accompanied by members from the Siberian and Baltic SGA Student Chapters (Figure 1). The Kola Peninsula is a magnificent region with vibrant geography and unique geology, which is represented by alkaline, ultramafic and metamorphic rocks. The purpose of the trip was to learn about the geology of the peninsula and its main kind of ore deposits. This trip included visits to several locations in the west part of the peninsula: Khibiny Mountains, Kovdor mining operations and the Monchegorsk layered intrusion.

The Khibiny Mountains represent an impressive massif as a plateau with steep slopes. The Khibiny Mountains have a circular-type structure. Individual complexes of rocks comprise the arches as they were emplaced into another, while remaining open on one side. These relationships can be explained by magma penetrating along faults. The massif represents a suite of magmatic rocks comprised of alkaline rocks, noted for more than 100 unique minerals found here. For a long time, different minerals have been mined here, such as apatite, nepheline, mica, iron ore, copper, nickel and construction materials.

Our visit to Khibiny Mountains was divided into two days, each day included a

Figure 1. Members of the field trip on the top of the Khibiny massif.

Figure 2. The landscape of Lake Small Vudyavr and the spurs of Mount Takhtarvumchorr.

Figure 3. A contact between a tinguaite dyke and host nepheline syenite.

Figure 4. A guide's dog on dump of pyrrhotite ore.

track for about 15 km through the mountainous landscape. Excursions took place in the area of Lake Small Vudyavr and the spurs of Mount Takhtarvumchorr on 15 September (Figure 2) and in the gorge of the Blue Lakes and Pyrrhotite gorge on 16 September. Our guides were the geologists of the Kola Science Center, thanks to them we learned many interesting facts about the geology of the Khibiny Mountains and the history of its development.

On the **first day**, the excursion participants visited the galleries of a molybdenite mine, which started in the 1930's to explore a small occurrence of a particularly valuable strategic mineral in those years. Young specialists examined with great attention the occurrences of molybdenite in albitites and alkaline pegmatite veins. The second objective on this day was the Tinguaite - alkaline dyke rocks, which have unusual "tortoise" textures and a beautiful green colour of a wide variety of shades (Figure 3). It is believed that Tinguaite with such a texture is found only in two places: the Tingua Mountains in the province of Sierra de Tingua (Brazil) and the Khibiny massif.

The **second day** of the excursion took place in the gorges of Mount Aikuivenchorr. We had a route along a small river, which presented picturesque autumnal views of the Khibiny area. The first objective of the second day was the Pyrrhotite gorge, where we saw large dumps of sulfide ores (Figure 4). Since all the rocks were covered, the students entertained themselves with their exploring to find the most beautiful and representative samples. The next stop was on the top of the Blue Lakes gorge with its breathtaking panoramic views of the Prihibinsky

Figure 5. A view of the Prihibinsky plain from the top of the Blue Lakes Hills.

Figure 6. An "aegirine bomb" from alkaline pegmatites.

Figure 7. The student observes the minerals of the Kola area in the Mineralogical museum.

plain, painted in the golden colours of the early northern autumn (Figure 5). Then we reached the dumps of alkaline pegmatites, where of particular interest were the so-called „aegirine bombs" - unique formations composed of radially growing aggregates of aegirine - in the center of which you can find crystals of milky white analcime (Figure 6).

The **third day** we visited the Museum of Geology and Mineralogy, where we saw rocks from the Kola superdeep borehole. Then we went to the Geological Institute of Kola Science Centre RAS, where we visited Mineralogical Museum n.a. Belkov I.V. and research laboratories.

The Museum of Geology and Mineralogy was established in the 1930's at the Khibiny Mining Station of the USSR Academy of Sciences. More than 7,000 samples of minerals, ore and rocks of the Kola Peninsula have been collected in the museum. More than 1,200 samples are presented in showcases. These mineral collections are the most complete on the Kola Peninsula. Among them are rare, new minerals, unique by association, unique in the form of crystallization and the variety of colours and sizes. All of this gives great value to the collections and arouses great interest of visitors (Figure 7).

On the **fourth day**, we visited the Kovdor deposit. The Kovdor massif has a special place among ultrabasic, alkaline rocks and carbonatites and is one of the most interesting places not only on the Kola peninsula, but also in the world. The Kovdor mining region is situated in the taiga of the south-west Kola Peninsula.

The Kovdor massif consists of ultrabasic, alkaline rocks and carbonatites and is circular, with multiple phases of igneous intrusions. It was emplaced into Archaean biotite- and hornblende-biotite gneisses and granite-gneiss of the Belomorsky block of the Baltic shield 360–420 million years ago. The age was determined by U-Pb isotope methods. In plan, the massif has a distinct concentric, zoned structure and contains three pronounced, ring-shaped complexes. Moving from the center towards the outer part of the massif, these are:

1) olivinite;
2) phlogopite-diopside, melilite and other various metasomatic rocks;
3) turjaite and melteigite-urtite.

In cross-section, the massif is almost vertical, slightly narrowing with depth replacing turjaite and melteigite-urite (Shats et al., 1967; Tsiryulnikov et al., 1968). Both, the main rocks of the massif and the host fenitised gneiss are penetrated by dykes of nepheline and cancrinite syenite, ijolite, tinguaite, alnoite, shonkinite and by calcite carbonatite. At the contact of

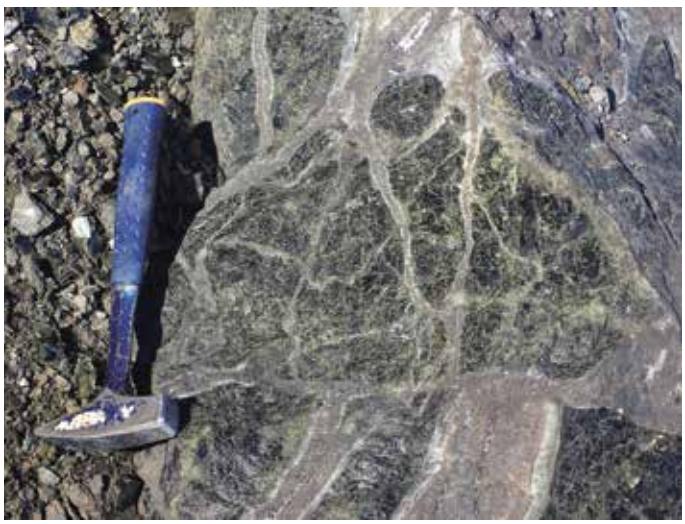

Figure 8. Carbonate rock with diopside and richterite rims, at the right – phlogopite.

