



SGA

News

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Number 34

Challenges for heavy rare earth production: lessons from Japan

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Introduction

Heavy rare earth elements (Gd to Lu) (HREE) (Henderson, 1996), in which often Y is included, are used to produce permanent magnet, phosphor, condenser, zirconia stabilizer, etc. Among them, dysprosium (Dy) is indispensable to improve heat resistance of the NdFeB magnet, which is applied in modern high-tech materials such as driving motors of hybrid vehicles, factory automation machinery, home electronics, wind turbines, etc. This NdFeB magnet is extremely superior in magnetic properties compared to the traditional ferrite magnet, and thus enables to produce compact motors that are highly efficient and reduce energy consumption (Minowa, 2008).

HREE, including Dy, have been exclusively produced from ion-adsorption type deposits in southern China, in which REE are absorbed in clay minerals such as halloysite and kaolinite that formed by weathering of granitic rocks (Wu et al., 1990). The advantages of this deposit type are 1) low REE production cost (~20USD/kg for REO) despite very low ore grades (0.05-0.2wt.% REO), 2) no beneficiation required (in-situ REE leaching by ammonium sulphate solution), 3) free from radioactivity

and 4) no large mining facility required. In recent years (2005-2010), the amounts of REE produced from ion-adsorption deposits in southern China are estimated to be 40,000 to 60,000t as rare earth oxides (REO) annually, including about 2,000-3,000t of Dy oxides.

Although China has been the main producer, supplier and consumer of REE in the world in the last two decades, the limited HREE production and exportation by the Chinese government (Figure 1) has made many countries difficult in the supply of HREE. In 2012, the Chinese government planned to limit the production and exportation to be 17,900t and 3,900t for medium and heavy REO, respectively (Industrial Rare Metals, 2013). These amounts are extremely small, compared with the amounts practically produced in southern China in 2005-2010. Thus, the Department of Energy of the United States of America regarded Dy as one of the most critical elements for clean energy in both a short (2012-2015) term and a medium term (2015-2025) (U.S. Department of Energy, 2010). Japan, the second largest REE magnet producer after China, has also been concerned about the

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News of the Society

SGA Ordinary Council Meeting, August 11, 2013 Uppsala, Sweden

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

P. Weihed (SGA President) welcomed Council Members (G. Beaudoin, N. Bortnikov, P. Eilu, H. Frimmel, K. Kelley, J. Pašava, A. Piestrzynski, J. Relvas, J. Richards and A. Vymazalová) and guests (S. Micklethwaite and Cam McCuaig, UWA; A. Sylvie Andre-Mayer, University of Lorraine; P. Klingbjer, LOC SGA 2013 from the Swedish Geological Survey and J. Slack, Chief Editor, SGA Special Publications) and thanked P. Klingbjer and his team for organization of the Council meeting and the Geological Survey of Sweden for hosting it. Then Council approved changes in suggested agenda.

Proposal for organization of SGA Field Courses in Western Australia (S. Micklethwaite and Cam McCuaig)

Cam McCuaig and S. Micklethwaite offered organization of SGA Field Course focused on geological mapping in WA. The 7 days course which is a part of MSc program can accommodate 20 people and a fee per person including on site expenses is AUD 2,000 (without any sponsorship). Cam McCuaig offered to secure industry sponsorship for 8-10 international SGA student participants. SGA would offer a support from SGA EF. Both supports would be distributed through a Committee (A. Vymazalova, J. Relvas, H. Frimmel). Supported European (oversea) participants would need to pay a minimum fee of AUD 500. The first run of the course could be organized between June and September 2015. Council accepted the concept with great thanks and approved the following motion: Cam McCuaig to provide a more detailed info on the course program.

Status of preparation of the 13th SGA 2015 Biennial Meeting (A.S. Andre-Mayer)

The report was presented by Anne Sylvie Andre-Mayer. After discussion Council recommended the following issues to be considered by the LOC:

MOU will be prepared and signed between SGA and LOC (J. Pašava)

Proceedings should be preferably on memory stick and only pre-ordered hard copies by participants plus 15 copies for SGA should be printed.

Lunches and gala dinner should be separate from registration fee.

It should be bigger difference between conference fees for SGA members and non-members.

Abstract template with an example of abstract should be provided on conference website and submission and handling of abstracts should be customers friendly.

Session leaders should consider inclusion of external reviewers as much as possible.

Conference budget should be discussed with and monitored by SGA Treasurer (H Frimmel).

SGA President and SGA Executive Secretary should be members of LOC.

Minutes of previous Council Meeting (April 11, 2013 Lisbon, Portugal)

After checking the actions, the Minutes were unanimously approved.

Reports of officers on Council (to be received prior to meeting) and matters arising from these reports

Reports were submitted by the SGA Executive Secretary, Treasurer's Office, Chief Editor, SGA News, Regional VP for Oceania and RVP for South America. Following a Council decision from Lisbon (April 11, 2013) an electronic Council vote resulted in approval of M. Bouabdellah (Morocco) as RVP for North Africa and Middle East and S. Piercy (Canada) as RVP for North America for upcoming SGA election. In July 2013 SGA membership was 1272 (11% increase in total membership and a 41 % increase in the student membership compared to the end of 2012).

After discussion, Council approved the reports with great thanks and the following motions: H. Frimmel to transfer a sum cca EUR 20,000 to SGA EF.

All Council members coordinated by RVP's to contact SGA 2012 members who haven't

SGA News

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31 May 2014

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renewed their membership yet.

P. Weiheid to ask Y. Watanabe to prepare a main article for SGA NEWS 34 and send it to M. Chiaradia.

P. Weiheid to inform Chief Editor, SGA website about Council decision on future policy re: Society website.

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

All Council members to submit contributions to SGA NEWS 34 to M. Chiaradia by October 30, 2013

All Council members to submit proposals/ideas on how SGA should deal with various international initiatives in the field of raw materials (EODI, RFG/IUGS and others)

Sabine Lange to write to all SGA non members who participated at the SGA 2013 meeting – to thank them for taking part and offer a complimentary SGA membership till the end of 2013 including electronic access to MD (which means to provide them with IDs valid till December 31, 2013).

J. Pašava to provide D. Layton-Matthews and S. Lange with the documents approved by Council for a public (electronic and/or mailing) vote.

Editorial matters (B. Lehmann, G. Beaudoin)

The report was given by G. Beaudoin. The journal continues to attract a high level of submissions (91 until end-July), maintaining an objective of 1000 pages per volume. Two new Associate Editors, David Huston (Australia) and Karen Kelley (USA) have been appointed in July 2013 and new Editorial Board members are needed particularly from East Asia and South America. Suggestions are welcome. The journal IF 2012 is at high of 2.15 and similar to those of Economic Geology (2.49) and Ore Geology Reviews (2.42). A. Buettner replaced Ch. Bendall on a position of a new Chief Editor, Earth Sciences at Springer. Council approved the reports with great thanks.

Progress report on the SGA Educational Foundation

(G. Beaudoin)

The report was presented by G. Beaudoin. The SGA has been approved as a charitable organization by the Swiss Philantropy Foundation on behalf of the organization Transnational Giving Europe (TGE). This has allowed the SGA to establish the SGA Educational Fund, with terms of reference approved at the Lisbon Council meeting, April 11, 2013. So far, we have been accredited by the United Kingdom, Netherland, Germany, Poland, Ireland, Luxemburg and Slovakia. We can now advertise that donors from these countries

can obtain tax relief for charitable donations. According to the Terms of Reference, the SGA EF is to be governed by a Committee composed of the SGA VP, the SGA Treasurer, and at least two outside members. Jim Franklin (consultant, Canada), Par Weiheid (Sweden) and John Miller (Australia) have agreed to serve on the committee. In the current economic market, the search for funds has been less than successful. We received only two donations for \$7 000 (Sinotech: \$5 000; Barrick: \$2 000), despite requests to a number of companies. Council approved the report with great thanks and the following motions:

Jim Franklin, John Miller and Par Weiheid to become members of the SGA EF Committee for a 2 year mandate (2014-2015).

Status of SGA 2013 in Uppsala (P. Klingbjer)

The report was presented by Per Klingbjer, Chair of the SGA 2013 LOC. To date 653 participants plus 16 accompanying members registered for the conference which is a new record for SGA meetings. Altogether 450 abstracts were printed in four volumes of the Proceedings of Conference papers. 127 participants registered and paid for printed version of the Proceedings. The conference was accompanied by ten field trips (Sweden, Finland, Russia, and Greenland) and a number of workshops and short courses. The conference was significantly financially supported by Boliden and LKAB companies and also Agnico and Wawson companies.

