SGA News
June 2013
Number 33

Metallic mineral deposits in Fennoscandia, Greenland and NW Russia

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The Nordic countries, including Greenland, and NW Russia have a long tradition in mining. Documented mining dates back to the 8th century AD. Today this region is the most important metallic mining district of the European Union. Metals are produced from active mines in all countries except Iceland and related industries are thriving in all countries.

Important ore deposit types include: volcanogenic massive sulphide deposits (Cu, Zn, Pb, Au, Ag), orogenic gold (Au), layered intrusions (Ni, PGE, Ti±V, Cr), intrusive hosted Cu-Au, apatite-Fe deposits, carbonatite and peralkaline intrusions (Nb, REE, Ta, Ti, Zr), and anorthosite-hosted Ti deposits. Besides these well-documented deposits, new kinds of deposits are being explored, e.g., iron oxide-copper-gold (IOCG), porphyry (Cu-Au, Mo, and shale-hosted Ni-Zn-Cu.

The Fennoscandian Shield, which forms a large part of the Nordic countries and the NW Russia and possibly extends into the Archaean and Palaeoproterozoic areas of Greenland, has historically been one of the most active mining areas in Europe. Since the industrial revolution in the 19th century, numerous iron mines were exploited in Bergslagen and, during the 20th century, mining of both base metals and iron ore started in several new mining districts such as the Skellefte and Northern Norrbotten districts in Sweden, the Vihanti-Pyhäsalmi and Outokumpu districts in Finland, the Pechenga district in Russia, Tellnes and Sør-Varanger in Norway, and the Kobberminebugt (Josva and Lilian Mines) and Black Angel mine in Greenland. However, Fennoscandian (the Precambrian Shield together with the Caledonides) can still be regarded as underexplored and having a good potential for major new discoveries, as shown by the discovery of metal, industrial mineral and natural stone deposits made every year in the region. The present economic mineral deposits (Figure 1) are largely concentrated in the Paleoproterozoic parts of the Fennoscandian Shield. Nickel-PGE, black shale Ni, orogenic gold, and VMS, Pb-Zn, BIF and Fe-oxide deposits are the main types of economic interest in the Shield (Table 1). Also, apparent porphyry-style Cu-Au and Mo deposits (e.g., Aitik), anorthosite-hosted Fe-Ti-V, chromite in layered intrusions, and REE and other rare metals in peralkaline intrusions are major deposit

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MAIN FEATURES

News of the Society

SGA Ordinary Council Meeting, April 11, 2013, Lisbon, Portugal

J. Pašava (SGA Executive Secretary), Czech Geological Survey, Prague, jan.pasava@geology.cz

P. Weihed welcomed Council Members (G. Beaudoin, N. Bortnikov, S. Bouhlel, P. Eilu, H. Frimmel, A. Cheilletz, J. Pašava, A. Piestrzynski, J. Relvas, A. Vymazalová, and J. Wilkinson) and guests (E. Jonsson and P. Klingbjer, LOC SGA 2013, Swedish Geological Survey for Item 7 and S. Lange, SGA Treasurer´s Office) and thanked J. Relvas and his team for organization of the meeting and the Geology Department for hosting it.

Minutes of Previous Council Meeting (September 25, 2011, Antofagasta, Chile)

The Minutes were unanimously approved.

Reports of Officers on Council and Matters Arising from These Reports

Reports were submitted by the SGA Executive Secretary, Treasurer's Office, Regional VP for Oceania, RVP for North Africa and Middle East, RVP South America and Chief Editor, SGA News. SGA Annual Report for 2012 was highly appreciated by IUGS. In 2012 SGA membership slightly decreased from 1215 to 1144 (mainly due to non-renewal by some student members).

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

A.Vymazalová to inform SGA Student Chapters about possibility of presentation of major results of Chapter at the SGA General Assembly in Uppsala (August 13, 2013 from 11.00 to 12.00).

G. Beaudoin to contact Barrick Gold to find out if Barrick is interested to continue with SGA-Barrick Young Scientist award through a new written contract.

All Council members coordinated by RVP´s to contact SGA 2012 members who haven´t renewed their membership yet.

J.Pašava to ask Council members who intend to take part in FUTORES Conference (Australia, June 2013) to get in touch with D. Huston to assist him manning the SGA booth.

E. Ferrari to supervise creation of SGA Chapter in Peru and collaboration with Geological Society of Peru.

M. Chiaradia to make sure that printing of SGA News in Heidelberg (after a careful correction by several Council members) will be without serious printing mistakes (e.g., altered titles in no. 32).

All Council members are asked to help M. Chiaradia in identifying potential contributors for the main articles in SGA Newsletter.

D. Layton-Matthews to suggest improvement of SGA website for the next SGA Council Meeting (Uppsala, August 11, 2013).

Editorial matters (B. Lehmann, P. Williams)

The report was given by G. Beaudoin, who became Chief Editor after P. Williams in June 2012. The journal continues to attract a high level of submissions, maintaining an objective of 1000 pages per volume. Two thematic issues are in preparation. He also presented a proposal for the best MD paper award (nominated 5 papers). Council approved the reports with great thanks and the following motions:

J.Pašava to organize electronic vote for the best MD paper award by April 30, 2013 and inform Chief Editors about a result of the simple majority Council vote.

B. Lehmann to inform award recipient about presentation of award during the SGA 2013 Opening Ceremony (Uppsala, Monday, August 12, 2013).

Report of the chair of the Nomination Committee (P.Weihed)

P. Weihed presented the report – a list of nominations with two positions still pending (a subject of adding). Council approved the list and the following motions:

P. Weihed to provide J. Pašava with remaining two names by April 30, 2013.

J. Pašava to organize electronic Council vote.

SGA News

No. 33 June 2013

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SGA News is a publication of SGA (Society of Geology Applied to Mineral Deposits) and appears twice a year.

SGA News can be also read in the SGA homepage on Internet:
http://www.e-sga.org

CONCEPT AND PRINTING

WMXDesign GmbH
Heidelberg, Germany

LAYOUT

Massimo Chiaradia, Geneva, Switzerland

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Items for publication may be sent to: SGA News (see address below)
Manuscripts should be sent by e-mail using Microsoft Word for text and Jpeg or Tiff formats for pictures and figures (the latter must be in grey level tones, not colour!). Please always send a paper copy and indicate the format you are using.

DEADLINE FOR SGA NEWS NO. 34

31 October 2013

SGA NEWS - MAILBOX

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Progress report on the creation of SGA Educational Foundation (G. Beaudoin)

The report was presented by G. Beaudoin. Instead of creation of the SGA Educational Foundation, the SGA is under present status (not-for-profit legal entity under Swiss law) able to receive donations from industry and individuals through a new account in the name of the SGA Educational Fund. Council recommended to adopt Terms of References and approved the report with the following motions:

H. Frimmel to open a new account and provide its coordinates to P. Weihed.

P. Weihed to contact industrial donors that already showed interest in this project, to prepare a master-copy of a letter addressing new prosperous donors and coordinate this effort.

P. Eilu to prepare a draft of a new SGA membership application form to enable collecting individual donations.

Status of planning for SGA 2013 in Uppsala (P. Klingbjer and E. Jonsson)

The report was presented by Per Klingbjer and Erik Jonnson from the SGA 2013 LOC. To date 120 participants registered and paid registration fee. Totally, 604 abstracts were registered with 580 abstracts in process (this no. includes several duplicates thus a real no. will be much lower). Several field trips (3 to Norway and 1 to Finland) had to be cancelled due to a low no. of participants. Council appreciated efforts of the LOC and approved the report and the following motions:

P. Eilu to contact Ch. Bendall (Springer) to encourage Springer Publishing House to set up a booth in the SGA 2013 meeting.

A. Cheilletz to contact BRGM officials to encourage them to set up a booth at the SGA 2013 meeting.

P. Weihed to advertise possibility of having booth at the upcoming meeting of the Mining Association of Nordic Countries.

LOC to provide H. Frimmel and P. Eilu a list of subjects asked for sponsorship (to avoid duplication of requests).

LOC (E. Jonsson) to send instruction to session chairs how to proceed with revised abstracts by mid-April 2013.

J.Pašava to send LOC more detailed info on the presentation of SGA awards at the SGA 2013 Opening Ceremony.

J. Wilkinson to contact M. Harris from RTZ to present a plenary lecture on morality of mining at SGA 2013.

H. Frimmel to check the conference budget.

Status of preparation of the SGA 2015 Biennial Meeting (A. Cheilletz)

The report was presented by A. Cheilletz. Council recommended various revisions regarding suggested symposia and field trips and approved the report with great thanks and the following motions:

A.Cheilletz to inform the LOC 2015 about suggested changes and to submit revised document to J. Pašava who will circulate it to Council members for the final approval. A. Cheilletz and LOC SGA 2015 to prepare a leaflet on SGA 2015 to be distributed in Uppsala and other geo-events.

Awards Sub-Committee – status on received nominations for the SGA-Barrick Young Scientist Award and SGA-Newmont Gold Medal (D. Houston et al.)

The report, prepared on behalf of the Awards Sub-Committee by D. Huston was presented by J. Pašava. At the close of nominations (31 March 2013), no additional nominations were received for either SGA-Barrick Young Scientist not the SGA-Newmont Gold Medal to be awarded at the 12th SGA Biennial Meeting in Uppsala. The Sub-Committee suggested and Council approved to work with existing still eligible nominations. Council approved creation of a new SGA award (SGA Krol Silver Medal named after G.I. Krol, the President of the provisional executive committee of SGA) – recognizing service to the Society Council which would consist of an engraved silver plaque and support (economy air fare, accommodation and registration) to attend the Biennial Meeting for presentation. Society members or former members who have made significant contributions to the Society through Council or other activities will be eligible for this award. It will be given initially on ad hoc basis with the first one at the 13th SGA Biennial Meeting (2015, Nancy, France). Council approved the report with great thanks and the following motions:

D. Huston and the Committee to actively solicit future nominations for SGA awards.

J.Pašava to organize electronic vote on both SGA awards by April 30, 2013 and to inform P. Weihed who will then contact winning candidates.

A.Piestrzynski to negotiate with KGHM to provide a proposal for a new SGA award – the SGA Krol Silver Medal and report to the next Council meeting.

J.Pašava to try to find a contact to G.I.Krol family to seek permission for naming the medal after Prof. G.I.Krol.

Status of SGA Guidebook series and update on revival of SGA Special Publications (J. Slack)

The report, prepared by J. Slack was presented by J. Pašava. J. Slack proposed for the SGA-Springer book series the books to be focused on mineral deposits of large regions for which modern summaries and detailed data are not available in English. The first book planned in this series is on North Africa (Algeria, Chad, Egypt, Libya, Mali, Mauritania, Morocco, Niger, Sudan, and Tunisia). Mohammed Bouabdellah from Morocco, and Salah Bouhlel from Tunisia, have agreed to serve as the editors of this book. Council also revisited the issue of field trip guidebook-series originally considered for the SGA-Springer series and decided that these will be published independently by LOCs. After discussion Council approved the report with great thanks and the following motions:

J. Slack to ask M. Bouabdellah (with a cc to A. Cheilletz and S. Bouhlel) to submit a more detailed proposal for individual chapters in the planned book for Moroccan side to be presented at the next SGA Council Meeting (August 2013, Uppsala).

Progress report on membership drive from the last SGA Council Meeting (P. Eilu, S. Lange, J. Pašava, A. Vymazalová)

The report was presented by P. Eilu. By the end of 2012, SGA had 1144 members which is a slight reduction from the year of 2011, mainly in the category of student member. This can be related opportunistic student membership taken out only for the year of the Biennial Meeting. Unfortunately, the loss of members remains a serious problem. Sabine Lange recently distributed to all RVP´s excel file listing members who haven´t paid their fees. Council approved the report with great thanks and recommended the following actions:

All RVP´s in collaboration with Council members should contact the members who haven´t paid their fees.

S. Lange to prepare a next list of people who didn't renew SGA membership and send it to all Council members by July 5, 2012 so that individual Council members and Regional Vice-Presidents could contact individual people.

S. Lange to email reminders to all who didn't renew SGA membership at least 3 times a year (every 4 months).

Status of development of SGA Student and Young Scientist network – Reports from Prague, Baltic and Novosibirsk Chapters (A. Vymazalová and J. Relvas)

The reports were presented by A. Vymazalová. After discussion Council approved two new Chapters – Nancy Chapter and Tehran Chapter. Council approved all reports with great thanks and the following budgets for 2012 activities (Baltic Chapter – EUR 3000, Barcelona Chapter – EUR 3000, Nancy Chapter - EUR 1000, Novosibirsk Chapter – EUR 1500, Prague Chapter – EUR 3000). No budget was requested by the Tehran Chapter.