Figure 9. Collecting samples at bottom of the open pit.

Figure 10. Students at the Kovdor deposit.

olivinite and foidolite intrusions in the west, the massif is intruded by a concentric zoned stock of phoscorite in the outer zone and magnetite-carbonate rocks (we reserve the name "carbonatite" in this description for typical carbonatite dykes) in the central zone. These rocks form the bulk of the Iron-Ore Complex. In turn, a stockwork of veins of dolomite carbonatite, picrite dykes and numerous pipes containing various breccias are concentrated within the Iron-Ore Complex. The final stages of formation of the massif include low-temperature hydrothermal alteration of rocks located near the present day surface, producing the staffelite and vermiculite complexes.

On this excursion, we visited three different types of deposits: vermiculite and phlogopite deposits on the flanks of intrusion and iron ore deposit at the bottom of the quarry. At the vermiculite deposit we saw mica and took samples for growing plants at home. At the phlogopite deposit students sampled forsterite-diopside-phlogopite rocks with richterite rims (Figure 8).

At the iron ore deposit, we studied the geology of the massif, looked at mining in the open pit and collected beautiful and large idiomorphic magnetite (Figure 8). All participants were delighted with the size of the quarry, which is 2,500 meters in diameter and 500 meters deep (Figure 9). For some students, this was their first time seeing an open pit mine.

On the **last day** of the geological tour, we visited the Monchegorsk layered intrusion. It is one of the most famous layered intrusions in Russia. It is one of the most richly mineralized layered mafic-ultramafic intrusions in Europe, with respect to platinum group elements (PGE), Ni, Cu and Cr. The U-Pb age of the pluton is 2,509-2,487 Ma. The intrusion is connected with Archean metamorphic rocks in the north and Paleoproterozoic rocks of the intercontinental Imandra-Varzuga rift structure (IVS) in the south. Moreover, the Monchegorsk intrusion is associated with the early stage of the IVS development. The IVS has a width of about 350 km from west to east, and varies from 10 km at the flanks to 50 km in the central part. The IVS contains a suite of rocks typical of rift-related events (i.e.: a suite of sedimentary-volcanic, intrusive and dyke complexes).

The Monchegorsk Intrusion has an area of about 65 km^2 and has a complex structure. It consists of two branches: a NNE-trending branch comprising the Nittis, Kumuzhya and Travyanaya (NKT) massifs and an ENE-trending branch comprising the Sopcha, Nude-Poaz and Vurechuaivench massifs. In addition, the Mon-

Figure 11. Pavel Pripachkin discusses the geology of the Monchegorsk intrusion.

chegorsk intrusion includes the so-called Dunite Block that hosts the Sopcheozero chromite deposit. The relationship of this block to the remainder of the Monchegorsk Intrusion remains under debate.

The plutonic section begins with branch NKT and is composed (from bottom to top) of quartz-bearing norite and gabbronorite of the basal (bottom) zone with a thickness of 10-100 m, harzburgite (100-200 m), alternating harzburgite and orthopyroxenite (250-400 m) (Kumuzhya) and orthopyroxenite (300-700 m) (Nittis-Sopcha). The branch of NKT, as well as the Sopcha, includes the syngenetic sulfide mineralization: the lowest deposit. Sulfide veins and low sulfide mineralization, which is named the 330 horizon. The total thickness of array 1 increases from north to south from 200-300 to 800-1,000 m, the thickness of rocks in the area of Mount Sopcha is 1,100-1,600 m.

The NE branch is folded in the bottom part of quartz-containing gabbronorite and norite with a thickness of up to 50 m, then melanocratic norite with lenses and layers of olivine-containing rocks — harzburgite and norite (NUD) and in the upper parts — meso-and leucocratic norite and gabbronorite. The total thickness of the section of the chamber varies from 300-400 to 600-800 m. In the middle part of the section of Mount Nyud lies the so-called „critical“ horizon, saturated with xenoliths, partially melted. It fixes the transition from olivine-containing to non-olivine, plagioclase rocks. The section of the eastern chamber is covered with metamorphosed gabbronorite and leucogabbro-anorthosite occurring in the Vurechuaivevench mountain.

Our group of students visited several different types of mineralization. They are: low sulfide PGE mineralization in “330 horizon”; sulfide ores with rich concentrations of PGE in NKT massif; chromite mineralization in Dunite Block and Cu-Ni-sulfide mineralization.

Figure 12. Participants of the excursion examine a sulfide vein.

The ore layer “330 horizon” refers to the syngenetic type of PGE-low-sulphide ores. It is called this because across the mountain Sopch at a height of 330 meters this mineralization occurs. Ores with disseminated sulfides comprise up to 10% of the rock volume. The main minerals are pentlandite, chalcopyrite, pyrrhotite and pyrite. PGM are represented by merenskite, intermetallic compounds (Pd, Pb) and (Pd, Rh and Cu). In addition, the presence of Pd impurities in pyrrhotite and chalcocite and Ir in pentlandite has been established. The metal contents in the ore are: Ni - 0.10–0.77 wt. %, Cu - 0.02–0.35 wt. %, Pt up to 0.25 ppm, Pd up to 1.6 ppm with Pd/Pt=4 and

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there are also elevated Rh contents up to 0.1 ppm (Figures 10 & 11).

Sulfide veins are confined to the system of prototectonic disturbances and localized in the peridotite zone. Veins consist of several horizons. The upper horizon is represented by PGE-Cu-Ni (chalcopyrite-pentlandite) ores, below is uneconomic pyrrhotite-chalcopyrite ores, the middle one is PGE-Cu (chalcopyrite) and the lower horizon is mineralization that is dominantly pentlandite. Average metal concentrations in ore: Pt - 6.73 ppm, Pd - 1.42 ppm, Au - 0.21 ppm, Ni - 4.94 wt. %, Cu - 3.05 wt. %. formed by filling the contraction cracks with the sulfide melt during the cooling of the massif (Figure 12).