Council approved the report with great thanks to LOC and the following motions:

P. Klingbjer to prepare a brief paper on the SGA 2013 Conference for SGA News 34.

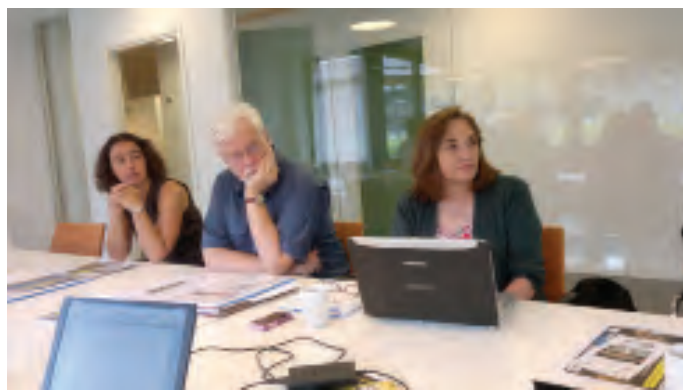
J. Pašava to prepare a paper on SGA awards for SGA News 34.

Update on SGA Special Publications (J. Slack)

The report was presented by J. Slack. The book on Mineral Deposits of North Africa is progressing well. Prof. M. Bouabdellah (Université Mohammed Premier, Oujda, Morocco) and Prof. Salah Bouhrel (Université de Tunis El Manar, Ariana, Tunisia) are serving as co-editors of the volume. Countries to be covered are Morocco (including Southern Provinces), Tunisia, Algeria, Libya, Egypt, Chad, Sudan, Mauritania, and Niger. To date, Profs. Bouabdellah and Bouhrel have received commitments from 15 colleagues to write various sections of the text and provide maps and other data. The book will be divided by types of mineral deposits, not by countries, in order to group information on the same deposit type in one chapter, which is considered the best approach for the general reader, economic geologists, and exploration geologists. All impor-



SGA Ordinary Council Meeting (Uppsala, August 2013) – from left: G. Beaudoin (SGA Vice-President), J. Richards, A. Vymazalová (Student Representative) and J.M. Relvas. Photo by J. Pašava.



SGA Ordinary Council Meeting (Uppsala, August 2013) – from left: A.S. Andre-Mayer (Representative of the SGA 2015 LOC), J. Slack (Chief Editor, SGA Special Publications) and K. Kelley. Photo by J. Pašava.

tant types of deposits, both metallic and non-metallic, will be covered in the book; an introductory chapter will include a simplified geological map of North Africa showing major deposits keyed by commodity and size. A detailed outline of the book and list of contributing authors will be available in November. A complete book proposal for consideration by SGA and Springer, together with a preliminary draft of the manuscript, are planned to be submitted to the next SGA Council Meeting (Spring 2014). The MS should be submitted for printing by the end of 2014. Council approved the report with great thanks and the following motions:

J. Slack to negotiate with A. Buettner possibility of the use of a part of royalties to reimburse M. Bouadbellah for part of expenses associated with the preparation of the book.

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. The statistics show a minor loss in regular member category during 2013, but an 11 % increase in the total number, and a 41 % increase in the student membership, when compared to the end of 2012 data. The number of “regular printed” is showing a weak decreasing trend since 2011 but fortunately increase in “regular online”. During the past 4 and half months, we have got 122 new members: 24 regular and 98 student members. This is roughly in line with the recent years. Unfortunately, the loss of members remains a serious problem. Sabine Lange recently prepared excel file listing members who haven’t paid their fees that is a part of this Minutes. 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 October 5, 2013

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 4 times a year (every 3 months).

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

The report was presented by A. Vymazalová. She emphasized the importance of recent creation of new Chapters in Colombia and Peru and provided basic statistics on the financial support for students participating in the SGA 2013 meeting. In total 184 students from 35 countries received financial support from SGA EF. Brief presentations of representatives of SGA Student Chapters are planned for the SGA General Assembly.

Past activities

- “Ore deposits models and exploration” workshop traditionally held in China (January 13-19, 2013 Guangzhou, China) – SGA keynote D. Leach – support 1500 USD. Council greatly appreciated the report and thanked D. Leach for SGA promotion in China
- 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. Leach – SGA keynote speaker – 3000 AUD, D. Huston et al.. Council greatly appreciated kind words from LOC on SGA involvement and thanked D. Leach who represented SGA in this important goevent.
- 2nd Short Course on African Metallogeny (June 17-21 Kitwe, Zambia) – S. Roberts et al.. Council greatly appreciated the re-



SGA Ordinary Council Meeting (Uppsala, August 2013). Guests: S. Micklethwaite (front right) and C. McCuaig (drinking coffee) from UWA, offering organization of the SGA Field Courses focused on geological mapping in WA with SGA Council members A. Vymazalová and J.M. Relvas. Photo by J. Pašava.

port and thanked S. Roberts and all other lecturers and local mining companies who contributed to such a successful workshop which attracted 53 delegates from 14 countries. J. Pašava to write to A. Cheillett to consider organization of the 3rd Short Course on African Metallogeny in the North Africa.

- Short Course "The chain of geological processes making porphyry-style and epithermal deposits (August 5-7, 2013 Santander, Colombia) – Ch. Heinrich for Colombian SGA and SEG Chapters. Council greatly appreciated an advanced info on a very successful course and thanked Chris Heinrich for promoting SGA in Colombia.

Future activities

- SGA Short Course „Gold deposits“ (September 13-15, 2013 Prague, Czech Republic) – flagship course promised to industry sponsors of the SGA EF – D. I. Groves, Z. Pertold et al.)
- 8th annual Ore Deposits Models and Exploration workshop, Hefei University of Technology, Hefei, China (December 9-15, 2013). For further information, contact in either Chinese or English Dr. Fan Yu <fanyu@hfut.edu.cn>. Co-sponsored by SGA.
- XII International Platinum Symposium (11-14 August 2014, Yekaterinburg, Urals, Russia) – SGA two special session – A. Vymazalová (approved 2,000 EUR for SGA student members)
- IAGOD Symposium (August 19-22, 2014 Kunming, China) – two sessions sponsored by SGA: MVT, SEDEX, and VMS deposits through geological history – D.

Leach et al. and Black shale-hosted mineral deposits – B. Lehmann and J. Pašava. J. Pašava to inform IAGOD about SGA plenary speaker.

- Session on Gold Deposits at the IMA Meeting (September 1-3, 2014 Johannesburg, South Africa – L. Greyling (approved 1,500 EUR for a keynote speaker)
- 13th SGA BIENNIAL MEETING (August 24-27, 2015 Nancy, France) – A. S. Andre-Mayer et al., sga-2015@univ.lorraine.fr

Requests for sponsorship

- Workshop on mineral deposits related with granitic intrusions (19-21 September, 2013) – asking EUR 1,950 for SGA Keynote Speakers Program-already decided by SGA EC (granted EUR 1,000)
- 8th annual Ore Deposits Models and Exploration workshop, Hefei University of Technology, Hefei, China (December 9-15, 2013) – asking 2500 USD to support D. Leach – SGA speaker. H. Frimmel to contact D. Leach to get more details on requested amount.
- Application for creation of the Peruvian Student Chapter (E. Ferrari, Nieriton Arquimedes Villa Godoy) – EUR 500 – approved by Council.
- Application for sponsorship of EURO-GRANITES 2014 (July 12-18, 2014 South-West England) – organized by Camborne School of Mines and the University of Exeter – Jens Andersen. J. Pašava to ask LOC for a list of SGA student members who will get supported (total approved support up to 1,000 EUR)

Any other business

SGA award for recognition of special services to the society - update (J. Pašava, A. Piestrzynski)

J. Pašava informed Council about approval of Krol's family to name SGA Silver Medal after GL Krol.

J. Pašava to provide A. Piestrzynski with more details on SGA-KGHM Silver Kroll Medal.

A. Piestrzynski to negotiate layout and production of ca. 20 pieces of 2-3 oz. Ag medal with KGHM management and report at the next Council meeting.

IUGS initiative on Resourcing Future Generations (D. Houston)

Council greatly appreciated action by D. Houston who on behalf of SGA submitted several suggestions to the IUGS proposed RFG initiative through I. Lambert (IUGS Secretary General).

Date and Place of the Next Council Meeting

Suggested spring 2014 in Nancy, France (A.S. Andre-Mayer and A. Cheillett). The precise time and venue will be announced in due time.



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

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News of the SGA General Assembly

August 13th, 2013 Uppsala, Sweden

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

The General Assembly was opened by the SGA President, P. Weihed at 11.00 and closed at 12.00. The meeting was attended by over 100 people.