A.Vymazalová to contact Chapter Presidents to inform them about approval of two new Chapters and budgets and invite them for brief (up to 5 min.) presentations about their Chapters to the SGA GA (August 13, 2013 at 11.00)

Past activities

- Ophiolites and related ores and industrial minerals (16-22 May 2012 Trabzon, Turkey) – SGA sponsored workshop – organized by I . Uysal et al. – info in SGA News
- The 6th International Siberian Early Career GeoScientists Conference – (June 9-23, 2012 Novosibirsk, Russia) - organized by a newly forming SGA Novosibirsk Chapter – info in SGA News.
- Session "Trace elements in oxides minerals from ore deposits…." (within Theme 9-Earth´s Resources: Origin, Evolution, Sustainable Exploitation and Remediation of the 22nd Goldschmidt Conference – June 24-29, 2012 Montreal, Canada – Brenan et al. – approved EUR 1000 for 4 students.
- Session "Black shales" 22nd Goldschmidt Conference – June 24-29, 2012 Montreal, Canada – J. Slack – approved EUR 1000
- 34th IGC (August 5-10, 2012 Brisbane, Australia) – 2 SGA sessions and 1 SGA co-sponsored session and SGA Council Meeting – D. Houston et al. – reservation for SGA Council meeting had to be cancelled due to insufficient presence of SGA Councillors.
- Black shales and ore deposits (SGA sponsored session at the 29th IAS Meeting, September 10-13, 2012 Schladming, Austria) – B. Lehmann and J. Pašava (requested EUR 1000 for sponsoring SGA student participants) – there were two other MD sessions and J. Raith asked if SGA would consider sponsoring also SGA student participation in his session – on Sediment hosted base metal deposits. Finally, sessions were merged and student support was distributed to SGA student members
- EMC 2012 (September 1-7, 2012 Frankfurt am Main, Germany) –MD sessions: 8a – Ore belts in Europe, 8b PGM and related accessory minerals in mafic-ultramafic rocks and unconventional deposits, 8c Ore-forming hydrothermal processes; 8d Critical raw materials for Europe.
- 11th Freiberg Short Course in Economic Geology - Automated Mineralogy & Petrography for Geometallurgy (December 5-7, 2012 Freiberg, Germany) – J. Gutzmer et al. - SGA sponsorship (student´s participation) – EUR 1000 support to SGA student members (A. Vymazalová reporting)
- XX Congreso Geologico Boliviano (1-4 October 2012 La Paz, Bolivia) – request for SGA keynote speakers – O. Arce (President, BGA) – E. Ferrari acted as SGA keynote – report provided by organizers.
- XXXI Curso Latinoamericano de Metalogenia UNESCO-SEG-SGA (19-22 September, 27 September - 1 October, 2012) – F. Tornos (supported by 3000 USD – returned 800 USD) – most likely no course in 2013
- SGA involvement in SEG 2012 Conference (September 23-26, 2012 Lima, Peru) - F. Tornos – keynote speaker
- Short course on pegmatite deposits (Barcelona Student Chapter, Barcelona, January 9, 2013) – T. Aiglsperger - supported through SGA Keynote Speaker Program.
- SGA at PDAC 2013 (March 3-6 Toronto, Canada) – P. Weihed.

Future activities

- "Ore deposits models and exploration" workshop traditionally held in China (January 13-19, 2013 Guangzhou, China) – SGA keynote D. Leach – support 1500 USD
- 4th International Students Conference (April 19-21, 2013 Brno, Czech Republic) – support to SGA student members.
- FUTORES (June 2-5, 2013 Townsville, Australia) - Noel White Symposium on ore deposits to summarize the current understanding and to discuss the future directions in research and exploration (co-sponsored SGA) – D. Huston et al.
- 2nd Short Course on African Metallogeny (June 17-21 Kitwe, Zambia) – S. Roberts et al.
- 12th SGA BIENNIAL MEETING (August 12-15, 2013 Uppsala, Sweden - www.akademikonferens.uu.se/sga2013) – P. Weihed et al.
- SGA Short Course „Gold deposits" (September 13-20, 2013 Mokrsko Au deposit, Czech Republic) – flagship course offered to

REDUCED PRICES FOR SGA PROCEEDINGS

BEIJING (2005) - Mao and Bierlein (eds) - Mineral Deposit Research: Meeting the Global Challenge, 2 Volume, over 1600 pages incl. CD-ROM

NOW available for 30 EUR plus shipping costs

DUBLIN (2007) - Andrew et al. (eds): Digging Deeper, 2 Volumes, over 1600 pages incl. CD-ROM
NOW available for 50 EUR plus shipping costs

Please contact Sabine Lange, Rixenweg 2, D-24222 Schwentinental- OT Klausdorf, GERMANY, phone +49-431-7993303, fax +49-431-7993420, email: sabine-klausdorf@t-online.de

APPLICATIONS to SGA for meeting sponsorship must be submitted to Jan Pašava, SGA Executive Secretary, on appropriate forms available at the SGA home page on Internet: www.e-sga.org

Other requests will be not considered.

Your suggestions and ideas for any topic of interest to SGA are welcome!
They can be addressed to any Council member or to

Dr. Jan Pašava
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industry sponsors of the SGA EF – D. I. Groves, Z. Pertold et al.

Requests for sponsorship

- Session on Gold Deposits at the IMA Meeting (September 1-3, 2014 Johannesburg, South Africa – L. Greyling (asking 1,500 EUR for a keynote speaker). Action: J. Pašava to inform Lynette about approval of her request.
- XII International Platinum Symposium (11-14 August 2014, Yekaterinburg, Urals, Russia) – SGA special session – A. Vymazalová. Action: A.Vymazalová to inform LOC about SGA sponsorship of two sessions (2000 EUR for SGA student members).
- IAGOD Symposium (August 19-22, 2014 Urumqui, China). Council appreciated invitation to the Symposium. Action: J. Pašava to inform IAGOD about interest of SGA in suggesting some activities.

Any other business

Requests for financial support to editors of SGA Special Publications (J. Slack)
Action: Covered in item 10.

SGA insurance (update)
Action: SGA Treasurer´s Office to ask Zurich Insurance Company to send invoices for renewal of insurance to SGA Treasurer´s Office.

SGA award for recognition of special services to the society - update (H. Frimmel)
Action: Covered in item 9.

ICSU grant proposals and IUGS initiative on Resourcing Future Generations
SGA Council discussed the IUGS document and suggested to build on our successful collaboration in the field of geo-educational activities (short courses on metallogeny) in Africa that could be, if desired adapted and offered in other parts of the world according to prioritized needs. Action: D.Huston to inform I. Lambert about SGA attitude towards RFG initiative.

Proceedings of the SGA Biennial Meetings – how they should look like in the future?
Council did not find any reason to change the present format (up to 4 pages abstracts).

Date and Place of the Next Council Meeting

The next SGA Council meeting will be held on Sunday, August 11, 2013 (from 10.00 to 18.00) in the building of the Geological Survey of Sweden in Uppsala (Headoffice, Villavagen 18, Uppsala Rubinsalen).

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LIST OF NEW SGA MEMBERS (November 14, 2012-March 15, 2013)

70 Regular and 232 Student Members applied for membership (14/11/2012-15/03/2013)

REGULAR MEMBERS

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>>> FORTHCOMING EVENTS <<<

* marks a new entry

2013

***June 17-21**
2nd SGA-SEG-UNESCO-IUGS Short Course on African Metallogeny: Base Metals in Basins. Kitwe, Zambia. Contact: Http:/ www.e-sga.org/

***July 3-5**
CORALS-2013 — Conference on Cathodoluminescence and Raman Spectroscopy in Geosciences, Vienna, Austria. Contact: http://www.univie.ac.at/Mineralogie/Corals2013/index.html

July 7-12
17th International Zeolite Conference, Moscow, Russia - Contact: http://www.izc17.com

***July 8-12**
MPE2013 — Mathematics of Planet Earth 2013: The Conference, Melbourne, Australia. Contact: Email: mpe@amsi.org.au; http://www.mope.org.au/events/2013/

July 10-13
11th International Congress of Applied Mineralogy, Mianyang, China - Contact: http://www.icam2013.org/

July 20-24
IAVCEI 2013 General Assembly: Forecasting Volcanic Activity, Kagoshima, Japan - Contact: http://www.iavcei2013.com/

***August 12-14**
Iron Ore 2013, Perth, Australia. Contact: Belinda Martin, Manager Operations, Events, The AusIMM, PH: +61 3 9658 6125, Email: bmartin@ausimm.com.au; http://www.ausimm.com.au/ironore2013/

August 12-15
12th SGA Biennial Meeting "Mineral Deposit Research for a high-tech World", Uppsala, Sweden - Contact: www.akademikonferens.uu.se/sga2013; e-mail: sga2013@sgu.se

***August 16-25**
mpacts and their Role in the Evolution of Life, Kuressaare, Estonia. Contact: http://www.nordicastrobiology.net/Impacts2013/; Phone: [0046-8-55378649]; Email: wgeppert@fysik.su.se

August 25-30
Goldschmidt 2013, Florence, Italy - Contact: http://goldschmidt.info/2013/program/programViewThemes

September 1-5
9th International Symposium on the Cretaceous System, Ankara, Turkey - Contact: http://www.cretaceous2013.org/en/

September 1-6
11th International Conference on Paleoceanography (ICP11), Barcelona, Spain - Contact: http://www.icp2013.cat/

***September 2-5**
International Conference on Diamond and Carbon Materials 2013, Riva del Garda, Italy. Contact: http://www.diamond-conference.elsevier.com/diamond-2013.html

***September 4-6**
ISPA — Recent advances in signal processing and pattern recognition in geosciences, Trieste, Italy. Contact: Said GACI, Sonatrach, Division Exploration, Boumerdes, Algeria.; Phone: [+213 (0) 696 470 613]; Email: Said_gaci@yahoo.com; http://www.isispa.org

***September 7-13**
30th International Conference on Ore potential of Alkaline, Kimberlite and Carbonatite Magmatism, Hurghada, Egypt. Contact: Prof. Hussein A. Hegazy, Geology Department, Assiut University, Egypt; Phone: [+2 01227831604]; Email: AlkMag2013@gmail.com; http://www.aun.edu.eg/conferences/alkaline2013/

***September 9-13**
ESA Living Planet Symposium 2013, Edinburgh, United Kingdom. Contact: http://www.livingplanet2013.org/contacts.asp

***September 13-20**
Gold Deposits: From Theory to Exploration Practice. Prague and Živohošť, Mokrsko Deposit, Czech Republic. Contact: http://www.geology.cz/sgagoldcourse

***September 22-27**
AIG-10 — 10th Applied Isotope Geochemistry Conference, Budapest, Hungary. Contact: Email: congress@akkrt.hu; http://www.aig10.com

***September 24-27**
SEG & SEG Canada Foundation Conference, Whistler, Canada. Contact: http://www.seg2013.org/

***September 24-27**
KM 2013 — The 3rd International Conference on crystallogenesis and mineralogy, Novosibirsk, Russia. Contact: http://km.igm.nsc.ru

***October 7-9**
SCS-2013 — International Symposium - The Safety Case for Deep Geological Disposal of Radioactive Waste: 2013 State-of-the-Art, Paris, France. Contact: Email: igsc@oecd-nea.org; http://www.oecd-nea.org/rwm/igsc/sc2013/index.html

***October 21-22**
Exploration, Resource & Mining Geology Conference 2013, Cardiff, Wales, United Kingdom. Contact: Sienna Deano, Conference Coordinator; Phone: [+61 3 9658 6120]; Email: conference@ausimm.com.au; http://www.ermg2013.com/

***October 21-23**
SFO — Solar System Formation and Observation - Conference, Bern, Switzerland. Contact: Email: sfo@space.unibe.ch; http://www.sfo.unibe.ch

***October 24-25**
17th Workshop of Active Tectonic Research Group, Antalya, Turkey. Contact: Email: atag17@akdeniz.edu.tr; http://www.atag17.com

***October 27-30**
Geological Society of America 2013 Annual Meeting, Colorado Convention Center, Denver, Colorado, United States. Contact: http://www.geosociety.org/meetings/2013/

***November 27-29**
International Heavy Minerals Conference 2013, Visakhapatnam, India. Contact: http://www.

meai.org/

December 15-19
AGU 2013 Fall Meeting, San Francisco, California, United States. Contact: http://www.agu.org/meetings/; AGU Meetings Department 2000 Florida Avenue, NW Washington D.C. U.S.A. 20009; Phone: (+1-202-777-7333)

2014

***August 11-14**
XII International Platinum Symposium, Ekaterinburg, Russia. Contact: http://12ips.uran.ru

August 30-September 6
IMA 2014 General Meeting — 21st General Meeting of the International Mineralogical Association, Johannesburg, South Africa - Contact: http://www.ima2014.co.za

***September 1-6**
31st International Conference on Ore potential of Alkaline, Kimberlite and Carbonatite Magmatism, Antalya, Turkey. Contact: Email: alkaline2014@akdeniz.edu.tr; http://alkaline2014.com/

***September 10-12**
Planet Formation and Evolution 2014, Kiel, Germany. Contact: http://www1.astrophysik.uni-kiel.de/~kiel2014/main/

***September 27-30**
Society of Economic Geologists (SEG) 2014 Conference, Building Exploration Capability for the 21st Century, Keystone, Colorado, USA. Contact: www.seg2014.org

December 15-19
AGU Fall Meeting, San Francisco, CA, USA - Contact: http://www.agu.org/meetings.shtml, AGU Meetings Department 2000 Florida Avenue, NW Washington D.C. U.S.A. 20009; Phone: (+1-202-777-7333)

2015

August 24-27
13th SGA Biennial Meeting "Mineral Resources in a Sustainable World", Nancy, France - Contact: sga-2015@univ-lorraine.fr

>>> page 1 Metallic mineral deposits in Fennoscandia, Greenland and NW Russia

types in the region. Greenland, with many terranes of Achaean and Palaeoproterozoic age, is currently also being explored for similar commodities, but younger settings have proven to be stronger endowed with deposit types like Porphyry Mo, SEDEX and locally layered peralkaline rare metal deposits. This short review of ore deposit types in the Fennoscandian Shield and their geodynamic setting is chiefly derived from Weihed et al. (2005, 2008), Lahtinen et al. (2011), Eilu (2012), and Eilu et al. (2013) and references therein, except where otherwise is indicated.