The Sopcheozerskoe chromite deposit is located in the southwestern part of the Monchegorsk pluton and is confined to dunites of the Dunite block. The chromite deposit is represented by one gently dipping layer 1.2 km long and 80 to 225 m wide. The main ore-forming mineral is chromite. The defined resource of chromium mineralization is 9.5 million tons, with an average Cr_2O_3 content of 24 wt. % (Figure 13). In terms of chromium ore resources, the Sopcheozerskoye deposit is in 2nd place in Russia, second only to the Aganozerskoye deposit of the Burakovsky massif in Karelia region.

The participants of the excursion, including geological students from Poland and Finland, showed genuine interest in the geology and mineralogy of such a unique location as the Khibinsky massif. The participants selected a significant number of representative samples of rare minerals and rocks of the massif. For all students it was a unique opportunity to visit the Kovdor mine. The mine management were helpful to us, told us about geology and let us visit the quarry by bus. The students also enjoyed the Monchegorsk intrusion, which is pictured in the last photo (Figure 14), as it is a small but highly mineralized massif with rocks and minerals that typify the ore.

The North-West students SGA chapter thank the staff of the Geological Institute KSC RAS, St. Petersburg State University and management of the Kovdor mining company for their assistance in organizing the excursion.

Figure 13. Dunite rocks in Sopcheozerskoe deposit

Figure 14. SGA student group in open pit at Nud-II.

People

Homage to Donald Frederick Sangster, 1935 – 2018

Charlie Jefferson[1*], Georges Beaudoin[2], Alex Brown[3*], Jim Franklin[4], Tom Frisch[1*], Beth Hillary[1*], and Bill Poole[1*]

[1] *Geological Survey of Canada*
[2] *Département de géologie et de génie géologique, Université Laval*
[3] *École Polytechnique de Montréal*
[4] *Franklin Geosciences Ltd.*
[*] *Retired*

Don Sangster focused on the geology and genesis of lead-zinc deposits throughout most of his career. As noted in the nomination for his Logan Medal, he had an uncanny ability to see a complex problem in its simplest elements, apply exactly the correct tools to investigate the genesis of a mineral deposit type, and then report the results and their genetic implications, elegantly and with profound insight. He showed admirable acumen when advising environmental panels, Ministers and foreign governments, and considerable skill editing significant journals and special publications. He was also a friendly, collaborative colleague with impeccable conduct, mentored many who have since become prominent researchers. Don also made a point of leaving his geological research at work – while at home, he focused on his family, friends, expert hobbies such as making 30 beautiful and seaworthy cedar strip canoes, and his community volunteer activities such as fire fighting and scouting. He joined the Geological Survey of Canada in 1964, and throughout his 30-year formal career, 2 ½ years of Emeritus and 20 years of alternating consulting and volunteering, Don was highly respected as a researcher, sought out for his sage advice, and regarded in awe for his ability "to git 'er done" succinctly and on time. This did not get in the way of his sense of humour. Don fashioned a nameplate for his office door, reading P.B. Zinc, and was duly recorded in the next GSC telephone directory as Zinc, P.B. From then on, he was known as Mr. P.B. Zinc!

Dr. Sangster was widely recognized for his exceptional contributions to Economic Geology. He was Distinguished Lecturer of the Canadian Institute of Mining and Metallurgy (1973), Thayer Lindsley Distinguished Lecturer of the Society of Economic Geologists (SEG) (1983), International Lecturer of the SEG (1988), and Visiting Senior Scientist at the University of Oslo, sponsored by the Royal Norwegian Council for Scientific and Industrial Research (1992). He earned the Duncan R. Derry Medal of the Geological Association of Canada (GAC) (1981), the Silver Medal of the SEG (1984), the Past-Presidents' Medal of the Mineralogical Association of Canada (1986), and the Logan Medal of the GAC (1998). Don served in many capacities in the SEG, became its exemplary president in 1994-95 and, according to Brian Skinner, he steered it toward being a truly international organization.

Don was born on August 3, 1935 in Sherbrooke, Québec to a family of community builders. Unsure of his career interests, he pursued his first B.Sc. in Chemistry, at Bishop's University. While in his third year, he discovered Geology while accompanying a friend's father to a job interview at a small lead-silver mine in the Gaspé Peninsula. Fascinated by the minerals he could see in the mine dump, he decided on his future profession right there and then. He finished his chemistry degree in 1955, and went on to obtain a B.Sc. and M.Sc. in Geology from McGill University in 1958 and 1961, respectively, and a PhD in Economic Geology from the University of British Columbia in 1964.

Don's career with the Geological Survey of Canada (GSC) began with support of his PhD thesis on iron skarn deposits in British Columbia. He became a GSC iron researcher right after graduation, and led major interdisciplinary (including geophysics) field studies to document and conceptualize iron metallogeny, terminology and processes such as skarnification. Don soon pursued Canadian volcanogenic massive sulfide (VMS) deposits research,

and produced comprehensive databases and models. Jim Franklin recalls that Don was the first to recognize the Flin Flon – Snow Lake greenstone belt, and its enclosed VMS deposits, as Proterozoic rather than Archean. Don's GSC Paper 72-22 entitled "Precambrian volcanogenic massive sulphide deposits in Canada; a review", a "best-seller" among GSC publications, became the "standard of its time" for research, was required reading for students, and changed discovery concepts for these economically important deposits. It contained the first mention of "mill-rock" which became an iconic term for describing key volcanic host rock types of VMS deposits and camps. That term came from Don standing on an outcrop of volcanic breccia and telling his field trip companions that once you recognized that lithology, you could "cup a hand around your ear and hear the future mill grinding the ore, just over there".