1- Report of the President (P. Weihed)

After presentation of the agenda by J. Pašava (SGA Executive Secretary), P. Weihed (SGA President) delivered the SGA activity report that covered the period from the previous SGA General Assembly (August 27, 2011 Antofagasta, Chile) to date. He highlighted the importance of setting up SGA Educational Fund, increasing interest of students in joining Society, increasing participation in Biennial Meetings, increasing quality of the Society journal *Mineralium Deposita* and will of SGA to continue making Society more attractive especially to students and young scientists. The report was approved by the General Assembly.

2- Report of the Vice-President on creation of SGA Educational Fund (G. Beaudoin)
The objective of the SGA Educational Fund is to provide financial support for training activities in mineral deposit geology. SGA EF sponsorship should be a seal of approval of the scientific validity of the training activities in relation to understanding mineral deposit formation and how to explore to find new mineral deposits. Specific objectives are:

1) to support student participation to national and international scientific meetings organized or sponsored by the SGA;

2) to support student participation to field trips, workshops and short courses sponsored by the SGA;

3) to support SGA-sponsored student activities.

The SGA has been approved as a charitable organization by the Swiss Philanthropy Foundation on behalf of the organization Transnational Giving Europe (TGE). This has allowed the SGA to establish the SGA Educational Fund, with terms of reference approved at the Lisbon Council meeting, April 11, 2013. The report was approved by the General Assembly.

3 - Report of the Treasurer (H. Frimmel)

H. Frimmel presented the Financial Report. After all SGA accounts had been consolidated in the SGA account at Credit Suisse in 2012, the balance at the beginning of 2013 was €691,903 in that account which evidences that the Society is financially healthy. On 6 February 2013 the SGA financial reports for the years 2010-2011 were audited by Dr. Nikola Koglin and Dr. Ulrich Schwarz-Schampera. Both auditors found no discrepancies with the accounting. The report was approved by the General Assembly.

4 - Report of the Executive Secretary on past and future SGA activities (J. Pašava)

Jan Pašava summarized major past (September 2011-August 2013) and future SGA activities.

He highlighted launching new geoeduca-

tional activities in Africa (Short Course on African Metallogeny). Already two very successful short courses were organized – one in Burkina Faso (2012) and the second one in Zambia (2013) which are particularly highly appreciated by IUGS.

5 – Report of Student Chapters Representatives (A. Vymazalová et al.)

Anna Vymazalová (Representative on Student Affairs on the Council) guided this part of the SGA GA when Representatives of Prague, Baltic, Novosibirsk, Barcelona, Nancy and Iran Chapters briefly informed about their past and future activities.

6 - Invitation to the SGA 2015 Biennial Meeting (A.S. Andre-Mayer)

On behalf of the LOC, Anne Sylvie André-Mayer from the University of Lorraine informed about the status of the preparation of the 13th Anniversary SGA Biennial Meeting, which will be held in Nancy, France in August 24-27, 2015. She extended a warm invitation to this Meeting where SGA will be celebrating 50 Anniversary. More information is available at sga-2015@univ-lorraine.fr

7 - Various

Jan Pašava informed about a planned release of a call for proposals for the 14th SGA Biennial Meeting – 2017.

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

SGA COUNCIL 2014

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Vice-President	J. Relvas (Portugal)
Executive Secretary	J. Pasava (Czech Republic)
Treasurer	H. Frimmel (Germany)
Promotion Manager	P. Eilu (Finland)
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Student Represent.	A. Vymazalová (Czech Rep.)

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South Africa	L. Greyling (S. Africa)
South America	F. Barra (Chile)

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J. Gutzmer (Germany)
K. Kelley (U.S.A.)
J. Richards (Canada)
J. Wilkinson (U.K.)
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Councillors: term ending on December 31, 2017

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President	M. Jingwen (China)
Publication Manager	R. Seltmann (U.K.)

LIST OF NEW SGA MEMBERS (March 15, 2013-October 31, 2013)

42 Regular and 136 Student Members applied for membership (15/03/2013-31/10/2013)

REGULAR MEMBERS

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Mr. Thomas J. Danielson 4644 Wesley Drive Delta, BC, V4M 1W4 CANADA

Mr. Charles Edward David Hughes PO Box 183 West Perth, WA 6872 AUSTRALIA

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>>> page 1 Challenges for heavy rare earth production: lessons from Japan

stable supply of REE to maintain its domestic REE-applied high-tech industries, and the Japanese government took measures to promote 1) REE exploration through JOGMEC (Japan Oil, Gas and Metals National Corporation) and trading companies, 2) recycling and reusing of REE, 3) reducing the REE amounts in products, and 4) substitution of REE with other elements, with a supplementary budget (approximately 1,000USD) in 2010-2011.

The Chinese policy that restricts the production and exportation of REE has resulted in the remarkable rise of the HREE prices in 2011 (Figure 2) as well as worldwide HREE exploration activities (Figure 3). These exploration activities mainly focus on the REE mineralization in hard rocks rather than ion-adsorption type deposits, because ion-adsorption mineralization requires several specific conditions for its formation and special environmental care when the deposits are exploited by in-situ leaching using ammonium sulphate solution. However, no project outside China has practically started HREE production yet, because there exists various challenges for the production. This paper overviews representative HREE mineral deposit types outside China and their challenges for the development

HREE DEPOSITS IN THE WORLD

Ion-adsorption type deposits are formed by the absorption of REE by kaolinite and halloysite, which are the weathering products of igneous feldspar (Wu et al., 1990; Figure 4). Although this type deposits can be formed from various igneous rocks, the

present major source rock in southern China is Mesozoic granites with I-type ilmenite-series characteristics (Ishihara et al., 2008). The ion-adsorption mineralization requires the following geological and climatic environments; 1) presence of REE enriched host rocks, 2) tropical to semi-tropical climate to form a thick saprolitic unit, 3) presence of soluble REE minerals (carbonates, mostly secondary) in the host rocks to supply ion exchangeable REE to the saprolitic unit (Wu et al., 1993; Ishihara et al., 2008), and 4) a low erosion rate to preserve a thick saprolitic unit (Murakami and Ishihara, 2008). This deposit type is found not only in southern China, but also in neighboring countries such as Vietnam (Machida, 2008) and Thailand (Sanematsu et al., 2013). Exploration projects are being conducted for this deposit type in Madagascar by Tantalus Rare Earths AG (http://www.tre-ag.com/operations/tre-project.aspx?sc_lang=en) and in Malawi by Gold Canyon Resources Inc. (http://www.goldcanyon.ca/s/Malawi_REE.asp?ReportID=494722), where the deposits are hosted by REE-enriched syenites.

Carbonatite deposits high in REE grade are generally enriched in LREE because bastnäsite-(Ce), which is enriched in LREE, is the major ore mineral in these deposits (Mountain Pass in USA and Bayan Obo and Maoniuping in China) (Castor, 2008; Yang and Woolley, 2006). However, some carbonatites (e.g., Glenover and Zandkopsdrift in South Africa) contain phosphates as ore minerals which are relatively enriched in HREE, although their REE grades are lower than those of the LREE-enriched ones. Xenotime-bearing Yen Phu deposit in northern Vietnam and Lofdal deposit in Namibia are HREE-enriched extreme examples. The Yen Phu deposit consists of two lensoidal orebodies; 260m x 160m

x 60m (thickness) and 70m x 20-50m x 13m (thickness) in size in sericite-quartz schist (Machida, 2008). The orebodies occur in the weathered and hydrothermally altered zone above a dolomitic carbonatite intrusion, which are enriched in xenotime and samarskite as ore minerals with abundant iron oxides (Figure 5). The Lofdal deposit is a part of a swarm of

about 100 carbonatite and phonolite dikes, mainly 0.5-5m wide but up to a maximum of 25 m wide and up to 5 km long in the Huab Basement Complex rocks. The carbonatite dikes contain xenotime as well as monazite, synchysite and thorite as REE minerals that are mainly formed during a hydrothermal stage of mineralization with hematite (Well et al., 2008). Namibia Rare Earths Inc. estimated 0.9Mt of indicated resources at 0.62% REO and 0.75Mt inferred resources at 0.56% REO (0.3% cut-off) in this deposit (Namibia Rare Earths Inc., 2013) that contain about 1,000t of Dy oxide.