Greenland

In the Archaean of Greenland, the Isua deposit represents the probably oldest BIF on Earth (ca. 3.8 Ga) that is explored and is likely to be mined in the near future. BIF deposits are also the target in the Melville Bugt, where they extend from deposits in the Baffin Bay iron mine district of Canada. A number of small orogenic gold occurrences have also been found (Kolb et al., 2013), and to the north of the capital Nuuk, several ultramafic intrusions are tested as Ni-PGE targets.

The Palaeoproterozoic rifting stage is not well preserved, except for some dyke complexes and the formation of the Black Angel SEDEX deposit, which was subsequently metamorphosed and deformed during basin inversion and continent collision (Thomassen, 1991). Internal and external Palaeproterozoic orgens are generally underexplored, but are tested for ultramafic-mafic intrusion hosted Ni-Cu-PGE, VMS and IOCG (Stensgaard et al., 2011), and host the only active mine in Greenland, the Nalunaq gold mine, which is an orogenic gold deposit (Bell & Kolb, 2013).

The Palaeoproterozoic assembly of Nuna is followed by a relative tectonic quiescence with rifting and basin development until the Caledonian and Ellesmerian orogens formed in North and East Greenland. Sedimentary basins in these regions host some stratiform Cu and SEDEX occurrences that are currently explored (Harpøth et al., 1986). Rifting predating the Grenvillian orogen has formed some of the rarest rocks and minerals on Earth in peralkaline intrusions of the 1350-1140 Ma Gardar Province in South Greenland (Upton et al., 2003). These intrusions host some large REE-Zr-Nb-Ta-U-Th-Zn and cryolite occurrences in the Kvanefjeld, Kringlerne, Kryolit and Motzfeldt deposits. Mafic dykes of the Gardar Province host the large Isortoq Fe-Ti-V deposit. The Palaeozoic Franklinian Basin in North Greenland hosts the Citronen SEDEX deposit in the same units as the Polaris mine in Canada (Van der Stijl and Mosher, 1998). Inversion of the basin during the Palaeozoic orgenies led to the formation of MVT-like occurrences in carbonates of the hinterland in northern Greenland. The Caledonian in East Greenland is represented by the foreland fold-and-thrust belt, where exploration is directed towards intrusion-related vein-type, skarn and porphyry deposits (Harpøth et al., 1986). In the following, small continental basins formed mainly in northern and eastern Greenland, which are only weakly endowed.

In particular at the northern margin of the North Atlantic Craton to the north of Nuuk, carbonatites and kimberlites intruded in the following of the Iapetus opening and again after opening of the Atlantic. The Sarfartoq rare metal-U deposit is hosted in one of the older carbonatite intrusions (Secher et al., 2009). The opening of the Atlantic also resulted in extensive flood basalt eruptions and mafic as well as felsic intrusions in central eastern Greenland. Flood basalts are explored for Ni in the Disko Island area north of Nuuk, whereas the mafic layered intrusions comprise the world-famous Skaergaard intrusion hosting a PGE-Au deposit (Nielsen and Bernstein 2004). Tertiary felsic intrusions host porphyry Mo deposits in Flammefjeld and Malmbjerg (Harpøth et al., 1986).

Fennoscandian Shield

Mineable Archaean BIFs (e.g. Kostomuksha, Bjørnevatn) occur, and a number of small orogenic gold occurrences have been identified. Unlike some other Archaean areas, komatiite-hosted nickel-copper sulphide deposits are rare, and significant volcanogenic massive sulphide deposits are not known from the Archaean supracrustal belts of Fennoscandia.

The Palaeoproterozoic rifting stages of the Archaean continent(s) in northern and eastern Fennoscandia have included the intrusion and extrusion of large volumes of mafic-ultramafic magmas, now seen in abundance associated with occurrences of layered intrusion-, intrusion- and some komatiite-hosted ore deposits. These deposits vary from sulphide-poor Cr, V-Ti-Fe and PGE producing systems to more sulphide-rich Ni-Cu-PGE systems. Major metal mineralisation peaks are at 2.44 Ga, 2.05 Ga and 1.98 Ga, where the first event includes the Kemi Cr mine and the last event the famous Pechenga Ni ores. Nickeliferous black schists (Talvivaara), were also formed

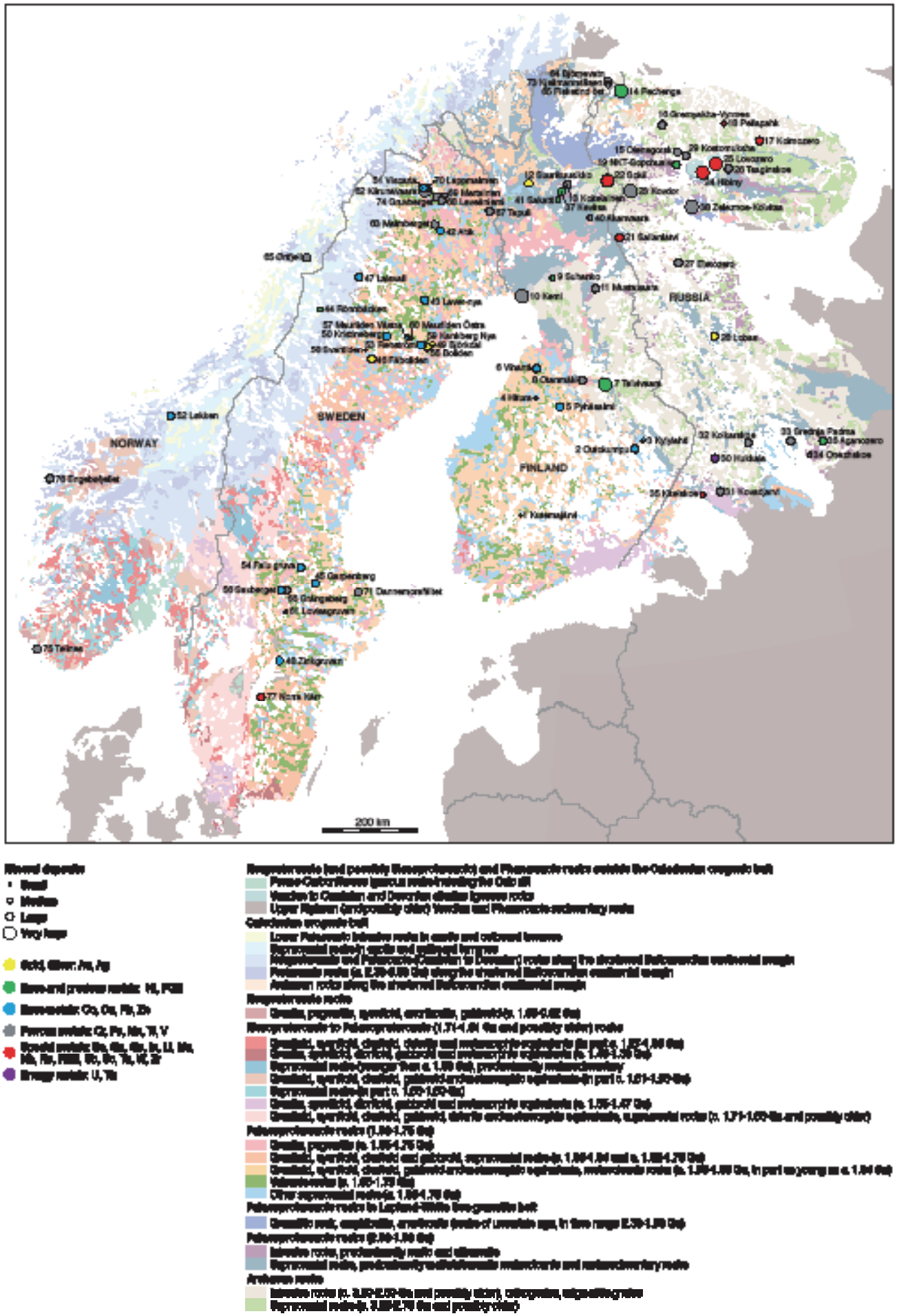

Figure 1. Location of major metallic mineral deposits in Fennoscandia, based on Eilu et al. (2013). Geology map from Lahtinen et al. (2005).

Table 1. Metallic mineral deposits in Fennoscandia, data from Eilu et al. (2013).