In the early 1980s, Don delved into the sedimentary Pb-Zn realm, both Sediment-Hosted Exhalative (SEDEX) and Mississippi Valley Type (MVT) types. His constructive start for SEDEX was to organize the 1983 CIM Short Course on "Sediment-hosted stratiform lead-zinc deposits", held in Victoria. This brought together current experts, many of them exploration geologists. His Short Course Notes crystallized working knowledge as a basis for future research. Cominco highly commended Don's explanation of the Sullivan deposit; it served as their exploration model for years.

He also kicked off a major International Conference on Mississippi Valley-type Lead-Zinc Deposits with his 1983 paper, entitled "Mississippi Valley-type deposits: A Geological Mélange", that fronted the Proceedings Volume that was co-edited by G. Kisvarsanyi and others. He then studied both SEDEX and MVT deposit types, both intrinsically and in relation to each other. Into the MVT dialogue, Don introduced more of his colourful expressions, such as the unique "snow-on-the-roof" texture, resulting from internal sedimentation on collapse-breccia blocks. He further documented the importance of paleo-karst, basement and reef structures to their genesis. Don solved a fundamental blockage in the genesis of MVT lead-zinc deposits by adding high-resolution palaeomagnetic calculations from Dave Symons' lab at the University of Windsor to constrain their ages that were previously open to dispute, but now are linked to orogenic events worldwide. He and Dave published seven papers on various districts, culminating in their 1994 review: "Palaeomagnetic methods for dating the genesis of Mississippi Valley-Type lead-zinc deposits." Right after retirement from the GSC, Don chaired the major 1995 SEG International Field Conference on MVT in St. Louis MO, complete with international field trips, and edited the proceedings as SEG Special Publication No. 4 (664 p.).

Don led in the technology and delivery of government mineral resource assessments. He was one of those chained to their desks for the 1972 Operation September report, a secret national appraisal that foresaw major discoveries such as Windy Craggy. His 1983 Geoscience Canada synopsis of GSC resource assessment recruited at least one young scientist to the public service for this honest-broker task. After completing his final national assessment for mineral policy, Don joked that with its "SECRET" designation, he could no longer read his own work!

Don co-supervised formally and informally, collaborated and co-published with many young scientists and assistants, before, during and after his GSC years. Jim Franklin marveled at Don's organizational abilities in this regard – he would be working on a paper, be interrupted by some brash young scientist, sort the person out, pick up the pen and finish the sentence! It would take most others a day to pick up the "thread". Don was an outstanding PhD supervisor, constantly probing hypotheses with pointed questions. He would give students considerable autonomy and not meddle in details, but laid bare any poorly supported conclusions. Serious discussions with Don invariably devolved into humour. A desk outside his door, termed his "farm system", kept students at bay until he had finished a task and then called them in. Don also taught many how to write in English, although Don complained he had to buy a new red pen each time a student gave him a draft. Many prominent scientists in universities and geological surveys around the world (e.g., many in Canada and at least four in Morocco) owe Don their start in geoscience.

Don gave freely of his time to family and friends, students and colleagues, and to his community. He was a volunteer Firefighter, Boy Scouts leader, artisanal canoe builder, pig roaster, beekeeper, storyteller, hunter, backcountry canoeist, hiker and camper. He overcame major medical challenges: such as barely surviving a ruptured spleen and broken back, suffered in a helicopter crash, quadruple bypass surgery, years of dialysis, and fighting off blood infections. Don died peacefully in hospital, in Ottawa, Canada, on December 28, 2018. He is survived by his wife of >50 years, Eleanor (née Doherty), his children Vicki Williams (Michael), Cameron (Alicja), Sharon and Geoffrey, his grandchildren Lewis and Sonia, his sister Janet Bourgeau (late Angus) and his brother James Sangster. To the end, Don provoked, innovated and was incredibly precise and productive in whatever he did. All who knew him enjoyed his dry wit, his easy manner and his genuine warmth. We shall miss him greatly.

APPLIED to MINERAL DEPOSITS SOCIETY FOR GEOLOGY

Homage to Jeremy Peter Richards, 1960 – 2019

Harquail School of Earth Sciences[1]

[1] *Laurentian University, Canada*

On 7 June 2019, the Mineral Exploration Research Centre and Harquail School of Earth Sciences at Laurentian University and the greater geoscience community lost an esteemed colleague, friend, mentor and award-winning scientist with the passing of Professor Jeremy Richards. Jeremy was a Tier I Canada Research Chair in the Harquail School and led a large and productive research program, including many graduate students, post-doctoral researchers and visiting scholars, who conducted research throughout the world.

Jeremy was born in 1960 in the UK and was awarded a BA Honours (1st Class) degree from the University of Cambridge in 1983 and 1987, a MSc degree from the University of Toronto in 1986 and a PhD degree from the Australian National University in 1990. He did post-doctoral work at the University of Saskatchewan between 1990 and 1992 and taught at the University of Leicester between 1992 and 1997 and at the University of Alberta between 1997 and 2017 before joining the Mineral Exploration Research Centre and Harquail School of Earth Sciences at Laurentian University as Tier I Canada Research Chair in Metallogeny in 2017. He was a registered Professional Geologist in Alberta and Ontario.

Jeremy was a world leader in the regional tectonics and metallogeny of hydrothermal ore deposits, particularly porphyry and epithermal deposits, including post-subduction deposits in the Eastern Tethyan Orogenic Belt. He obtained millions of dollars in funding for his research from federal and industry sources, authored or co-authored more than 100 peer-reviewed journal articles in some of the top geoscience journals in the world, including Nature Geoscience, Geology and Geochimica et Cosmochimica Acta, and gave over 140 invited presentations all over the world. He served as Editor of Exploration and Mining Geology, an Associate Editor of Mineralium Deposita and Economic Geology and as Editor or Co-Editor of numerous special volumes, including the Economic Geology 100th Anniversary Volume.