HREE deposits associated with alkaline rock complexes are explored worldwide. Advanced stage projects are known in Canada (Nechalacho, Strange Lake, Kipawa), USA (Bokan Mountain), Greenland (Kvanefjeld), Scandinavia (Norra Kaar), Australia (Dubbo) and Mongolia (Khaldzan Burgei). These deposits are associated with peralkaline syenite (Nechalacho, Kipawa, Kvanefjeld, Norra Kaar, Dubbo) or fractionated alkaline granites (Strange Lake, Bokan Mountain, Khaldzan Burgei) in the complexes. The orebodies are variable in form; cumulate units (Kvanefjeld), dissemination (Kvanefjeld, Kipawa, Dubbo, Khaldzan Burgei), pegmatite (Strange Lake), and vein (Bokan Mountain). Some of the deposits (Strange Lake, Kvanefjeld, Nechalacho) have extremely large reserves, although ore grades are generally low (2.0-0.5wt.%) compared to those of the LREE-enriched carbonatite deposits. Ore mineralogy is variable and complex in these deposits, including zirconium silicates (zircon at Nechalacho and Dubbo, eudialyte at Kipawa, Kvanefjeld and Norra Kaar, elpidite and gittinsite at Khaldzan Burgei) (Sheard et al., 2012; Hoshino et al., 2013; Currie and van Breemen, 1996; Steenfelt, 1991; von Eckermann, 1968; Kovalenko et al., 1995) unconventional for REE production (Jordens et al., 2013).

The Kipawa deposit in Canada is hosted by a syenite body that is part of the Kipawa Alkaline Complex, a concordant folded sheet of peralkaline syenite and granite. The deposit has been drilled by Matamec Explorations Inc. over an extent of about 1450 m x 200 m x 100 m depth and contains three mineralized layers (eudialyte, mosandrite and britholite layers) that, in addition to zirconia, contain significant REE concentrations (Figure 6). Matamec aims to exploit the first two layers in which major ore minerals are eudialyte and mosandrite. At a cut-off grade of 0.3% TREO, mineral resources in the indicated category show

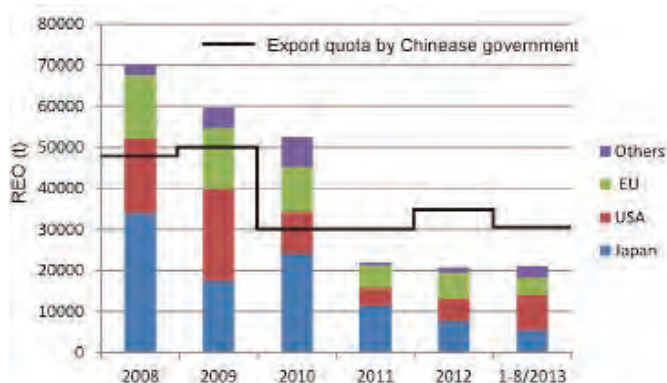


Figure 1: The amounts of REE exported from China by countries (based on China Export Statistics) and export quota by the Chinese government.

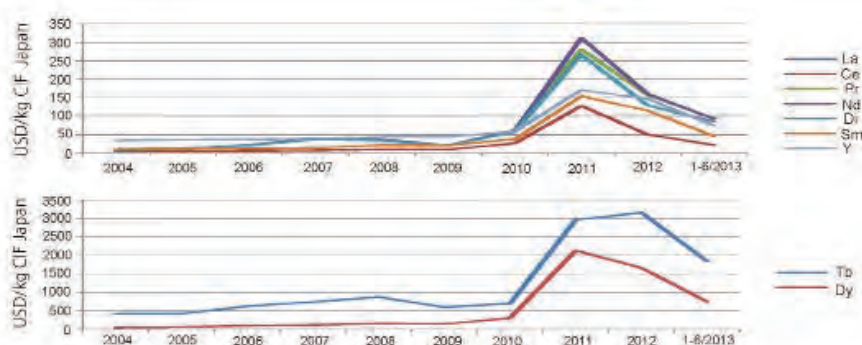


Figure 2: The prices of rare earth metals in Japan (data from Annual Review of Industrial Rare Metals, 124-129).

23.9 Mt@0.41%REO (Matamec Exploration Inc., 2013).

Unconformity related and/or sediment-hosted uranium mineralization is occasionally associated with xenotime mineralization. Representative examples are found in Canada (Douglass River) and Australia (Browns Range) (Cook et al., 2013). Despite relatively small proven reserves of these deposit so far, ore mineralogy (xenotime) is simple and the ores are heavily enriched in HREE. REE is going to be recovered from phosphate minerals in tailings of a uranium mine in Kazakhstan (Summit Atom Rare Earths Company, 2010), which is probably similar in mineralization style to those in Canada and Australia.

Xenotime is commonly associated with Sn granites (Lenharo et al., 2003), and it

was recovered from heavy placer sands in Australia and Malaysia in 1980s (Castor and Hedrick, 2006). It is now recovered or planned to recover from Sn tailing materials (Amang) in Malaysia, Indonesia and Brazil (Academy of Science Malaysia, 2013; Neo Material Technologies, 2009).

REE mineralization is also confirmed in submarine mud spread over a large part of the Pacific Ocean. The mud contains a few thousands ppm of REE with a high proportion of HREE (Kato et al., 2011). The presence of similar mud was confirmed off Minami Torishima Island where several thousand ppm of REE are detected in a couple of meter thick mud about 3m below 5000m-deep sea floor (Press Release by JAMSTEC and University of Tokyo, 2013). Kon et al. (2014) revealed that REE

in the mud near Minami Torishima Island are hosted mainly by apatite biogenic in origin.

CHALLENGES FOR HREE PRODUCTION

Japanese trading companies and/or end users have been trying to secure the supply of HREE to Japan by investing in exploration and exploitation projects, as well as concluding offtake agreements with the developers. At present, several HREE projects that involve Japanese companies are on-going. Those includes the monazite project by Indian Rare Earths Ltd. in India, uranium tailing project by SARECO in Kazakhstan, bauxite tailing project by Nippon Light Metal Co. Ltd. in Jamaica, Kipawa eudialyte project in Canada, Dubbo zirconium silicate project by Alkane Resources and Browns Range xenotime project by Northern Minerals in Australia. Some of these projects aim to produce REE as by-product (India, Dubbo) or from tailings (India, Kazakhstan, Jamaica) to reduce the production cost and shorten the period until the production. The supply of REE from these projects will decrease the Japan's dependence on China in near future, coupled with the supply of LREE from Mountain Pass and Mount Weld projects. However, the REE production is not simple like the base and precious metals production, and there exist stupend-