	Deposit	Deposit type	Pre-mining size	Status
1	Kutemajärvi	Epithermal gold	3 Mt @ 5.2 g/t Au	Active mine
2	Outokumpu	VMS	65.5 Mt @ 3.6% Cu, 0.84% Co, 1.07% Zn, 0.18% Ni, 0.8 g/t Au, 6.8 g/t Ag	Closed mine
3	Kylylahti	VMS	8.27 Mt @ 1.26% Cu, 0.24% Co, 0.56% Zn, 0.2% Ni, 0.88 g/t Au, 3.5 g/t Ag	Active mine
4	Hitura	Ultramafic intrusion Ni-Cu-PGE	61.1 Mt @ 0.69% Ni, 0.8% Cu, 0.05% Co	Active mine
5	Pyhäsalmi	VMS	67.4 Mt @ 2.2% Zn, 0.8% Cu, 0.3 g/t Au, 14 g/t Ag, 40% pyrite	Active mine
6	Vihanti	VMS	37.1 Mt @ 4% Zn, 0.46% Cu, 0.30% Pb, 0.44 g/t Au, 85 g/t Ag	Closed mine
7	Talvivaara	Black shale Ni-Zn-Cu-Co	2100 Mt @ 0.22% Ni, 0.60% Zn, 0.13% Cu, 0.02% Co, 0.3% Mn, 0.0017% U	Active mine
8	Otanmäki	Mafic intrusion V-Ti-Fe	46.3 Mt @ 0.80% V, 7.07% Ti, 33.8% Fe	Closed mine
9	Suhanko	Layered intrusion PGE±Ni,Cu	353 Mt @ 0.88 g/t Pd, 0.20 g/t Pt, 0.09 g/t Au, 0.08% Ni, 0.15% Cu	Not exploited
10	Kemi	Layered intrusion Cr	150.1 Mt @ 30% Cr	Active mine
11	Mustavaara	Mafic intrusion V-Ti-Fe	110.45 Mt @ 0.2% V, 5% Ti, 19.2% Fe	Closed mine
12	Suurikuusikko	Orogenic gold	64 Mt @ 4.14 g/t Au	Active mine
13	Kolosjoki UC	Layered intrusion Cr±V±PGE	70 Mt @ 14.4% Cr, 0.4% V, 1.1 g/t PGE	Not exploited
14	Pechenga	Ultramafic intrusion Ni-Cu-PGE	1807 Mt @ 0.55% Ni, 0.28% Cu, 0.032% Co, 0.005 g/t PGE	Active mines
15	Olenegorsk	BIF	2310 Mt @ 30.3% Fe	Active mines
16	Gremyakha-Vyrmes	Mafic intrusion V-Ti-Fe	340 Mt @ 4.21% Ti, 20% Fe, 3.22% P_2O_5	Not exploited
17	Kolmozero	Granitic pegmatite	74 Mt @ 0.0075% Ta, 0.011% Nb, 0.53% Li, 0.019% Be	Not exploited
18	Pelgujoki	Porphyry Mo-Cu-Au	0027 Mt @0.032% Mo, 0.25% Cu, 1.39 g/t Au, 6.1 g/t Ag	Not exploited
19	NKT-Sopchuaiv	Ultramafic intrusion Ni-Cu-PGE	139.4 Mt @ 0.61% Ni, 0.33% Cu, 0.03% Co, 0.13 g/t Au	Closed mine
20	Tikkakoski	Layered intrusion Cr	64.9 Mt @ 14.2% Cr	Not exploited
21	Sallanlatvi	Carbonatite rare metal	72 Mt @ 0.191% Nb	Not exploited
22	Sokli Nb	Carbonatite raw metal	850 Mt @ 0.21% Nb, 0.005% Ta, 0.13% Zr, 0.01% U, 17.0% Fe, 4% P_2O_5	Not exploited
23	Kovdor	Carbonatite P-Fe-Zr	1294 Mt @ 0.16% Zr, 27.5% Fe, 6.78% P_2O_5	Active mine
24	Hilmy	Peralkaline rare metal	6900 Mt @ 0.26% REE, 14.09% P_2O_5	Active mines
25	Lovozero	Peralkaline rare metal	1151 Mt @ 0.1046% Nb, 0.0174% Ta, 1.11% REE, 1.42% Ti	Active mines
26	Tsagnek	Mafic intrusion V-Ti-Fe	65.9 Mt @ 0.14% V, 3.7% Ti, 35% Fe	Not exploited
27	Bletozero	Mafic intrusion V-Ti-Fe	102.3 Mt @ 0.08% V, 9.2% Ti, 20.6% Fe	Not exploited
28	Lobash	Porphyry Mo-Cu-Au	817 Mt @ 0.07% Mo, 0.1% Cu, 1.1 g/t Au, 6.4 g/t Ag	Not exploited
29	Kostomuksha	BIF	3193 Mt @ 31.06% Fe	Active mines
30	Hakkala	Vein uranium	780.0 Mt @ 0.016% U	Not exploited
31	Kovadjarvi	Stratabound clastic-hosted V	88.7 Mt @ 0.15% V	Not exploited
32	Kolliavi	Mafic intrusion V-Ti-Fe	344 Mt @ 0.32% Fe, 6% Ti, 32.8% Fe	Not exploited
33	Srednja Padma	Stratabound clastic-hosted V	4.59 Mt @ 2.35% V, 0.31 g/t PGE, 0.16 g/t Au	Not exploited
34	Orivesi	Mafic intrusion V-Ti-Fe	2300 Mt @ 0.83% V, 3.8% Ti, 38.7% Fe	Not exploited
35	Pitkäranta	Skarn Sn-Zn-Fe	46.16 Mt @ 0.52% Sn, 3.8% Zn, 25% Fe	Historic
36	Aganozero	Layered intrusion Cr±PGE	804 Mt @ 31.9% Cr, 1.2 g/t PGE, 0.9 g/t Au	Not exploited
37	Kevitsa	Ultramafic intrusion Ni-Cu-PGE	274.8 Mt @ 0.3% Ni, 0.41% Cu, 0.0146% Co, 0.15 g/t Pd, 0.2 g/t Pt, 0.11 g/t Au	Active mine
38	Zelenoe-Kolmilas	Mafic intrusion V-Ti-Fe	409 Mt @ 0.43% V, 6.1% Ti, 35% Fe	Not exploited
39	Sebl'javr	Carbonatite rare metal	2085 Mt @ 0.146% Nb, 0.012% Ta	Not exploited
40	Akanvaara	Layered intrusion Cr±PGE	66.1 Mt @ 15.06% Cr, 0.4% V, 0.48 g/t Pd, 0.22 g/t Pt	Not exploited
41	Sakatti	Ultramafic intrusion Ni-Cu-PGE	>950 m long; 128 m @ 1.45% Ni, 1.55% Cu, 0.64 g/t Pd, 0.55 g/t Pt, 0.13 g/t Au	Not exploited
42	Aitik	Porphyry (Cu, Au,Mo, W, Sn, Ag)	8772 Mt @ 1.3 g/t Au, 0.17 g/t Au, 0.013% Cu, 0.0035% Mo	Active mine
43	Laver-nya	Porphyry (Cu, Au,Mo, W, Sn, Ag)	690 Mt @ 2.8 g/t Ag, 0.12 g/t Au, 0.2% Cu, 0.53% S	Not exploited
44	Rönnbölen	Magnetite Ni-Co-PGE	338 Mt @ 0.009% Co, 0.197% Ni	Not exploited
45	Garpenbergsfältet		102 Mt @ 140 g/t Ag, 0.47 g/t Au, 0.1% Cu, 2.3% Pb, 5% Zn	Active mine
46	Fäboliden	Orogenic gold ±Cu,Co	69 Mt @ 2.50 g/t Au	Not exploited
47	Laisvall	Stratabound clastic-hosted Pb-Zn	64 Mt @ 11 g/t Ag, 3.6 g/t PGE, 0.1 g/t Au, 0.01% Cu, 3.8% Pb, 0.3% Zn	Closed mine
48	Björkdal	Orogenic gold (± Cu,Co)	64 Mt @ 60 g/t Au, 0.05% Cu, 4.25% Pb, 6.4% Zn	Active mine
49	Kaitajärvi	Orogenic gold (± Cu,Co)	56 Mt @ 2.02 g/t Au	Active mine
50	Kaldohaksa	VMS	39.1 Mt @ 47.6 g/t Ag, 1.2 g/t Au, 1.1% Cu, 0.85% Pb, 0.8% Zn	Active mine
51	Viscaria	VMS	34.1 Mt @ 4 g/t Ag, 0.1 g/t Au, 1.43% Cu, 0.01% Pb, 0.7% Zn	Closed mine
52	Lölven	VMS	30 Mt @ 10 g/t Ag, 0.5 g/t Au, 0.07% Co, 0.3% Cu, 37.5% Fe, 0.02% Pb, 1.5% Zn	Closed mine
53	Renström	VMS	19.2 Mt @ 151 g/t Ag, 2.8 g/t Au, 0.81% Cu, 1.44% Pb, 7.26% Zn	Active mine
54	Falu gruva	VMS	11.4 Mt @ 19 g/t Ag, 3 g/t Au, 3% Cu, 1.5% Pb, 4% Zn	Closed mine
55	Boliden	VMS	8.3 Mt @ 50 g/t Ag, 15.5 g/t Au, 1.43% Cu, 0.27% Pb, 0.92% Zn	Closed mine
56	Stekenjokk	VMS	0.4 Mt @ 42 g/t Ag, 0.4 g/t Au, 0.7% Cu, 0.5% Pb, 7.1% Zn	Closed mine
57	Maurliden Västra	VMS	4.9 Mt @ 49 g/t Ag, 0.9 g/t Au, 0.2% Cu, 0.4% Pb, 3.4% Zn	Active mine
58	Svartliden	Orogenic gold ±Cu,Co	4.1 Mt @ 3.67 g/t Au	Active mine
59	Kankberg nya	VMS	3.5 Mt @ 13 g/t Ag, 3.60 g/t Au, 165 g/t Te	Active mine
60	Maurliden Östra	VMS	0.89 Mt @ 82.6 g/t Ag, 1.3% Cu, 1.1% Zn	Active mine
61	Lovisagruvan		0.62 Mt @ ? Zn	Active mine
62	Kleivavaara	Apatite iron ore	1870 Mt @ 53.6% Fe, 0.03% Mn, 1.65% P_2O_5, 0.05% S	Active mine
63	Malmberget	Apatite iron ore	1036 Mt @ 50.90% Fe, 0.03% Mn, 0.05% S	Active mine
64	Blötmossen	Stratiform iron	420 Mt @ 32% Fe	Active mine
65	Örtfjell	Stratiform iron	417 Mt @ 34% Fe	Active mine
66	Grängesberg	Apatite iron ore	208 Mt @ 48.53% Fe, 0.14% Mn, 1.87% P_2O_5, 0.21% S	Closed mine
67	Tapuli	Iron oxide-copper-gold	207 Mt @ 31.3% Fe	Active mine
68	Leveäniemi	Apatite iron ore	159 Mt @ 46.85% Fe, 0.10% Mn, 0.67% P_2O_5	Closed mine
69	Mertainen	Apatite iron ore	157 Mt @ 35.0% Fe, 0.04% P_2O_5	Closed mine
70	Leppenjaure	Apatite iron ore	150 Mt @ 43% Fe	Not exploited
71	Dannemorafältet	Skarn Fe	98 Mt @ 38.61% Fe, 1.98% Mn, 0.003% P_2O_5, 0.21% S	Active mine
72	Rektorn Öst	Stratiform iron	30.3 Mt @ 30% Fe	Active mine
73	Kjellmannsåsen	Stratiform iron	21 Mt @ 32% Fe	Active mine
74	Gruvberget Fe	Apatite iron ore	19.1 Mt @ 53.8% Fe, 1.09% P_2O_5	Active mine
75	Tellnes	Mafic intrusion-hosted Ti-Fe±V	408 Mt @ 1% Fe, 11% Ti(t)	Active mine
76	Engebøfjellet	Mafic intrusion-hosted Ti-Fe±V	400 Mt @ 8.4% Ti (ot)	Not exploited
77	Norra Kärr	Peralkaline associated rare metals	58 Mt @ 0.590% REE, 1.7% Zr	Not exploited

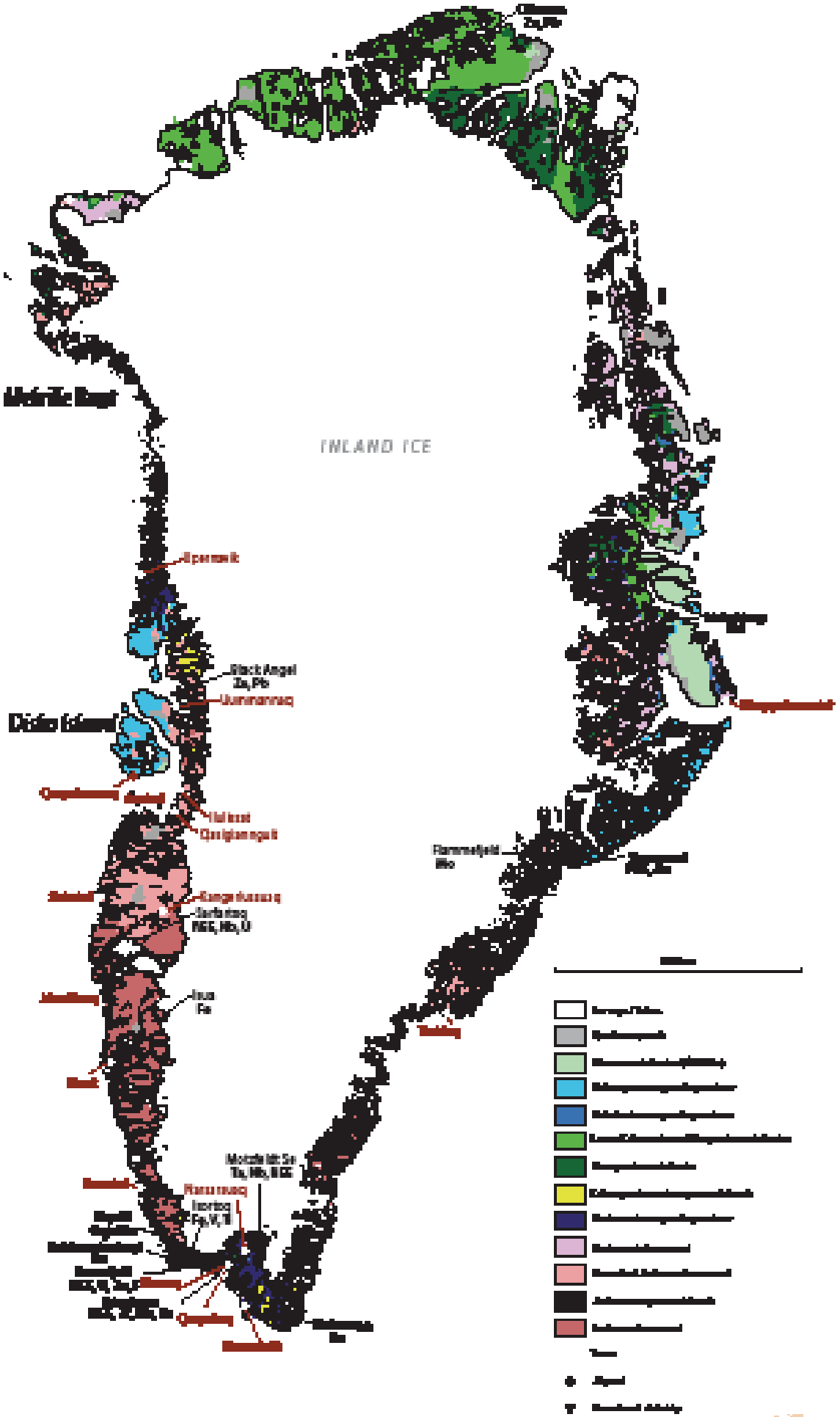

Figure 2. Major metallic mines and prospects in Greenland. Geology map from Henriksen et al (2009).

Table 2. Major mineral deposits in Greenland.