Jeremy was also an impassioned advocate for sustainable development, particularly as applied to the minerals industry. Several projects examining various aspects of the industry were initiated between 2001 and 2019, five involving PhD, MSc and MA students, and in 2002–2003, he was Chair of the Canadian Geoscience Council Standing Committee on Sustainable Mineral Resources Development. He was a keynote speaker at several international conferences and 2009, he edited and published a book entitled Mining, Society, and a Sustainable World. He also served as a Council member for the Society for Geology Applied to Mineral Deposits (SGA) and the Society of Economic Geologists (SEG), served on many SEG, Geological Association of Canada (GSA) and Canadian Institute of Mining and Metallurgy (CIM) standing committees and reviewed papers for all of the top geoscience journals.

Jeremy was above all a highly creative researcher, who generated original interpretations and new ideas, some of which resulted in provocative papers that led to debate and further research. Similarly, he did not shy away from administrative and procedural issues in science and academia that appeared to run counter to the best interests of research and education. His outspoken commentary gained him many enthusiastic followers.

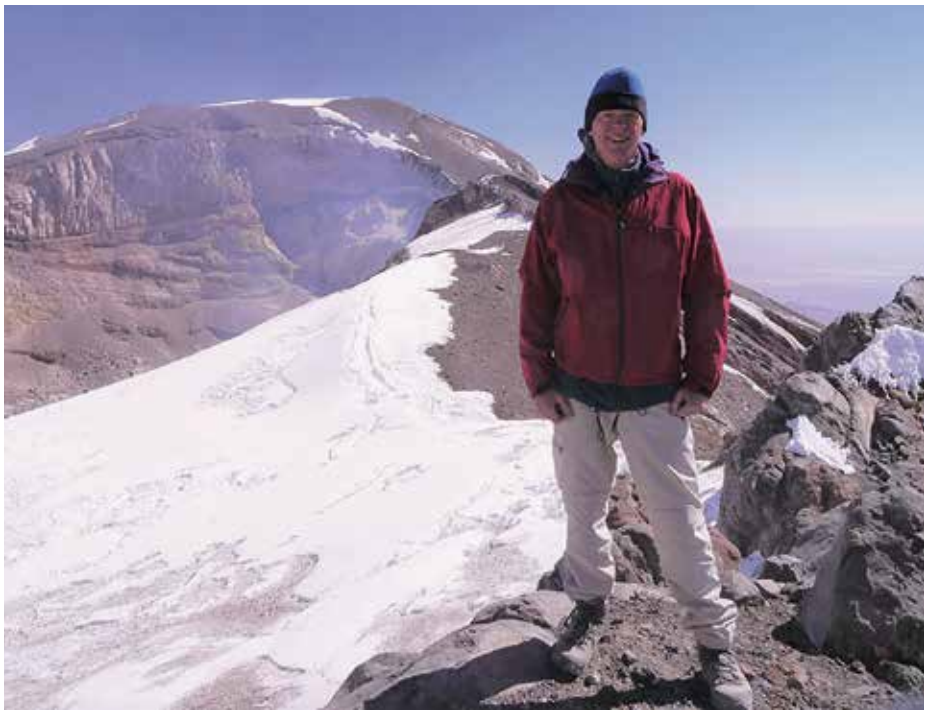
Jeremy's students remember him for his beautiful and insightful geological figures and meticulous attention to writing style, grammar, and punctuation and his generosity in supervising and hosting so many students, scientists and industry professionals from "developing" countries, including China, Iran, Pakistan and Turkey.

For these many accomplishments, Jeremy was awarded the Society of Economic Geologists Lindgren Award in 1995, the International Exchange Lectureship in 2002-2003, the Silver Medal in 2015 and the Thayer Lindsley Visiting Lectureship in 2016. He was also awarded the Geological Association of Canada Hutchison Medal in 2007, the Canadian Institute of

Mining and Metallurgy Julian Boldy Memorial Award in 2007 and the Geological Association of Canada Mineral Deposits Division William Harvey Gross Award in 2001 and, most recently, their prestigious Duncan R. Derry Medal in 2019.

Jeremy served as a major exploration consultant for many junior mining companies, for which he had an important role in the exploration for and discovery of many deposits around the world, including potentially world-class deposits in Peru, Chile, Turkey, Iran, Pakistan and China. His interests did not stop at science. He pursued other activities with the same passion that he gave to his science – he was an avid guitarist, hiker, scuba diver and cat lover.

Professor Jeremy Richards was one of the top economic geologists in the world and will be sorely missed by his family, friends, students and the academic community as a whole.