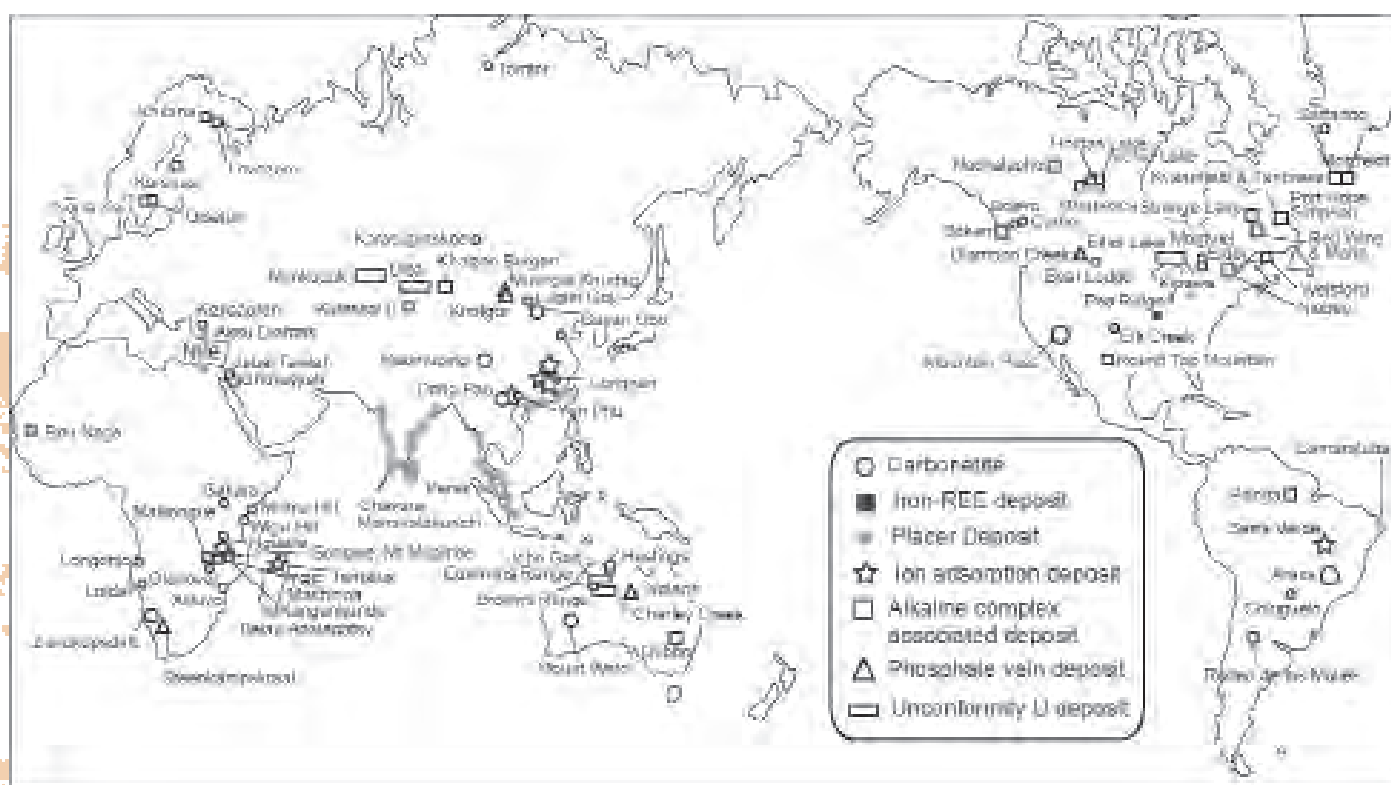


Figure 3: Distribution of major REE projects in the world.

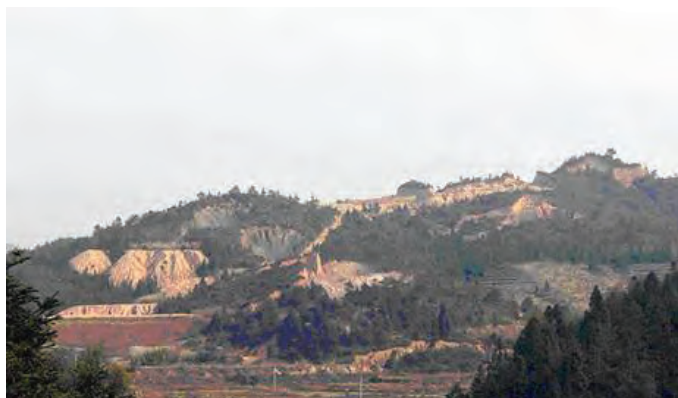


Figure 4: Open pits of ion adsorption type deposits near Dingnan in Jiangxi province, China.

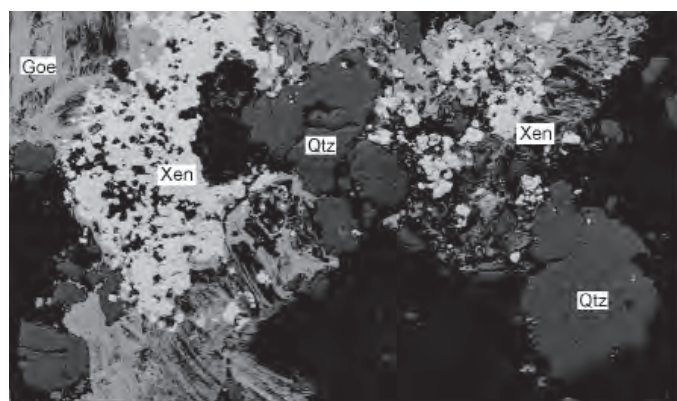


Figure 5: A photo of SEM compositional image of the ore from Yen Phu deposit in northern Vietnam. Goe: goethite, Qtz: quartz, Xen: xenotime.



Figure 6: Occurrence of eudialyte (pink in color) $[Na_{15}Ca_6(Fe,Mn)_3Zr_3(Si,Nb)(Si_{25}O_{73})(O,OH,H_2O)_3(Cl,OH)_2]$ in the drilled core from the Kipawa deposit in Canada.

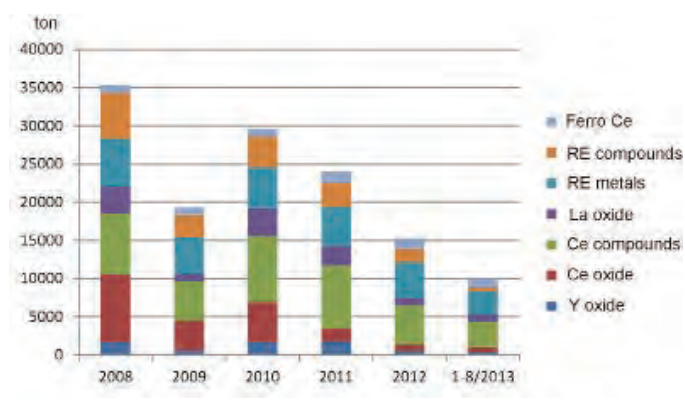


Figure 7: Demand of rare earths (shown as oxide t) in Japan based on Japan Import Statistics.

ous challenges.

Production cost is the largest challenge for the HREE projects. These projects should compete with the low-production cost of the Chinese ion adsorption deposits (~20USD/kg), although the prices of HREE outside China are higher than those in China (e.g. Dy oxide price is 1.7 times higher in December 2013). Related to this cost competition, many issues arise before the production of HREE from hard-rock deposits.

In the exploration stage, higher grade ores, especially HREE-enriched ones, are preferred, but ore mineralogy is also a key issue. Major target minerals for HREE recovery in the hard-rock deposits are carbonate [synchysite-(Y)], phosphate (xenotime, apatite) and zirconium-silicate minerals (zircon, eudialyte, mosandrite, gittinsite, elpidite), in addition to Nb oxide minerals (fergusonite, samarskite, euxenite, etc.). Ore minerals that contain high amounts of REE are preferred because high-grade mineral concentrates can be expected.

Ore minerals should be concentrated be-

fore leaching REE to save the consumption of the chemicals. If the ore minerals were variable in species and size in the ores, high recovery of REE minerals may not be achieved. Thus, simple mineralogy is preferred to conduct beneficiation and processing. Each project should establish a proper beneficiation method for the specific ore minerals in the target deposits since presently available REE beneficiation methods are only for REE carbonates and phosphates (Jordens et al., 2013). Weathering can upgrade the ores, especially in the case of carbonatites due to dissolution of carbonate minerals, but the secondary minerals formed in the weathered environment are extremely fine in size and refractory in general. Thus, a more expensive leaching method such as sulphating roasting may need to be applied for these ores. Development of REE extraction methods from zirconium silicates is still underway. Recently it has been proved that REE are successfully leached from eudialyte in several projects, but REE extraction from elpidite and zircon are still problematic, except for the zircons with low

crystallinity (Hoshino et al., 2012).

Special care also should be paid for radioactivity. Some ore minerals may contain significant amounts of thorium and uranium. The treatment of these radioactive elements should be planned, following to the regulations of the countries where the target deposits are located. Other important factors are access to the target deposits, permission by the governments concerned, period necessary for the production, separation into individual elements from the mixed REE products, and off-take agreement with customers. By-production of HREE is preferred, because REE can be produced cheaply and constantly for a longer time, with reduced initial investment costs.

EPILOGUE

In Neoproterozoic to early Palaeozoic there are common perspectives that the demand of REE, in particular, HREE will steadily increase in future. However, recent efforts to reduce the amounts of REE used

in the products or during polishing, or to replace REE with other materials have been successful in Japan. Dysprosium content in NdFeB magnet has decreased one third compared to the content five years ago, and the commercial production of Dy-free magnets have started already. Recycling of REE also has become popular, and REE-containing scraps generated during the production of finished goods are completely recycled. As the result, the demand of REE in Japan has significantly decreased in the last five years (Figure 7), and REE including HREE are becoming less critical. The real competition in the production of HREE is not among the mining companies or countries but the competition with the rapid innovation of high tech industries.

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International Student Geological Conference Brno, Czech Republic

Ivo Macek & Kristyna Novotna

Masaryk University, Brno

ISGC was established as a student conference in Poland, 2010 in cooperation with the Polish Geological Survey and Institute of Geological Science of Jagiellonian University in Krakow. In 2011 conference was organized in Ratnieki, Latvia and in 2012 in Lviv, Ukraine.

Last ISGC took place in Brno, Czech Republic, between April 19 and 21, 2013 at Masaryk University which is the second largest university in this country. The whole event was under the patronage of students of Department of Geological Sciences, Faculty of Sciences.