	Deposit	Deposit type	Pre-mining size	Status
1	Citronen	SEDEX	132 Mt @ 4.5% Zn + Pb	Feasibility
2	Flemingefjeld	Porphyry Mo	600 Mt @ 0.40% MoS_2	Exploration
3	Isortoq	Mafic intrusion V-Ti-Fe	1160 Mt @ 62.6% FeO, 19.1% TiO_2, 0.32% V_2O_5	Exploration
4	Ilua	IOF	651 Mt @ 38% Fe	Not exploited
5	Kringlerne	Layered intrusion REE-Nb-Zr	4300 Mt @ 0.2% Nb_2O_5, 0.65 % REE, 1.8% ZrO_2	Exploration
6	Kvanefjeld	Layered intrusion REE-U-Zn	557 Mt @ 1% TREO, 0.03% U_3O_8, 0.4% Zn	Feasibility
7	Malmbjerg	Porphyry Mo	224 Mt @ 0.12% Mo	Not exploited
8	Motzfeldt	Layered intrusion Ta-Nb	600 Mt @ 0.043% Ta & 0.14% Nb	Exploration
9	Skaergaard	Layered intrusion PGE-Au	23 Mt @ 1.5 ppm Au equivalent	Feasibility
10	Nalunaq	Orogenic gold	0.7 Mt @ 14.6 ppm Au	Active mine
11	Black Angel	SEDEX	17.2 Mt @ 8.6% Zn, 3% Pb	Not exploited
12	Kvanefjeld	Peralkaline	0.39 Mt eryttite	Historic
13	Sarfartoq	Peralkaline rare metal	7.5 Mt @ 1.6% TREO	Exploration

during this epoch, probably between 2.1 and 1.95 Ga. The significant new greenfield discovery of the Sakatti Cu-Ni-PGE deposit in Finnish Lapland shows that northern Fennoscandia is still fertile territory for new discoveries of rift-related deposits.

The 2.44 Ga layered intrusions are probably related to a failed rift and thus can be classified as intra-cratonic. Many of the 2.1–1.98 Ga deposits also are intra-cratonic in nature, although they show affinity to asthenosphere-derived mantle melts. The systems related to bimodal alkaline magmatism during craton break-up at ca. 2.05 Ga produced REE-Nb mineralisation. While the age of the very large black shale-hosted Talvivaara Ni-Zn-Co-Cu deposit is not known, it forms a unique deposit class of its own. Sedimentary exhalative or red bed-type Cu, V and VMS-type deposits have been found related to sag and rift phases, respectively. The Outokumpu-type deposits have a VMS-type (Co-Cu-Zn) proto-ore, formed at 1.95 Ga, but were strongly modified during deformation at ca. 1.90 Ga. Some intracratonic U occurrences have been found, but none yet in mineable sizes.

The VMS districts in Fennoscandia are among the most important Palaeoproterozoic VMS districts in the world. They were formed in intra-arc extensional settings prior to basin inversion and accretion. The arc settings vary from primitive, bimodal arc complexes at 1.92 Ga (Pyhäsalmi) to the 30 million years younger Skellefte district deposits mainly formed in mature arc crust. The VMS deposits in the Bergslagen area, south-central Sweden, are similar in age to the Skellefte deposits but formed in a continental margin back arc setting. In the Bergslagen area, a number of economically important iron ores, mostly carbonate replacement (skarn iron ores), were also formed at this time. The economically important group of Fe-apatite ores (Kiiruna, Grängesberg) formed at this time, too, in two restricted areas in northern and south-central Sweden, respectively. The northern Palaeoproterozoic part of Fennoscandian is also host to porphyry copper (Aitik) and IOCG deposits.

Palaeoproterozoic orogenic gold deposits formed at syn- to post-peak metamorphism. Svecofennian orogenic Ni-Cu deposits are related to mafic–ultramafic rocks intruded during transpressional collisional phases along linear belts at the margins of micro-continents. Late- to post-collisional stages include intrusion of Ti-P rich mafic magmas, pegmatites and carbonatites with minor rare-metal mineralisation.

The Palaeo- to Mesoproterozoic transition in Fennoscandia included the intrusion of 1.65–1.47 Ga rapakivi granites, and the Gothian (1.64–1.52) and Telemarkian accretionary events (1.52–1.48 Ga) without the formation of any significant metallic ore deposits. Several minor Cu (Au, Ag) and Co occurrences are known in the pre-Sveconorwegian supracrustals (1.34–1.14 Ga). Similarly, the rocks formed during the Sveconorwegian orogeny (1.14–0.97 Ga) have almost no known mineralisation, except the large volumes of post-collisional anorthositic magmas hosting major Ti deposits (Tellnes) and minor synorogenic Mo deposits. Stratabound Mesoproterozoic U mineralisation occurs in unmetamorphosed Mesoproterozoic sandstone in the Ladoga region, Russia.

In Neoproterozoic to Palaeozoic times, the opening of the Iapetus Ocean (ca. 600 Ma) included the development of an Atlantic-type passive margin in Fennoscandia. This stage produced some stratabound-stratiform VMS Zn-Pb-Cu and sedimentary Fe ores (Rana) followed by deposition of bituminous alum shales, which now host large but low-grade V-U-Mo deposits (Myrviken). Arcs and marginal basins formed either outboard of the present Fennoscandia (Baltica plate) or on the Laurentian side of the Iapetus Ocean. Abundant Zn-Cu, Cu-Zn and Fe-Cu VMS deposits, and Cu-Ni-(PGE) deposits related to boninitic intrusions have been found in these arc and marginal basin settings. During initial collision, intrusion-related Ni-Cu deposits and Cu-Zn VMS deposits formed in a transtensional environment. At some time between the early Cambrian (age of host rocks) and mid-Silurian to early Devonian (faulting of mineralised rocks), the formation of a sandstone-hosted Pb deposit (Laisvall) took place.

The final Palaeozoic continent-continent collision occurred during the Scandian orogeny (ca. 430–390 Ma) and produced metamorphic rutile deposits in eclogites (Engebøfjellet). Palaeozoic post-collisional peralkaline to carbonatitic rocks are widespread in the NE part of Fennoscandia (especially in Kola), and have a significant potential for Ti and rare metals (Hibiny, Lovozero, Sokli). The last major metallogenic event is the Permian Oslo Rift (300–240 Ma), when porphyry Mo deposits (Nordli) were formed in alkaline to peralkaline granitic rocks. The Ag-rich calcite veins at Kongsberg are also related to this magmatic-hydrothermal event.

Caledonides

In Neoproterozoic to early Palaeozoic times, the opening of the Iapetus Ocean (ca. 600 Ma) included the development of an Atlantic-type passive margin. This stage produced stratabound-stratiform VMS Zn-Pb-Cu and sedimentary Fe ores (Rana) followed by deposition of bituminous alum shales, which now host large but low-grade V-U-Mo deposits (Myrviken). Arcs and marginal basins formed either outboard of the present Fennoscandia (Baltica plate) or on the Laurentian side of the Iapetus Ocean. Abundant Zn-Cu, Cu-Zn and Fe-Cu VMS deposits, and Cu-Ni-(PGE) deposits related to boninitic intrusions occur in these arc and marginal basin settings. These include Løkken, the largest ophiolite-hosted VMS

deposit known. Between collision stages, intrusion-related Ni-Cu deposits and Cu-Zn VMS deposits formed in trans-tensional environments. A sandstone-hosted Pb deposit (Laisvall) was formed at some time between the early Cambrian (age of the host rocks) and mid-Silurian to early Devonian (faulting of mineralised rocks). .

The final Palaeozoic continent-continent collision occurred during the Scandian orogeny (ca. 430–390 Ma): numerous bodies of eclogite were formed, including Engebøfjellet which contains a metamorphic rutile deposit, which is currently the subject of a permitting process.

Post-Caledonian metallogeny

Palaeozoic, post-collisional peralkaline to carbonatitic rocks are widespread in the NE part of Fennoscandia (especially on the Kola Peninsula), and have a significant potential for Ti and rare metals (Hibiny, Lovozero, Sokli). The youngest major feature with metallogenic significance is the Permian Oslo Rift (300–240 Ma), in which porphyry Mo deposits (Nordli) were formed in alkaline to peralkaline granitic rocks and Fe-Ti-P deposits in stocks of monzonite (Kodal) (Lindberg, 1985). The Ag -rich calcite veins at Kongsberg are also related to this magmatic-hydrothermal event.

Subsea mineralisations

An active “black smoker”vent field was discovered on the Mid-Atlantic Ridge at 73o30´ N in 2008 (Pedersen et al., 2010): it is known as Loki’s Castle and consists of four active vents located on a mound of hydrothermal sulphide. Hydrothermal vent fields are also known to occur close to Jan Mayen and Iceland.

Concluding remarks

The Fennoscandian Shield is one of the most intensely mineralized Paleoproterozoic areas in the world. Important ore deposit types include volcanogenic massive sulphide, orogenic gold, black-shale Ni, layered intrusions, intrusive hosted Cu-Au, apatite-Fe, IOCG, and anorthosite Ti deposits. Currently all these types of deposits are exploited and exploration expenditure has been at an all time high since 2007. Investment in exploration in the Fennoscandian Shield in 2012 will probably be close to 200 million euro. Greenland is still a frontier area concerning mineral exploration and mining, however, present high activity of exploration is promising for the country. One mine is in operation (Nalunaq), two deposits have and exploitation license (Black Angel, Malmbjerg) and feasibility studies are in progress for four deposits.

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Baltic Student Chapter SGA Annual Meeting 2012

Paulina Kolarz (text) & Tomasz Ćwiertnia (photos)

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In 2012, the annual meeting of the SGA Baltic Student Chapter took place in Luleå, Sweden. The picturesque region in northern Sweden attracted students from Kraków, Poland (Tomasz Kmiecik, Paweł Łydek, Urszula Janicka, Andrzej Lis, Władysław Zygo, Tomasz Ćwiertnia, Paulina Kolarz, Joanna Kołodziejczyk, Marta Sośnicka, Marta Kiedrowska, Adrian Krzemiński), Turku, Finland (Jani Jäsberg, Jenni Nevalainen, Evgeniia Serediuk) and Sweden & Czech Republic (Lisa Andersson, Sanna Naalisvaara, Astrid Lindgren, Friederike Minz, Nikola Denisova, Kateřina Schlöglová). The organizers, Lisa Andersson, Nikola Denisová, Astrid Lindgren and Sanna Naalisvaara, hosted participants at Luleå University of Technology (LTU) and created an unforgettable event.

Fig. 1. Participants at the Polar Circle.

Fig. 2. Looking for ore minerals in Aitik open pit mine.

During the three-day meeting, which was held on 20-22 November 2012, student members of SGA were given the opportunity to learn about the ore deposits of Northern Scandinavia.

The first day was the conference day. Lectures and presentations given by experts and senior lecturers covered a wide range of ore types both in Sweden and worldwide. Professor Pär Weihed (LTU) introduced students to the metallogeny of the Skellefte district and Professor Wolfgang Maier (University of Oulu, Finland) approached the topic of gold, platinum and diamonds in South Africa and Finland. Further lectures were given by Dr. Olof Martinsson (LTU) on the characteristics and origin of iron ores of Kiruna types, and by Dr. Christina Wanhainen (LTU) on the Aitik Cu-Au-Ag deposit. These lectures were an introduction to field trips which were held on the following two days of the meeting.

The field trips took place in Northern Norrbotten County in Sweden. After a long journey, participants crossed the Polar Circle (Fig. 1) and reached the town of Gällivare. The Aitik Cu-Au-Ag mine is located 17 km east of the town and belongs to New Boliden. Ore deposit is thought to be a hybrid between porphyry-copper and IOCG (Iron Oxide Copper Gold ore deposits). The proved mineral reserves are 476 Mt ore with 0.24 % Cu, 0.14 ppm Au, 1.5 ppm Ag and 26 ppm Mo (New Boliden 2013). After processing of the ore material (comminution & flotation), the final concentrate contains an average grade of 27-29 % Cu, 8 ppm Au and 250 ppm Ag (Nordin et al. 2007).

During the visit, participants had the opportunity to see an impressive Aitik open pit, which is 3-km-long, 1.1-km-wide and 450-m-deep and take rock samples with ore minerals there (Fig. 2). What is more, students were introduced to the ore excavating and ore processing, and finally they visited a truck workshop (Fig. 3). The tour was guided by Boliden specialist.

The second excursion day was carried out in the Kiirunavaara mine. It is located in the town of Kiruna in the north of Sweden. The mine is the largest of the AIO (Apatite Iron Ore) type in Sweden and belongs to LKAB. At the early stages, the mine was operated as an open pit, but now it is only an underground excavation on a huge scale. The 6-km-long, up to 200-m-thick ore body is on the contact line between a pile of trachyandesitic lava and pyroclastic rhyodacite, and it extends at least 1500 m below the surface. The iron ore is estimated at 2000 Mt with 60 to 68% Fe (Martinsson & Bergman 2007). The final concentrate as pellets has an average 67% Fe content (LKAB 2013).

During guided tour through the mine, the whole process involved in mine operation were explained and demonstrated: from exploration, extraction and transport, through processing, and the export of the final product to the world. Students were taken to the ore body where they could take rock samples (Fig. 4, Fig. 5). Finally, they visited drill core logging center and received core souvenirs (Fig. 6).