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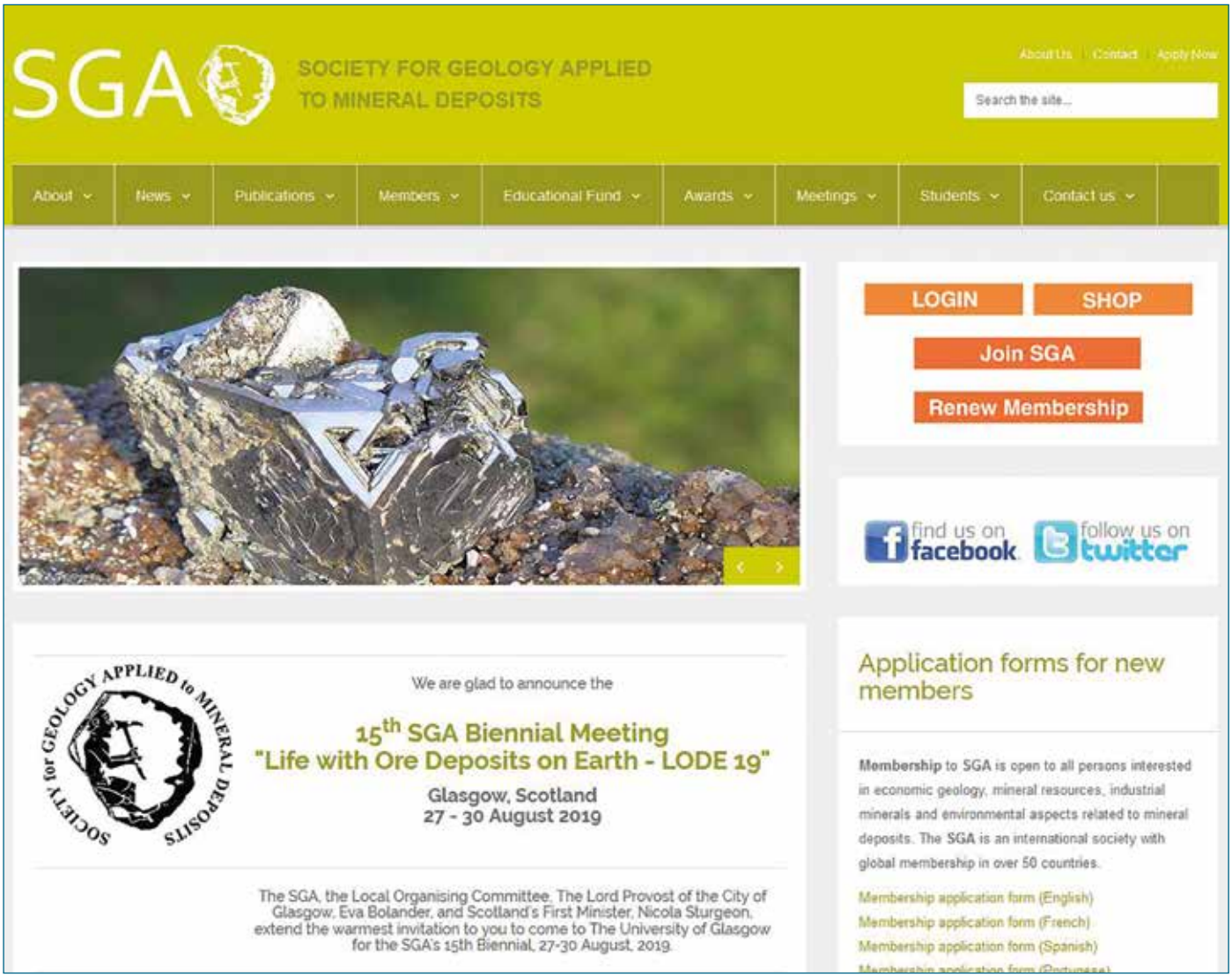

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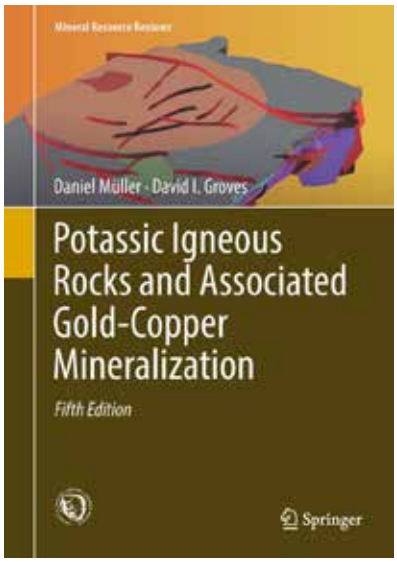

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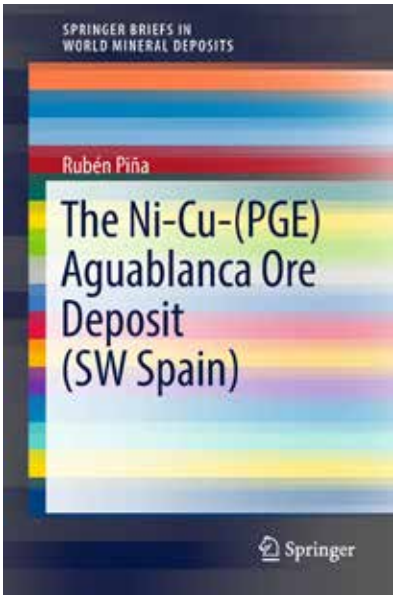

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Rubén Piña

The Ni-Cu-(PGE) Aguablanca Ore Deposit (SW Spain)

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- Furthers our understanding of Ni-Cu-PGE sulfide deposits in general and the unique geodynamic evolution of the deposit in Aguablanca
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Ghislain Tourigny (Perseus Mining, Abidjan, Côte d'Ivoire)

Introduction

Ivory Coast possesses the largest area of prospective greenstones (Birimian) in West Africa, but is highly under-explored. However, gold is the largest mineral resource among all natural resources in Ivory Coast with the largest gold mines: Tongon, Bonikro, Ity and Angovia. Since Ivory Coast is politically stable in recent years and significant technological advances have been achieved, a new gold rush has kickstarted. At present, Ivory Coast is becoming one of the most productive countries for gold mining in Africa. Production roughly increased two-fold between 2013 and 2015 from 13.0 t to 23.5 t of Au. More companies are obtaining licenses for exploration for gold ore deposits in eastern, northern and the southwestern part of the country.

Most of the deposits are orogenic-type gold mineralization, sedimentary rock-hosted and occur as quartz veins or in sheared carbonate sedimentary rocks (with diorite sills), carbonate-hosted (e.g. Au-bearing skarn) and as placer gold.

Innovation in exploration relies on reducing drilling, analytical and processing costs in order to increase resource efficiency. This can only be achieved with a smart combination of regional and local data on the ore deposits (structures, footprints, mineralogical and chemical vectoring tools), using airborne and ground sensing technologies (e.g. seismic, gravity, radar, IP resistivity, electromagnetics) adapted to explore at surface and depth. Smart drilling followed by closed sensing data on drill-cores (portable instruments and automated core-logging) will speed up exploration, reduce waste and environmental impact while increasing metal recovery. Geometallurgy is a key parameter for improved beneficiation and processing design.

The 6th short SGA short course on Gold will cover these topics. It is addressed to researchers, lecturers, PhD students, geologists from exploration, mining companies and government institutions.

Venue

The five-day short course will be held at the Institute National Polytechnique Félix Houphouët-Boigny, Yamassoukro about 3 hours north of Abidjan from 28th October to 1st November 2019. The short course is composed of 2.5 days lectures and 2 days

Accommodation (proposition)

Hotel	Locality; contact	Approx. price in FCFA
Hôtel Fanon	Rue des Lacs hotelfanon@aviso.ci Tel.: +225 08 58 60 32	15,000 – 35,000
Hôtel Behira	Quartier Millionnaire	15,000 – 35,000
Hôtel Fondi	Quartier Assabou	15,000 – 25,000
Hôtel Bacambel	Quartier Assabou	15,000 – 35,000

excursion (Yaoure gold mine and surrounding area).