We were very surprised by an enormous interest of students worldwide. Participants of the conference were mainly from Euro-

pean countries (Poland, Ukraine, Romania, Germany, Slovakia, Slovenia, Latvia, Norway, Estonia and Czech Republic) but also from Lybia, Egypt, Indonesia and Armenia. On the day of deadline we received 135 abstracts which were contained of 71 oral and 64 poster contributions. Finally 160 students came to visit this occasion. During the conference three field trips were held. All of them were focused on geological localities in the surrounding of Brno. On the first field trip the students had an opportunity to visit the caves in karst area to the north of Brno and the Turold quarry established in Jurassic and Cretaceous sedimentary rocks. The second field trip was focused on geological attractive localities in the city

of Brno where students visited outcrops of Proterozoic metabasite rocks, Stránská rock – Mesozoic marine coral limestones and hornstones and Hády, an old quarry with demonstration of Proterozoic limestones and transgressive Jurassic rocks. The biggest interest was aroused by the third mineralogical field trip (46 participants). Students visited many pegmatites localities close to Brno, for example Rozna (type locality of lepidolite). Some of the students could also visited the latest active uranium mine in Europe - Dolní Rozinka.

The schedule of the conference was very busy but still there was a time for half-day lectures and workshops where we host key note speakers as an Associated Professor



Fig. 1 From left Petra Jakubova, Iva Petranova, Radana Malikova behind the registration desk.



Fig. 2 Opening of the conference - head of Geological department Associated Professor Josef Zeman.

Sarka Hladilova (Masaryk University, Brno) with Neogene of the south Moravia (Czech Republic), Dr. Katerina Jaskova (NANO IRON, Ltd. – Czech Republic) with Production of Zero-Valent iron nanoparticles (nZVI) for in-situ groundwater remediation including recent field scale application and Dr. Jiri Mizera (Academy of Science, Czech Republic) with Activation analysis – useful tool for multielement analysis in geochemical and cosmochemical research.

We were also successful with arranging international evaluating committee. The Chairman was Professor Yves Géraud (École Nationale Supérieure de Géologie, Université de Lorraine, France) and the members of the committee were for example Professor Pavel Uher, Faculty of Natural Sciences, Comenius University in Bratislava, Slovakia or Dr. Stéphane Bodin, Ruhr-Universität Bochum, Germany and many other associated professors and PhD's employees from Masaryk University. We highly appreciate their presence and time.

Our effort couldn't be successful without



Fig. 3 One of the poster sessions.



Fig. 4 Field trip locality Vezna with blue marble.



Fig. 5 Field trip locality Rozná (type locality of lepidolite).



Fig. 6 Group photo of participants of the mineralogical field trip.

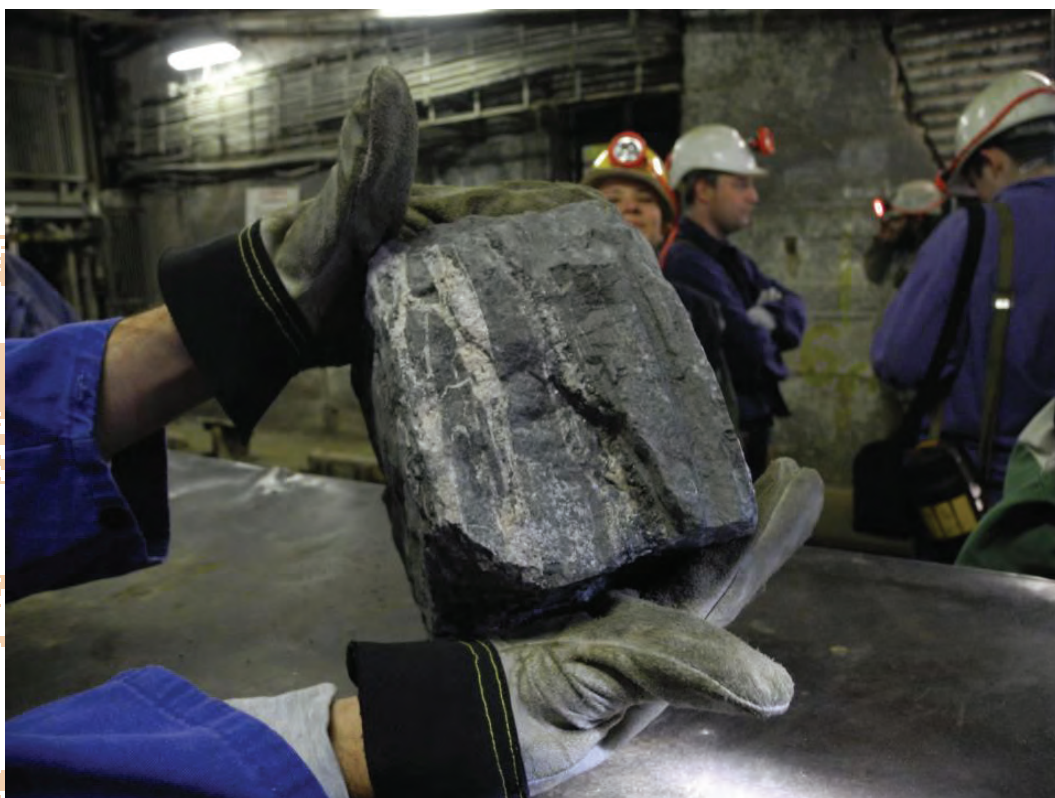


Fig. 7 Uranium ore from Dolni Rozinka mine.

any sponsors. One of many was SGA and because of its help we were able to hold the better standard for students without increasing the fees of field trips. We would like to thank for their generous donation and propagation.

Next ISGC will take place at Eötvös Loránd University, Budapest, Hungary in 2014. We wish to our colleagues energy and desire to organizing this geological event and afterthought many satisfied participants as we had this year. Good luck!



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SGA Awards at the 12th Biennial Meeting in Uppsala, Sweden

J. Pašava (SGA Executive Secretary)

Czech Geological Survey, Prague, jan.pasava@geology.cz

Similarly as at the 11th SGA Biennial Meeting, the Awards Ceremony was a part of Opening Ceremony at the 12th SGA Biennial Meeting in Uppsala. The following SGA awards were presented during the Opening Ceremony, which was held on August 12, 2013 from 9.45 to 10.30 and attended by Mr. Hakan Ekengren, State Secretary and Mr. Lennart Evrell, CEO Boliden (Gold Sponsor).

The SGA-Newmont Gold Medal

The SGA-NEWMONT Gold Medal was established in 2006 to be awarded biannually primarily in recognition of a full career in performance of „unusually original work in the mineral deposit sector, which shall be broadly interpreted to encompass major contributions to (1) the science through research and (2) the development of mineral resources through mine geology, exploration and discovery. The award consists of a citation, pure gold medal, and travel to the Biennial meeting for the presentation.

The first recipient of this most prestigious award was Dr. Zdeněk JOHAN (France) at the 9th SGA Biennial Meeting in Dublin, Ireland (2007).

The second recipient of the SGA-Newmont Gold Medal became Dr. Shunso ISHIIHARA (Japan) at the 10th SGA Biennial Meeting in Townsville, Australia (2009).

The third recipient of the SGA-Newmont Gold Medal became Dr. David GROVES at the 11th SGA Biennial Meeting in Antofagasta, Chile (2011).

The fourth recipient of the SGA-Newmont Gold Medal became Dr. Michel CUNNEY who was nominated by M. Pagel and finally selected by SGA Council out of five pre-selected candidates. After introduction and explanation of the history of the medal by J. Pašava, citation of M. Cuney was presented by M. Pagel. The medal was presented by P. Weihed (SGA President) who also congratulated on behalf of G. Simon (Vice-President, Exploration Newmont). Then M. Cuney, who accepted the award presented the acceptance speech. The following ci-



Fig. 1 Presentation of the SGA-Newmont Gold medal during the Opening Ceremony of the SGA 2015 Meeting in Uppsala (from right to left: M. Cuney – recipient of the award, P. Weihed – SGA President, J. Pašava – SGA Executive Secretary, M. Pagel – nominator of M. Cuney and P. Klingbej – Chair of the LOC).



Fig. 2 Presentation of the SGA-Barrick Young Scientist Award during the Opening Ceremony of the SGA 2015 Meeting in Uppsala (from right to left: P. Weihed – SGA President presenting the award to D. Dolejš at the presence of J. Pašava – SGA Executive Secretary).

tation was prepared and delivered by M. Pagel (Emeritus Professor at the University of Paris XI, Orsay):

Mr. Chairman, Ladies and Gentlemen,

Dr. Michel Cuney, the fourth recipient of the SGA NEWMONT GOLD MEDAL, is an outstanding geoscientist in all fields related to uranium deposits and the uranium cycle in the crust, ranging from practical geology to laboratory work and conceptual thinking. It's a pleasure for me to present Michel as I have known him since 40 years. He has been employed by the National Center for Scientific Research (CNRS), in France since 1976. He received his 3rd cycle thesis entitled "The uranium deposits of Bois Noirs Limouzat" in 1974 and completed a State thesis in 1981 on 'Uranium and thorium behavior during metamorphism. The role of anatexis in the genesis of radioelements-rich magmas'. He is presently Research Director at CNRS acting as permanent Researcher in the "Georessources" laboratory of the Lorraine University.