Besides the lectures and field trainings, participants enjoyed a dinner with lecturers and professionals from mining companies. Students from four European countries could exchange their knowledge and experience and have a good time together. Moreover, travelling through Scandinavian countries, they could enjoy the marvelous landscapes and learn about the local culture and traditions. Participants will surely remember the Baltic Student Chapter SGA meeting in Luleå for a long time. They have gained the skills and knowledge which will be their key to success in a geological career.

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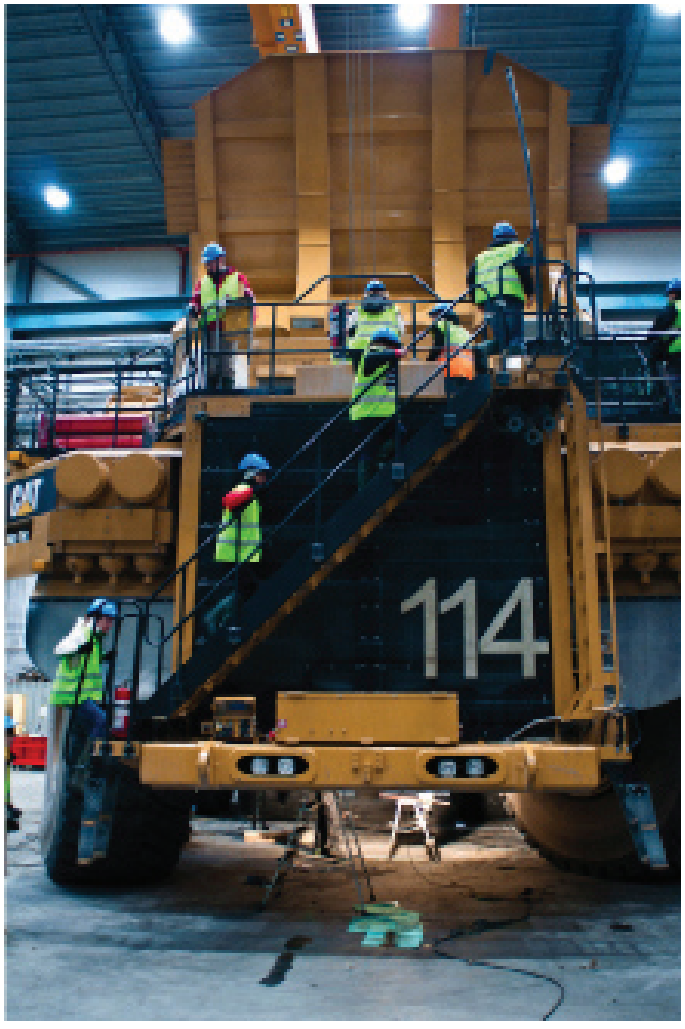

Fig. 3. Visiting the truck workshop in Aitik.

Fig. 4. Magnetite ore body in Kiirunavaara mine.

Fig. 5. Participants visiting Kiirunavaara mine.

Fig. 6. Drill core logging center in Kiirunavaara mine.

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News from the Prague Student Chapter - Origin of ore deposits in the Erzgebirge (Krusne hory) Mts., Central Europe

Vit Peresty and David Dolejs

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The SGA Student Chapter Prague organized its final excursion for 2012 on November 4-5, with the main focus on the origin of ore deposits in both the Czech and German parts of the Krusne hory/Erzgebirge Mts. The main attraction of the field trip was an underground visit in the historical mines of Ehrenfriedersdorf and Pöhla and at the Zlatý Kopec near Boží Dar (Gotesgab).

The common feature of all localities is a widespread cassiterite mineralization related to the hydrothermal fluid flow from late Variscan biotite to topaz granites (327–312 Ma). The tin deposits are located in the paleoroof of the Krusne hory/Erzgebirge batholith formed by Neoproterozoic and Early Paleozoic supracrustal sequences: phyllites, micaschists, paragneisses, amphibolites, and marbles that were altered and host stratiform or disseminated mineralization. Altered rocks are also intersected by numerous ore-bearing veins. The highest abundances of economic minerals are concentrated in skarns that formed by replacement of dolomites or surrounding metasediments and metavolcanics. Therefore skarns were target of historical mining as well as post-war exploration and became the principal target of our field trip.

We first visited the tin deposit of Ehrenfriedersdorf, where we spent several hours on the second underground level of the mine. The mining activities started about 750 years ago and continued until 1990. The cassiterite mineralization mostly occurs as zonal vein swarms trending E-W and ENE-WSW, with thickness ranging from several mm to a few cm and of metre length. Cassiterite, arsenopyrite, loellingite, wolframite, scheelite and molybdenite are abundant in the quartz veins together with topaz, micas, fluorite, chlorite and beryl. Younger greisen-type mineralization is developed along the upper contact of the lithium granite intrusion and attains thickness on the order of 0.1 to 1 m. Fluorite, triplite, cassiterite, arsenopyrite and molybdenite are present in minor amounts. The thickness of skarn bodies with cassiterite and sulphide mineralization ranges from 0.2 to 2 m. As part of our visit at Ehrenfriedersdorf, we were able to examine collection of minerals and mining techniques in the local museum.

SGA student chapter Prague on the second underground level of the mine Ehrenfriedersdorf. Photo by Matylda Heřmanská.

In front of the Ehrenfriedersdorf mine. Photo by Jan Bubal.

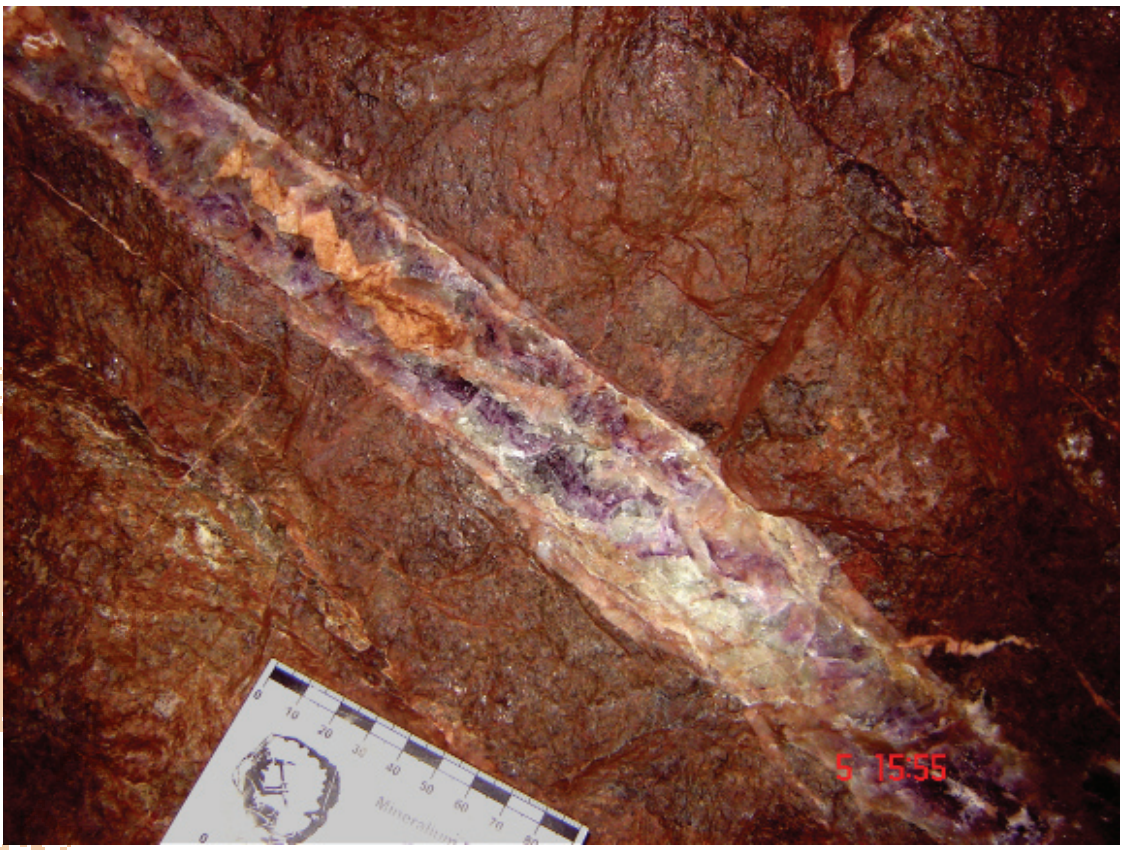
On the second day, the excursion continued along the Czech-German border where our next excursion locality, the abandoned mine at Zlatý kopec, was located. This small mining district belonged to one of the richest skarn deposits on the Czech side of the Krusne hory/Erzgebirge Mts. The first mention of mining activities comes from the 16th century, the largest ore production dates back to the 17th century and the mining of Sn, Ag, Cu and, to a lesser extent, of Fe and Zn ores continued with variable success till the 19th century. The diverse mineralization at the Zlatý Kopec site is a result of combination of several ore-forming processes. The most prominent is anomalous elevation of the hidden granite surface, which promoted fracturing in its host rocks. In addition, proximity of the regionally important fault enhanced porosity and allowed increased fluid flow. Finally, dolomites and mafic metavolcanics acted as a chemical barrier, which promoted strong wall-rock alteration and significant ore precipitation. Two main mineralization styles occur at Zlatý Kopec: Sn-W mineralization and Ni-Co-Bi-Ag-U mineralization that are temporarily separated. The most important Sn-W ores were found in skarns (up to 5 % Sn), but also in the tourmalinized phyllites (0.6 % Sn in lenses 30–40 m long and 1.5–9.5 m thick) that are cut by numerous quartz–tourmaline–cassiterite veins with abundant sulphides: arsenopyrite, pyrite, sphalerite, pyrrhotite, chalcopyrite, and locally fluorite.

Despite that the Zlatý Kopec mine is abandoned, it still contains substantial reserves of Sn-ore with estimated grade up to 1 % SnO_2. Other metals of recent interest are In or Cd, which mostly occur in sphalerite at levels of 0.1 % and 1 %, respectively. However, all metal-bearing minerals have microscopic scale, and presently the exploitan is not economically and technically feasible.

Our final stop was the Pöhla ore deposit. From the geological view point, the underground mine is particularly interesting because it exposes superposition of several contrasting mineralization styles. The oldest ores are represented by magnetite skarns, which form stratiform or stratabound bodies in the Cambrian and Ordovician volcanosedimentary sequences. During Variscan magmatic events, that is, emplacement of peraluminous highly evolved granites, the Sn-W mineralization formed. It includes magnetite skarn formation in carbonate precursors and precipitation of cassiterite and scheelite. The next mineralization style are uranium-bearing hydrothermal veins of Mesozoic age that are contemporaneous with the famous Czech uranium deposit at Jáchymov (Joachimsthal), from which the name of dollar originates. The youngest hydrothermal process was fracturing and precipitation of low-temperature fluorite-barite veins during Tertiary period.

The mining activities at Pöhla continued for several centuries, however, most metals were extracted after the World War II, when uranium mineralization was discovered. During its exploitation, major magnetite skarn bodies with cassiterite and scheelite mineralization was found. The Pöhla mining district was important for its production of tin, zinc, iron, uranium but also rare metals such as indium or cadmium. The Ag-rich veins were mined as well, however due to their high amounts of As, the mining was inefficient and stopped. The mining activities ceased in 1990 but today, more than 3 kilometers of underground adits are accessible for sightseeing or geological courses. We shall also mention a local curiosity - a large ceremonial hall in one of the large cassiterite-magnetite skarn caverns where weddings, concerts and other cultural events are held.

This excursion provided an interesting and educational opportunity to better understand ore-forming processes in the Krusne hory/Erzgebirge Mountains that are applicable elsewhere as well. It was indeed a very pleasant closing of the chapter activities in 2012 and we would like to thank all our guides for their time and effort to make the mine visits successful.



Late fluorite-barite vein in the Pöhla mine. Photo by Jan Bubal.