Participants must arrive on the 27th of October in Abidjan. The transfer by minibus from Abidjan airport to the hotel will be organized. Participants will leave together the 28th October in the morning from Abidjan to Yamoussoukro by minibus and dropped-off at their accommodation.

Number of participants

A maximum number of 45 participants is set for logistic reasons and in order to ensure maximum benefit for each participant. It is expected that participants from industry meet and exchange with academia (researchers, lecturers and students).

Fees short course

The course fee includes the 2.5 day lectures and 2 day field trip, mine visit, course material and light meals during the course and a short-course banquet.

Lectures

- Industry: 900 €
- Government/academia: 400 €
- Students: 300 €

Field trip

- Industry: 700 €
- Government/academia: 200 €
- Students: 100 €

Costs for travel to and from Abidjan, accommodation, breakfast and dinner are excluded. Students and young researchers can request a grant. Grant application is available on the website.

Social events: ice-breaker party, dinner and visit to the cathedral in Yamoussoukrou.

VISA: After registration and payment, a formal letter will be sent for VISA application.

Language: the workshop will be held in French and English.

Contact: Beate Orberger (beate.orberger@u-psud.fr)

Lecturers

Lenka Baratoux, PhD, researcher at Institute de Recherche pour le Développement (IRD), Toulouse, France. She is a field geologist with a specialization in structural geology and petrology. She is particularly interested in geodynamics of Precambrian terrains and timing of the gold and base metal mineralization within the global tectonic scenario. Since 2006, she has been working in West Africa (Burkina Faso, Ghana, Niger, Senegal and Ivory Coast) in the framework of the West African Exploration Initiative project.

David Baratoux, a senior researcher at the French National Research Institute for Sustainable Development. His research interest is the evolution and differentiation of planetary crusts. The objective of this research is to understand the distribution of elements within the crust at all scales, including extreme concentrations of metals (i.e, ore deposits of economic interests). An important aspect of his research activities is to develop partnerships with scientists in developing countries and to focus on research areas corresponding to the most pressing issues in these countries. He is involved in the West African Exploration Initiative (http://www.tectonique.net/waxi3/), the AMEDEE network (Mining Activities, Environment, Economic and Ethical Development, http://www.amedee-network.science) and is also leading the Africa Initiative for Planetary and Space Science, AFIPS, https://africapss.org).

Lionel Boya, PhD in Earth Sciences, option Petrology-Geochemistry-Metallogeny. In the last 4 years, Lionel is a research professor at Université Félix Houphouet-Boigny and consultant at GEORECO. Lionel worked for almost 10 years on different topics: the petrology, metallogeny and geochemistry of hydrothermal alteration of gold deposits in west Anti-Atlas (Morocco), the geology of epithermal deposits of the El Hammam district (fluorite) and the Imiter Mine of silver (east Anti-Atlas), also in Morocco. He began his career as a geologist, tin exploration project manager at MANAGEM Group, before working on the group's largest project, Imiter, as geologist responsible for production areas. He has contributed to some research work on Birimian gold mineralization, particularly located in the Toumodi-Fètêkro greenstone belt. As a consultant, he assisted some companies in research (gold mineralization, diamond, raw material cement, etc.). He also provides training for officials of the Ministry of Mines and Geology.

Jochen Kolb, Professor, Karlsruhe Institute of Technology (KIT), Karlsruhe, Germany. Jochen Kolb has more than 20 years of experience in research on Archean and Paleoproterozoic orogenic gold deposits worldwide. He has both, university experience and experience in working in a geological survey. Jochen studies orogenic gold deposits with a holistic approach, using structural geology, petrology, geochemistry and isotope data. He also worked on other hydrothermal gold mineralization types, such as copper porphyry and epithermal deposits. He has a strong field work background from projects in Greenland, with mapping of Archean and Paleoproterozoic terranes.

Beate Orberger is Associate Professor at the University of Paris Sud, Orsay, France and president of Catura Geoprojects (Geoscience Conseil). She has 30 years of experience in economic geology and geometallurgy, mainly on sediment-hosted iron and manganese deposits (Brazil, Australia, South Africa, Zimbabwe and Gabon), but also on Ni and Mn laterites. She worked for 5 years for ERAMET. Her major research contributions are in the field of metal transfer and trapping during fluid circulation (magmatic, hydrothermal and weathering processes). At present, she is scientific coordinator of several EU-financed projects (H2020, EIT-KIC) constructing combined drilling and on-line-on-mine-real time analytical expert systems to increase resource efficiency during exploration, mining and processing. She is SEG fellow and SGA councilor.

Peter Williams has livelong experience in exploration geophysics. He worked for Western Mining Corporation, Australia, as Chief Geophysicist and Manager of Geoscience Technology. Since then, he has been on the forefront of exploration and founded several companies that were directly responsible for major discoveries and asset identification, also in West Africa. As well as working in industry, he also holds adjunct positions at the Western Australian School of Mines, Curtin University and lectures at ENAG (Ecole nationale d'applications des geosciences) in France.

Two more lecturers (Academia and Industry) will be appointed.