During his career, his main and continuous research was dedicated to uranium metallogeny and geochemistry. However, he also worked on rare metals. He was the principal investigator for the first drill hole

of the French Deep Geology Drilling Program on the Echassieres granite. He also contributed to studies on reclamation of uranium mining sites, natural analogue for nuclear waste disposal and the radon risk.

Michel Cuney is the author and/or co-author of 200 papers in scientific journals including 125 in international referred journals, 507 communications in congress (including 100 invited conferences) and has contributed to 13 books. He has directed 35 PhD and co-directed 19 others and thus has contributed to formation of a new generation of uranium geologists, more than 20 of his students work in Areva.

His research on geology and evolution of granite-related vein uranium deposits was fundamental to the understanding of their metallogeny. He visited and studied almost all types of uranium deposits in the world and focused on the parameters controlling the formation of high-grade uranium deposits. Since his stay at the University of Gottingen with Professor HG Winkler in 1971-1972 he was always interested in experimental study of the solubility and partition coefficients of metals between solution and magma. Michel was also one of the researchers who showed that the study of U-Th bearing minerals was a key for the understanding of the uranium and

thorium geochemical cycle. He especially focused on the importance of monazite either as a source of uranium or as a witness of fertile altered granite. He just finish now publishing excellent syntheses on uranium fractionation through time driving the secular variation of uranium deposits types and, on the genetic classification of uranium and thorium deposits. He is recognized as the word-class leader in the uranium domain. He became highly respected by distinguished experts in uranium geology who acknowledge his professional and human qualities and his conviction of the necessity to transfer high quality research into exploration practice.

Michel has shared all his unique knowledge with earth science community in numerous international meetings, workshops, short courses and conference in the universities worldwide. Michel was invited to serve on national and international panels and committees on geo-political and social-economic issues, recently he was appointed as advisor of the U.S. National Research Council (National Academy of Sciences). He also acts as a consultant for IAEA. He serves as a member of the Editorial Board of the SGA premium journal, *Mineralium Deposita*, and is a special associate editor for the *American Mineralogist*. He was pre-



Fig. 3 Presentation of the Award for the best paper in *Mineralium Deposita* during the Opening Ceremony of the SGA 2015 Meeting in Uppsala (from right to left: Cornel de Ronde receiving the award from P. Weihed – SGA President at the presence of G. Beaudoin – Chief Editor, MD, J. Pašava – SGA Executive Secretary and P. Klinghjer – Chair of the LOC).

viously in the editorial board of the Bulletin of the French Geological Society and the "Chronique de la Recherche Minière". He was the Thayer Lindsley Visiting Lecturer of the Society of Economic Geologists in 2010 and was elected SEG Fellow. I know that Michel had to show a strong tenacity in his research during a long period when metallogeny studies were not supported in France and especially because of a lack of interest in uranium. This year, Michel received the Barbier prize of the French Geological Society.

Michel is an enthusiastic and patient scientist who spends a lot of precious time explaining his own ideas and approaches. He shows a strong interest in the education of professional exploration geologists.

I would like to congratulate Dr Michel Cuney for his major contribution explaining different ways of concentration of uranium in the magmatic, metamorphic and hydrothermal environments.

The following acceptance speech was delivered by M. Cuney:

Mr. Chairman, Ladies and Gentlemen,

It has been a great surprise when Pär announced me that I had been chosen to receive such a prestigious award: the SGA-Newmont gold medal.

It has also been a great pleasure not only for me but for the recognition of all the work that had been done in Nancy for the past years on the genesis of uranium deposits.

A great surprise: because uranium, despite its high density represents a "very light metal" in the mineral resource economy and in scientific research compared to the "heavy metals" like gold, which attract about 40% of the exploration geologists and budgets.

A great surprise : also because during about past 20 years I felt quite lonely in the field of uranium geochemistry and metallogenesis. My colleagues and friends were asking me "why are you still working on uranium, there is no future in this field?". Even a top manager of AREVA told me in 2005 "Michel !!! you are still working on uranium, you won't see a new start of this business before your retirement. It is still time to change your research subjects" ! Two years later, in July 2007, the uranium price rose to 135\$/pound from about 10\$ in 2004 !

It is also a great pleasure, because I feel somehow reassured that the research I have

worked on for the past 40 years have some interest for the geological community.

But, the greatest pleasure to receive this extraordinary award is the recognition of the huge fundamental and applied research work which has been produced in Nancy for more than a half century. The uranium story in Nancy started in 1948 when the Nobel Prize Frederic Joliot Curie nominated Marcel Roubault - the Director of the Nancy School of Geology - uranium exploration and production manager at the French Atomic Energy Commission. Four years later, the first uranium mine was producing in the France.

- Since then, Nancy has always kept very tight relations with the mining companies involved in U exploration from France (COGEMA, AREVA, TOTAL Mines, SNEAP, ...) and other countries (CAMECO, RIO TINTO, ANGLO AMERICAN ...). A tremendous rise in the research capabilities on uranium metallogenesis occurred with the creation of the CREGU (Centre de Recherche sur la Géologie de l'Uranium) in 1978 after the first oil crisis, a creation initiated by Valéry Ziegler from the French Atomic Energy Commission, with Hubert de la Roche and Bernard Poty from the CNRS and a young team composed of Maurice Pagel, Jacques Leroy and myself. At that time it was a rather unique interface between the scientific research and the exploration companies. It has been a great opportunity for my career.

Many geologists educated at Nancy have been involved in the discovery of numerous important uranium deposits in France and throughout the World. They have also largely contributed to a better understanding of uranium ore forming processes and uranium - thorium geochemistry with famous names such as Bernard Poty, Jacques Leroy, Maurice Pagel, Michel Cathelineau, Nguyen Trung Chinh, Patrick Landais, Jean Dubessy and others.

I also would like to use this opportunity to thank all of them, together with the Master and PhD students I have supervised as well as the numerous geologists of the mining companies (Valéry Ziegler, Marcel Moreau, André Durandau, Patrice Bruneton, Claude Caillat, among many others) which offered me new research opportunities, access to their mines and exploration fields, stimulating discussions, and to the colleagues all over the world with which collaborations have been developed. I also have to present all my respects to the memory of Frantz Dahlkamp, which died this spring, for his friendship, and his prodigious

contribution to the knowledge of world uranium deposits.

Last but not least I would like to thank my family and especially my wife Liliane which has been essential in this adventure. They could all claim a part of this medal.

I sincerely thank the SGA colleagues and the company Newmont for choosing me for receiving the prestigious SGA-Newmont Gold Medal.

The SGA-Barrick Young Scientist Award

The former SGA Young Scientist Award (established in 2003) was approved to be changed to the SGA-Barrick Young Scientist Award from 2007. The award is offered biannually to a young scientist who has contributed significantly to the understanding of mineral deposits. It consists of a citation, certificate, EUR 1500 and travel expenses to the place of the Biennial Meeting for the presentation. The award is given for contributions to economic geology published before the author's 35th birthday. The recipient must be less than 40 years of age on January 1 of the year in which the award is presented.

The first recipient of this award was Dr. Noreen Vielreicher (Australia) - 2003

The second recipient of this award was Dr. Alexandre Raphael Cabral (Brazil) - 2005

The third recipient of this award was Dr. Gilles Levresse (France) - 2007

The fourth recipient of this award was Dr. David Holwell (UK) - 2009

The fifth recipient of this award was Dr. Kalin Kouzmanov (Bulgaria) - 2011.

The sixth recipient of the SGA-Barrick Young Scientist Award became Dr. David DOLEJŠ (Czech Republic) who was nominated by J. Pašava and finally selected by SGA Council out of four candidates. After introduction and explanation of the history of the award by J. Pašava, citation was read by J. Pašava (SGA Executive Secretary), who jointly with P. Weihed (SGA President) presented the award. P. Weihed also congratulated to D. Dolejš on behalf of F. Robert (Barrick Gold). Acceptance speech was delivered by Dr. D. Dolejš (Czech Republic).