The SGA website

Daniel Layton-Matthews , Chief Editor SGA website
Queen's University, Kingston, ON K7L 3N6, Canada, dlayton@geol.queensu.ca

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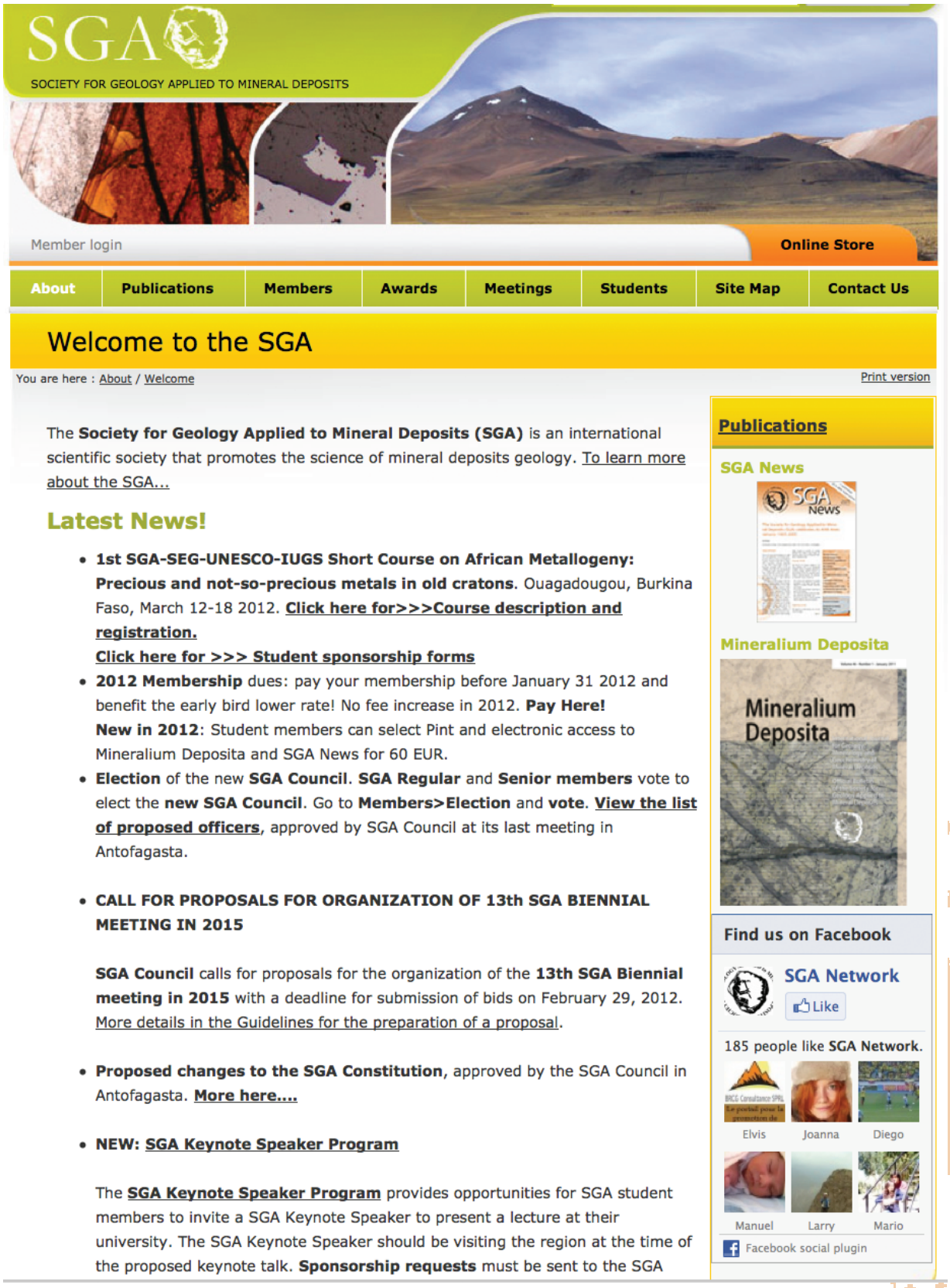

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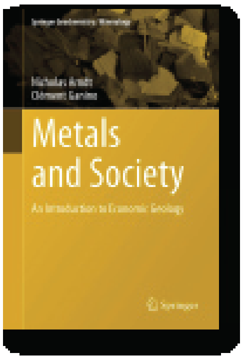

2012, 2012, XIII, 160 p. 61 illus., 40 in color.

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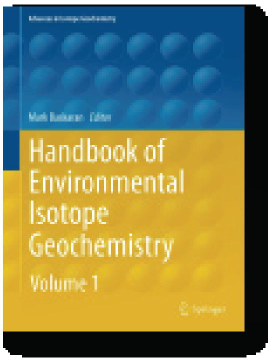

2012, 2012, XXI, 951 p. 315 illus., 139 in color.

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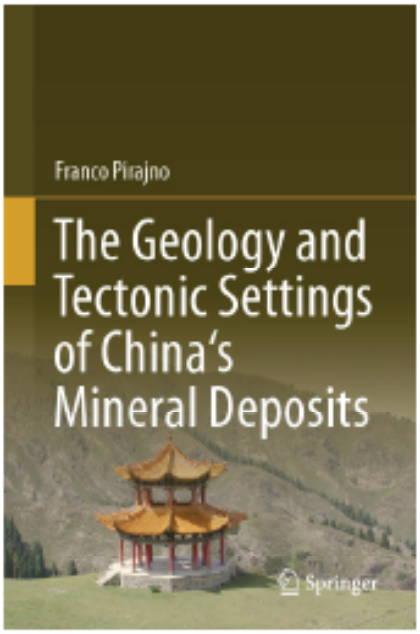

Franco Pirajno, Geological Survey of Western Australia, East Perth, WA, Australia; The University of Western Australia, Perth, WA, Australia; and Chinese Academy of Geological Sciences, Beijing, China

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SGA, the Geological Survey of Sweden and the Nordic mining industry invite you to the 12th SGA Biennial Meeting:

Mineral deposit research for a high-tech world

12–15th August 2013, Uppsala, Sweden

Second circular

SGU
Sveriges geologiska undersökning
Geological Survey of Sweden

www.akademikonferens.uu.se/sga2013

Invitation

The Geological Survey of Sweden and the local organizing committee are proud to announce the 12th SGA Biennial Meeting which will be held in the university city of Uppsala. The meeting will take place at the Uppsala University main building within walking distance to most downtown hotels.

The 12th SGA Biennial Meeting will provide excellent opportunities to present and exchange knowledge within the field of mineral deposit research.

Sweden has a history of mining and metals refining stretching back more than a thousand years. Its metal ores and other mineral resources, and the knowledge about how to use them, have been key elements in building the prosperity of the country.

There will be a wide variety of activities available to both delegates and accompanying persons, in terms of excursions and of all the interesting social activities that Uppsala and nearby Stockholm have to offer.

It is my pleasure to warmly invite you to Sweden and Uppsala. We look forward to seeing you at the 12th SGA Biennial Meeting.

Kaj Lax

Chairman of the local organizing committee, Head of department, Geological Survey of Sweden.

Organisers

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Front page: Aitik copper, gold and molybdenum mine. Norrbotten. Courtesy: Boliden Mineral AB.

Venue

The conference will be held at the Uppsala University main building, located in the centre of the town. Built in the 1880s and hosting a magnificent and spacious foyer and a Grand Auditorium, it is often used for academic ceremonies such as inauguration of full professors and the doctor's degrees ceremonies. The University main building also has many smaller lecture halls of various sizes and it is therefore often used for conventions and conferences. The venue is centrally located in a beautiful area within walking distance to most downtown hotels. The building has free unlimited wireless internet access.

The workshops and short courses will primarily be held at Geocentrum – the Department of Earth Sciences at Uppsala University and at the Geological Survey of Sweden.

The official language of the meeting, workshops and excursions will be English.

The University main building. Photo: Anders Damberg.

Committees

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Alireza Malehmir, Uppsala University
Erik Jonsson, Geological Survey of Sweden
Iain Pitcairn, Stockholm University
Karin Högdahl, Uppsala University
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Raimo Lahtinen, Geological Survey of Finland
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Pasi Eilu, Geological Survey of Finland
Raimo Lahtinen, Geological Survey of Finland
Rodney Allen, Boliden Mineral AB
Thomas Wagner, University of Helsinki
Wolfgang Maier, Oulu University

Scientific Program

	Aug 7-11	Aug 12	Aug 13	Aug 14	Aug 15	Aug 16-19
Morning	Pre-conference excursions	Plenary session	Plenary session	Scientific sessions	Scientific sessions	Post-conference excursions
Lunch						
Afternoon		Scientific sessions	Scientific sessions	Scientific sessions	Scientific sessions	
Evening	Aug 11 Ice breaker			Conference Dinner		

Scientific Sessions

S1 Present and future of metals and minerals
S1.1 New metal needs and new deposit types
S1.2 Sustainability in mining and exploration: the role of geosciences.

S2 Methods and advances in mineral deposit studies
S2.1 3D modelling of ore deposits.
S2.2 New advances in geophysical mineral exploration.
S2.3 New analytical methods and applications in mineral deposit studies.
S2.4 Advances in mineral chemistry of Fe oxides: ore-forming processes and implications for exploration.
S2.5 Ore mineralogy and geometallurgy.
S2.6 New advances in geochemical exploration.
S2.7 Predictive modelling.

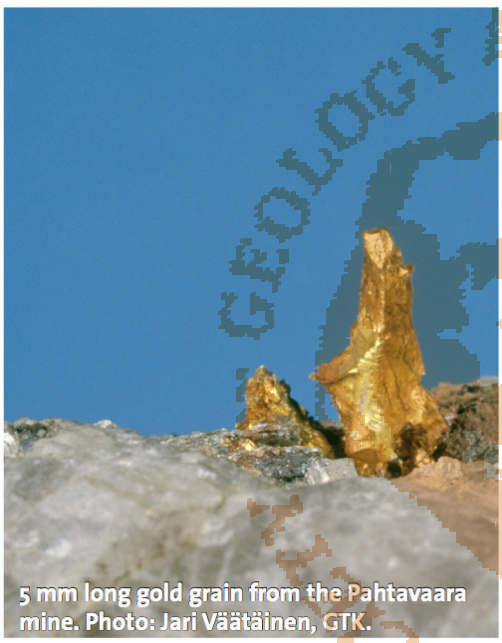
S3 Ore forming processes and deposit types
S3.1 Volcanic-hosted base and precious metal deposits.
S3.2 Sediment-hosted deposits.
S3.4 Magmatic and hydrothermal hypogene and supergene iron ores.
S3.5 Porphyry systems and epithermal deposits.
S3.6 Ore deposits associated with mafic and ultramafic rocks.
S3.7 Orogenic gold deposits.
S3.8 Hydrothermal ore-forming processes.
S3.9 New developments in the understanding of IOCG deposits.
S3.10 Metallogenesis of collisional orogens in the tethyside domain.
S3.11 Metallogeny in the Urals.
S3.12 Skarn deposits – 138 years after Törnebohm.
S3.13 Uranium and thorium deposits.

S4 Fennoscandian mineral deposits
S4.1 Metallogeny of Fennoscandia: The Shield, the Caledonides and the Oslo rift.

S5 High-tech elements – deposits and processes
S5.1 High-tech elements – deposits and processes

S6 Industrial minerals
S6.1 Industrial minerals.
S6.2 Construction materials.

S7 Open session


5 mm long gold grain from the Pahtavaara mine. Photo: Jari Väätäinen, GTK.

Excursions

Finland and Russia

FINRUS Ni-Cr_PGE deposits of Finnish Lapland and the Kola peninsula, pre-conference, Aug 5-11
Deadline for registation and cancellation: February 28, 2013. Registration closed. Fully booked.

FIN1 Orogenic gold excursion, Finland, post-conference, Aug 16-19
Deadline for registation and cancellation: May 31, 2013.

FIN2 Proterozoic base metal deposits along the Archean-Proterozoic boundary in central Finland, pre-conference, Aug 6-9
Deadline for registation and cancellation: March 15, 2013.
Registration closed. Excursion cancelled due to too few participants.

RUS Gold deposits of the Russian North East, pre-conference
Information and registration through Nikolay Goryachev, e-mail: goryachev@neisri.ru

Greenland

GRE South Greenland excursion, post-conference, Aug 16-24
Deadline for registation and cancellation: March 15, 2013. Registration closed. Fully booked.

Norway

NOR1 Metallogeny in the Oslo Rift and adjoining shield areas, pre-conference, Aug 8-11
Deadline for registation and cancellation: April 1, 2013
Registration closed. Excursion cancelled due to too few participants.

NOR2 Fe-Ti and Fe-Ti-V-P deposits in the Rogaland Anorthosite Province, S. Norway, post-conference, Aug 16-19
Deadline for registation and cancellation: April 1, 2013
Registration closed. Excursion cancelled due to too few participants.

NOR3 Copper and gold-copper mineralizations in N. Norway, pre-conference, Aug 8-11
Deadline for registation and cancellation: April 1, 2013
Registration closed. Excursion cancelled due to too few participants.

Sweden

SWE1 The Skellefte District, volcanostratigraphy and structures related to Palaeoproterozoic base metal deposits, pre-conference, Aug 5-9. Deadline for registation and cancellation: May 24, 2013. Registration still open. Extended deadline June 7.

SWE2 The gold line and deposits in the Skellefte district, pre-conference, Aug 7-9
Deadline for registation and cancellation: June 7, 2013

SWE3 Norra Kärr REE-Zr project and the birthplace of the light REEs, pre-conference, Aug 10-11
Deadline for registation and cancellation: June 7, 2013

SWE4 Bergslagen, post-conference, Aug 16-21
Deadline for registation and cancellation: May 24, 2013. Registration closed.

SWE5 IOCG and related deposits in northern Fennoscandia, post-conference, Aug 16-20
Deadline for registation and cancellation: May 24, 2013. Registration closed. Fully booked.