6th SGA-SEG-UNESCO-IUGS Short Course on African Metallogeny

Gold Deposits: from Exploration to Mining

organized by
Society for Geology Applied to Mineral Deposits (SGA)
in cooperation with
INP HB, Yamoussoukro
Université Félix Houphouët-Boigny, Abidjan
RH Excellence Afrique, Abidjan
IRD
Université Paris Saclay (GEOPS)

supported by
SEG, UNESCO and IUGS

to be held in
Yamoussoukro, Ivory Coast, 28th october – 1st november 2019

Pre-Registration Form and Application for Financial Support

Please send this form by e-mail to
mailto:beate.orberger@u-psud.fr
For more information on the Short Course see http://e-sga.org/

PERSONAL INFORMATION

First name:		**Surname:**		
Date of birth:	**Place:**	**Country:**	**Male / Female** ☐ / ☐	**Member SGA:** ☐ **Member SEG:** ☐

PERMANENT RESIDENCE

Street name and number:		**Place:**
Province:	**Country:**	**Postal Code:**
Telephone:	**Fax:**	**e-mail:**

EDUCATION

	Institution	Place	Country	Degree	Duration from:	Duration to:
Education						

INFORMATION ON HOME INSTITUTION OF APPLICANT

Name:		
Street name and number:		**City:**
Province:	**Country:**	**Postal code:**
Telephone:	**Fax:**	**e-mail:**

Position:						
Head of department:						
Type of institution	**University** ☐	**Geological Survey** ☐	**Research Centre** ☐	**Public enterprise** ☐	**Private company** ☐	**Other (detail)** ☐

INFORMATION ON PARTICIPANTS REQUESTING A SCHOLARSHIP

I am currently preparing/conducting the following:
a) BSc thesis (university) ☐
b) MSc thesis (university) ☐
c) PhD thesis (university) ☐
d) Research work outside university (most relevant, institution) :
e) Other:

Brief motivation for your participation in the course :

Have you participated in previous SGA-SEG short courses?	YES ☐	NO ☐	I request a grant for:	Transport ☐	Accommodation ☐
I have received support from UNESCO, SGA, SEG or any other organization/institution for previous similar short courses	YES ☐ Year:	NO ☐	I have received support/scholarship from UNESCO for other activities ☐		Which activity? Year:

LIABILITY

I assume full responsibility in case of accident, disability, illness or death that might occur during the course or the field trip. I herewith renounce any claim to financial compensation in respect of damage that could affect me as a result of participating in the course and/or the field trip and thus release the course organizers from whatever responsibility. I confirm that all information provided above is correct.

Name:

Date: **Signature:**

Registration Form for Individuals

6th SGA-SEG-UNESCO-IUGS Short Course on African Metallogeny
Yamoussoukro, Ivory Coast, 28th october – 1st november 2019

Gold Deposits: from Exploration to Mining

Title:
First name:
Surname:
Company name
Company address:
Country:
Contact Tel.:
e-mail:

Registration fees for the 2.5 day workshop-lectures

☐ Industry 900 €
☐ Government/Academia 400 €
☐ Student 300 €

Registration fees for the 2-day workshop-lectures

☐ Industry 700 €
☐ Government/Academia 200 €
☐ Student 100 €

I am an academic without sufficient funds or a student and apply for a subsidy (see separate form – application for subsidy) YES ____
NO ____

E-mail this form to beate.orberger@u-psud.fr not later 15th september 2019.

On confirmation of your places, we will ask you to transfer the registration fee to the following bank account:
Name of the bank: Credit Suisse
Address: Postfach 500, CH-8070 Zuerich, SWITZERLAND
Account holder: SGA
IBAN (International bank account number): CH4604835181963192000
BIC (Bank identification code): CRESCHZZ80A

SGA membership forms can also be downloaded in 5 different languages from the home page of our website www.e-sga.org

Business Card
Staple HERE

SGA

Society for Geology Applied to Mineral Deposits (www.e-sga.org)

APPLICATION FORM FOR NEW MEMBERS

I would like to become a member of the **Society for Geology Applied to Mineral Deposits** and to receive my personal access to **Mineralium Deposita**. Membership fees will be due after acceptance of the membership application.

- Note that incomplete forms and those that are not legible will NOT be processed! -

Last name*	
First name*	
Title	
Postal address*	
Phone	
e-mail*	
Academic degrees	

*** mandatory fields**

Select your Membership Dues*

☐ 75.00 EUR Regular Member (Printed copy + online access **Mineralium Deposita** and **SGA News**)
☐ 60.00 EUR Regular Member (Online access only **Mineralium Deposita** and **SGA News**)
☐ 10.00 EUR Student Member (Online access only **Mineralium Deposita** and **SGA News**, certificate required)
☐ 60.00 EUR Student Member (Printed copy + online access **Mineralium Deposita** and **SGA News**, certificate required)
☐ 60.00 EUR Senior Member (Printed copy + online access **Mineralium Deposita** and **SGA News**, after retirement, certificate required)
☐ 300.00 EUR Corporate Member (includes 3 printed copies of **Mineralium Deposita**) (for industry only, no academic)

Applications **until September 30th** will be processed for the current year. **From October 1st** membership starts with the following year.

Donation for the SGA Educational Fund

☐ I want to donate _____ EUR to the SGA Educational Fund and
☐ agree that my (or company) name as donor will be published in SGA media/conferences
☐ wish to remain anonymous

*** ☐ I agree to the SGA data privacy policy as published at https://e-sga.org/contact-us/data-privacy-policy**

If my application is approved, I authorize the "Society for Geology Applied to Mineral Deposits" to charge the above amount (please tick) to the given credit card:

☐ VISA ☐ MASTERCARD/EUROCARD

Card Holder* _____ **Expiry date (MM/YY)*** _____

Card No* _____ **3-digit security code*** _____

Signature* _____ **Place and date:** _____

(If you do not intend to pay by credit card, please make a note here and an invoice will be issued after acceptance of your application)

Sponsor (SGA member):

Name Place Date Signature

_____

Send the membership application form to:

Dr. Jan Pašava, SGA Executive Secretary, Czech Geological Survey, Klárov 131/3, CZ-118 21 Praha 1, CZECH REPUBLIC
Phone: ++(420)-2-51085506, Fax: ++(420)-2-51818748, e-mail: secretary@e-sga.org.

Please note that bank charges will not be covered by SGA.

Version June 2018

Myanmar Applied Earth Sciences Association (MAESA)

15 C, Pyi-Htaung-Su Lane,
Saya San Road, Yangon, Myanmar. 11201.
Email: organizingcommittee@maesa.org

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In Partnership with:

Ministry of Natural Resources and Environmental Conservation &
Myanmar Engineering Society (MES)

Pre-Conference Workshops: 29 November; Conference: 30 November–1 December 2019
Upper Myanmar Field Trip: Mandalay-Sagaing-Minwun-Mogok, 2–7 December 2019

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