SWE6 One day excursion to the historic Sala Ag deposit, post-conference, Aug 16
Deadline for registation and cancellation: June 7, 2013

SWE7 One day excursion to the island of Utö, post-conference, Aug 16
Deadline for registation and cancellation: June 7, 2013

SWE8 City walks to see ornamental and building stones in Uppsala Cathedral, (Once a day, Aug 12-15)
Registration will take place on-site, August 12-15, 2013

Workshops and Short Courses

A number of workshops and short courses will be arranged in association with the SGA 2013 meeting in Uppsala. More detailed information will be provided on the conference webpage. Those interested in offering short courses or workshops, please contact the local organizing committee at: sga2013@sgu.se.

New proposals will be considered until December 7th, 2012.

Workshops

W1: 3D/4D Modelling of Mineral Deposits. Dr. Nigel Phillips &Dr. Gervais Perron, Mira Geoscience.

W2: Applied Structural Geology in Exploration and Mining. Dr. Chris Bonson, Dr. Ivo Vos and Paul Stenhouse, SRK Consulting.

W3: BIF-hosted iron ore systems: Genesis and exploration models. Prof. Steffen Hagemann, Thomas Angerer, Paul Duuring, Centre for Exploration Targeting-University of Western Austalia. Prof. Lobado, Prof. Figueiredo e Silva, Prof. Rosiere Universidade Federal Minas Gerais at Belo Horizonte, Brazil.

W4: Archaean-Proterozoic basic and ultrabasic magmatism of the Karelian and Kola cratons. To be held pre- excursion in Oulu, Finland. Prof. Eero Hanski, Prof. Wolfgang Maier, Oulu University, Finland.

Short Courses

S1: Global Orogenic Gold – Temporal and Spatial Distributions, Critical Characteristics and their Relevance for Exploration. Dr. Pasi Eilu, Geological Survey of Finland. Dr. Rich Goldfarb, US Geological Survey. Dr. Iain Pitcairn, Stockholm University, Sweden.

S2: Fluids, minerals and melts: Investigating hydtrothermal processes using laser ablation-ICP-MS techniques. Dr. Brian Rusk, Western Washington University, USA.

Cancellations and Refunds

Cancellation of Registration

Notification of cancellation must be made in writing and sent to Akademikonferens, the conference secretariat. Cancellation of registration will be accepted until May 31, 2013, up to which date the total amount will be refunded minus SEK 750 for cancellation fee. We regret that no refunds or reductions of fees will be accepted for cancellations made after the registration deadline date, nor for no-shows for any reasons.

Cancelled event by the organizers

If your chosen workshop or shourt course should be cancelled by the organizers, due to too few participants or by other reason, your full fee will be returned. The cancellation will be announced as soon as possible after the registration deadline (May 31, 2013).

Accommodation

Please make your hotel reservation by filling in your request on the registration form. Hotel rates and room availability can only be guaranteed if your booking is made by June 27, 2013. The hotel rooms will be confirmed on a first come – first served basis.

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In order to guarantee accommodation you need to state your credit card details on the registration form. The information will only be used in case of no-show or late cancellation. Please read “Cancellation and Refunds” on the Registration page.

Payment Options

Accommodation must be paid directly to the hotel during your stay. You will be able to pay by credit card or by cash.

Changes to your Reservation

If you need to change your reservation, please contact the conference secretariat at
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- See map of Uppsala

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All rates include breakfast and VAT. Price and availability when booking on the conference registration form only.	Rate/night/room
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Clarion Hotel Gillet • website Located in the city centre 5 minutes walk from the Uppsala Travel centre. Non-smoking. Internet available.	Single room SEK 1195 Double room 1445
Profilhotels Hotel Uppsala • website Located in the city centre, 5 minutes walk from the Uppsala Travel centre. Non-smoking. Free internet.	Single room SEK 1350 Double room SEK 1550 (Fri-Sat SEK 669 resp 869)
Scandic Hotel Uplandia • website Located in the city centre, 5 minutes walk from the Uppsala Travel centre. Non-smoking. Free internet.	Single standard SEK 1450 Single superior SEK 1550
Akademihotellet • website Located by the Uppsala University Main Building, 15 minutes walk from the Uppsala Travel centre. Non-smoking. Free internet. The front desk has restricted opening hours.	Single room SEK 1020 Double room SEK 1280
Hotell Charlotte • website Located 20 minutes walk from the Uppsala Travel centre. Non-smoking. The front desk has restricted opening hours. Free internet in most rooms.	Single room SEK 1110 Double room SEK 1370
Hotel and Hostel Centralstation • website **(Hotel and Vandrarhem Centralstation)** Located across the street from Uppsala Travel centre. Non-smoking. Free wireless Internet. Front desk is open around the clock. Hostel rooms only have window towards corridor and shared bathroom. Some hotel rooms might have windows to corridor, not towards the street. These prices all include breakfast, bed linen and cleaning.	Single hotel room SEK 749 Single hostel room SEK 500

If you wish to find less expensive accommodation, we recommend you to contact:

- **Fyrishov Cabins & Camping**, phone: +46 18 727 49 60, **stugby@fyrishov.se**
- **Bed & Breakfast Agency Uppsala**, phone: +46 18 42 10 30, **bb.018421030@telia.com**
- **Citystay**, phone +46 18 121 000, **booking@citystayuppsala.se**

Students

The future and development of economic geology depends on the involvement of graduate and postgraduate students. Therefore, students within a broad field of ore deposits research are invited and encouraged to submit abstracts and present their results at the 12th SGA biennial meeting in Uppsala. The meeting offers a great opportunity for students to interact with leading scientists, other young researchers and the industry in an inspired and informal environment. Attractive benefits are being offered to students to encourage their participation in SGA2013 including:

Reduced registration fees

The registration fee for all students is at a reduced level, with SGA student members paying the lowest registration fee.

Student grants

To support participation of students at the conference, a limited number of grants are open for students who are senior authors of accepted abstracts. For these grants, SGA student members are prioritised. The student grants will be awarded upon the acceptance of an abstract for oral or poster presentation at the conference, and will be based on the financial need and scientific relevance of the submitted contribution. An application form for student financial support will be available on http://www-conference.slu.se/ sga2013/students.

Free excursions

Several pre- and post-meeting excursions to Nordic countries and Russia are being organized. For students, a limited number of free registrations will be offered (only one per trip). An application form will be available on the conference website. The Greenland and North-east Russia excursions are excluded.

Student awards

The best student oral and poster presentation will be awarded a certificate and a prize of 300 USD.

Social evening 'Student & Industry'

All registered students are also invited to a social event organized by the industry to discuss future projects, employment opportunities or just to mingle with a range of different types and sizes of mining and mineral exploration companies, active in the Nordic countries and elsewhere. For further information about this event, please contact Rodney Allen: rodney.allen@boliden.com.

Do not hesitate to contact the Student Committee members if you have any questions, comments or suggestions.

The SGA Student Committee
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The Hall of State at Uppsala Castle, prepared for a dinner hosted by SGU. Photo: Carl-Erik Alnävik

Social Program

Conference Banquet at Uppsala Castle

The Uppsala Castle dates back to the 16th century and is the site of numerous historical events. Today, the castle houses the art collection of Uppsala city and Uppsala University and a museum on peace. It is also the residence of the county governor. The conference banquet will include a three-course dinner in the magnificent Hall of State, where Queen Christina of Sweden abdicated her throne in June of 1654.

Location

The castle is located centrally: an easy 15–20 minute walk from several downtown hotels, and a 10–15 minute walk from the conference venue, also facing the beautiful botanical gardens.

Destination Uppsala

Uppsala's profile as a city of learning, with close proximity to Stockholm and Stockholm-Arlanda Airport and a wide variety of modern and historical experiences that only the Uppland region can offer, lays the foundation for a winning concept for both national and international meetings.

A town with two universities

Uppsala is the fourth largest city in Sweden, with a steadily increasing population of around 200,000. The city retains the charm of a small town while offering major urban opportunities and attractions. Here are two universities, the Swedish University of Agricultural Science and Uppsala University, founded in 1477. Uppsala is considered to be the religious and historic centre of Sweden.

People

The city has a solid base of knowledge and tradition from which to progress. At the same time, the atmosphere is youthful, and more than 40,000 university students are a signicant factor to this vivacity. Uppsala also hosts Sweden's oldest botanical gardens, the Garden of Linnaeus, founded by the great natural scientist himself. Carl Linnaeus' professorial residence is situated in the garden. Just outside of the city you can visit his summer residence, Linnaeus' Hammarby.

Sightseeing

Uppsala boasts the largest cathedral in Scandinavia, one of Sweden's most famous locations of prehistoric artifacts (Old Uppsala), a unique anatomical theatre built in the 1600's by Olof Rudbeck the Elder, the great university library (Carolina Rediviva) with the Silver Bible, Uppsala Castle dating back from the mid-1500's, and many more marvellous sites and attractions. The city's geographical location, only 20 minutes from Stockholm- Arlanda airport and 45 minutes from Stockholm, the capital, has made Uppsala an attractive place for meetings and to establish new companies.

Getting to and around Uppsala

Transport

Uppsala has a well functioning public transportation system and taxis are also available at the Central Station.
Sweden has a highly efficient rail network spanning the entire country. For those traveling by car, Sweden offers a well-maintained network of roads and motorways which makes Uppsala easy to access by car. Delegates will also have the possibility to travel to Stockholm by boat. Ferries regularly connect Stockholm to Finland, Estonia, Latvia and Poland. Trains from Stockholm Central Station to Uppsala Central Station depart at least twice an hour from 6 am to 11 pm and the journey takes 40 minutes. Stockholm-Arlanda International Airport is situated between Uppsala and Stockholm. The airport offers 170 destinations worldwide and 70 airlines. Easy access buses and trains run frequently directly from the airport to Uppsala city centre and the trip takes 20–45 minutes. You can go by taxi straight from the airport to your hotel in Uppsala for approximately 55 €, if the price is agreed on beforehand (if not, the price may turn out much more expensive).

Currency

The Swedish monetary unit is the Swedish krona (SEK), divided into 100 öre. Excange rates in October 2012:
Euro 1=SEK 9 USD 1=SEK 7 GBP 1=SEK 11. Major credit cards are accepted almost everywhere. There are several currency exchange

offices and cash dispensers at Stockholm Arlanda International Airport and in Uppsala. Exchange rates may vary. To see current exchange rates, please visit oanda.com. or x-rates.com.

Accommodation

There are several hotels and hostels within walking-distance from the conference centre. For more information, please see pages XXX and visit the conference webpage.

Lunches

There will be an option to pre-purchase lunch at registration. However, there are several restaurants in downtown Uppsala. Prices vary between c. 10 and 15 €. Going downtown, eat lunch and walk back will take approximately 1 hour.

Security

Uppsala is a peaceful city and the only risk to consider is pickpockets – always keep an eye on your belongings. The same goes for Stockholm, where there are more tourists and therefore also more pickpockets.

Weather

At the time of the conference the weather in Uppsala is either sunny or rainy, due to thunderstorms. Temperatures vary from c. 15 to 25 °C and it might be windy.

The library Carolina Rediviva. Photo: Anders Damberg.

Photo: Anders Damberg.

The Uppsala Castle at nightfall. Photo: Anders Damberg.

Important information

Registration

Registration fees	By May 31 at the latest	After May 31
SGA member	SEK 4300	SEK 5000
Student, SGA member	SEK 2000	SEK 2500
Non-member	SEK 5300	SEK 6300
Student, non-member	SEK 2500	SEK 3000
Accompanying person	SEK 1000	SEK 1500

Registration fees include:

- Access to all technical and plenary sessions.
- Morning and afternoon refreshments.
- Ice breaker party.
- All meeting materials including the final programme and conference abstract volume in digital format.

Lunch is not included in the registration fee, but during registration lunch can be purchased for an additional fee of c. 580 SEK. A printed copy of the proceedings can be ordered in conjunction with registration for an additional fee.

Exibits

Limited space is available for exhibits at the conference venue. Please contact the local organizing committee (sga2013@sgu.se) for more information regarding reservation and prices.

Sponsorship

Sponsorship is available in different categories – please contact the local organizing committee for a detailed offer (sga2013@sgu.se).

Please note

Only abstracts by authors who have paid their registration fee (limit two papers per first author) by May 31st will be included in the conference program and abstract volume.

Important dates

June 3: Deadline for early bird registration

May 24: Detailed schedule posted

Feb 22: Abstract submission is closed

Jan 11, 2013: Info about sessions updated

Jan 7, 2013: Registration is open

Nov 8, 2012: Please click here for 2nd circular

For more information and registration: www.akademikonferens.uu.se/sga2013

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50th SGA Anniversary meeting

Welcome back to the roots of SGA

13th SGA Biennial Meeting

SOCIETY for GEOLOGY APPLIED to MINERAL DEPOSITS

Nancy, France, August 24-27, 2015

Mineral Resources in a Sustainable World

Photo : V. Hunault

sga-2015@univ-lorraine.fr