The following citation was prepared and presented by J. Pašava (SGA Executive Secretary):

Mr. State Secretary, distinguished guests, ladies and gentlemen,

it is a very great honor to present David Dolejš, an associate professor at the Charles University in Prague, as the recipient of the SGA Barrick Young Scientist award

in 2013. David was born in the Czech Republic and graduated with an M.Sc. degree summa cum laude in petrology from Charles University. Links between magmatic and hydrothermal processes attracted David's interests since his early university days, and they continue to provide a solid foundation for his ability to see ore-forming processes, petrogenesis and geodynamic interpretations in one interrelated context. David has always been strongly interested in unraveling global hydrothermal processes as opposed to case studies, and this led him to add laboratory experiments and numerical models of remarkable quality and insight to his research projects.

For his Ph.D. at McGill University in Canada, he restarted the experimental laboratory and developed an extensive research program devoted to magmatic-hydrothermal transition in highly evolved granitic systems. He addressed mineral stabilities and melt-fluid partitioning in fluorine-bearing systems, a ligand, whose relevance for mass transport is still not completely appreciated. His doctoral thesis at McGill, crowned with a dean's honour list, led to six papers with a total impact factor of 21.5. He provided definite resolutions for the dichotomy of volatile composition and mineralization in magmatic arcs versus continental collision, and critically assessed the role of exsolution of fluoride liquids or brines from granitic melts that lead to the formation of deposits of various critical metals, such as Zr, Nb, Ta, or rare earth elements.

Subsequently, David accepted postdoctoral position at the University of Bayreuth in Germany, with the support from the Elite Network of Bavaria, and developed strong and successful international collaboration to address some of the long-standing deficiencies in our understanding of feedback relations between alteration mineralogy, the chemistry of aqueous fluids, reaction mechanisms, and environmental factors such as oxygen or sulfur fugacities. Together with Thomas Wagner, they modelled alteration reactions in shallow-level granites, with implications for redox variations and identified solute ratios, now analytically accessible, which may provide potential geothermometers for hydrothermal fluids. With Andreas Audétat and Jacob Lowenstern, they documented multiple occurrences of primary magmatic molybdenite worldwide and calibrated the potential of molybdenum as a sulfobarometer at the magmatic-hydrothermal transition. More recently, David began to investigate the nature of fluid-mediated element transport in the deeper

lithosphere. He questioned the conventional wisdom of zirconium immobility and with his graduate student Diego Bernini published in-situ diamond-anvil cell measurements, first of its kind in the world. Finally, David developed a new solubility model for representative minerals in aqueous fluids and changed our views on the significance of retrograde solubility in hydrothermal or geothermal systems. These few examples indicate the breadth and impact of his research published in numerous papers appearing in *Geofluids*, *Geochimica et Cosmochimica Acta*, *Journal of Petrology*, *Reviews in Mineralogy and Geochemistry* and other major international journals.

In 2008, David has accepted position of assistant, now associate professor at the Charles University in Prague and maintained a strong sense for outreach and student education. For the last five years, he has been acting as the faculty advisor to the SGA student chapter in Prague and a relentless excursion guide in central Europe and Scandinavia. Under his leadership, the chapter has rapidly grown from 8 to 42 student members, and it became a very active and one of the largest groups in Europe. David's enthusiasm and personal devotion to promotion of economic geology among young generation of students is clearly a very important and successful aspect of his academic activities. The Faculty of Science of his alma mater has already recognized him as a double recipient of the excellent teacher award.

David's scientific productivity has been extraordinary, and he earned the Walter Hitschfeld award in Montréal 2001 and the Albert Maucher award in Munich 2007. To date, he has published more than 35 papers in major international journals and the number of his citations is on a sharp increase, exceeding 390 worldwide. This clearly reflects his sense for scientific pursuit, the relevant scope of his approaches, and the application of his research results to an interdisciplinary area between economic geology, geochemistry and mineralogy.

I would like to present David Dolejš to you as the 2013 recipient of the SGA Barrick young scientist award in recognition of his scientific enthusiasm, creativity and leadership.

The following acceptance speech was delivered by D. Dolejš:

President Weihed, members of the society, ladies and gentlemen,

I am thoroughly delighted and excee-

dently grateful to the SGA and the Barrick Co. for this award. Thank you, Jan, for nominating me for this prestigious recognition for young scientists and for your kind words. Let me use this opportunity and share with you what were the major influences that bring me to the podium today.

My interests in geology date back to time spent with my parents, Jan and Jana, in the countryside where the nearest rock outcrop, albeit temporary, was in our garden. I have enrolled at the Charles University in Prague and because that outcrop was made of weakly metamorphosed sediments, I was convinced to become a sedimentologist. How wrong ...

During my university studies in Prague, contrary to warnings of my classmates, I attended the course on thermodynamics by Milan Rieder. Although the subject was virtually impossible to grasp by a geologist, I somehow felt that nature operates by simple physico-chemical principles and understanding rather than ignoring them may offer the clue to many processes. One year later, Miroslav Štemprok and his phase equilibria class convinced me that Rieder had a point. Štemprok's gentle, encouraging and persistent personality kept me coming back not only to use his extensive library but mainly for long and intriguing discussions. His far sight and worldwide experience with ore-forming hydrothermal processes presented a steady enquiry for me, but I felt that he wants to urge me that I find the solutions on my own. Finally, when I complained to Petr Jakeš that he did not sufficiently cover hydrothermal phenomena in his graduate geochemistry class, he, instead, wrote a supportive reference letter for me to pursue a Ph.D. in North America. So I went ...

I arrived to McGill in Canada and the department was well populated with hard-rock academic staff providing unusually rich and diverse expertise in geochemistry, petrology and ore deposits. My Ph.D. supervisor, Don Baker, has generously allowed me to choose and put his funds behind my own thesis topic, which meant a hard and slow start for a naive youngster. However, this discovery path of my own research attitude and capabilities was truly rewarding. Being the only student working with Don for several years, I naturally gravitated to the most populated room across the corridor, happened to be a fluid inclusion lab of economic geologist, „Willy“ Williams-Jones. The SEG student chapter at McGill was in a full swing, we extensively travelled to ore deposits across Eastern Canada, and Willy's students and postdocs kept reminding me

how fluids are important scientifically, economically, and on Friday nights. Still in Montreal, I started my collaboration with Thomas Wagner, postdoc at that time, and our work on thermodynamic models of hydrothermal alteration continued when we both moved to German universities. The more we enjoyed the intricacies of physicochemical properties of silicate, oxide and sulfide minerals and aqueous species, the less time was left for writing additional joint papers, but I am happy that we both still continue to build on these results.

In 2004, I moved to the University of Bayreuth as a postdoc and I wish to appreciate the generosity of Hans Keppler, for offering me a long-term position. The attitude at the Bayerisches Geoinstitut was unlike at any other university, but was that of a research centre with a high flux of excellent young researchers, unparalleled infrastructure and technical support. I started there just two months ahead of arrival of Andreas Audétat, who then built the laser ablation ICP MS lab, and we revived our collaboration from North American times, and started on several studies related to the occurrence, stability and implications of molybdenum mineralization. Andreas's meticulous analytical skills and my desire to amplify the results and applicability into a broader picture led to recognition of magmatic molybdenite in a number of igneous suites worldwide and to subsequent calibration of a new oxy- and sulfobarometer for ore deposit studies. Another important moment in Bayreuth was a sabbatical of Craig Manning, visiting us from UCLA, when we started to carefully evaluate solubilities of various minerals in hydrothermal fluids, with prospective applications to deeper lithosphere and global cycles. Our daily interactions in the summer of 2009 provided much impetus for my subsequent work on fluid flow and estimation of fluid fluxes from mineral and alteration record.

My so far last move to Charles University in 2008 meant adding teaching and science outreach into my daily schedule. Upon my arrival in Prague, I unavoidably became an power-point slide creator but I am happy to note that the more slides I had, the larger number of curious and inspiring students I was able to meet. Supervising eight students working with me today, and with the help of local and international laboratory facilities, we have embarked on several projects related to pulsed fluid flow, origin of greisen and skarn deposits, and the mechanisms of mineral reactions on the microscale. It is also very gratifying to see that a number of

my students found geology interesting and important, and they pursue their studies or jobs abroad.

In closing I can say that the award is not the sole accomplishment of myself but I would like to acknowledge the many collaborators and individuals who have given me the opportunity to achieve this recognition. I would not be standing here without continuing support of our family and my girlfriend, and their steady forbearance and sacrifice for my scientific pursuits.

We would not be meeting here today if we would not share sense that our profession needs communication, strategy and visibility in the modern society. Likewise, this award would not exist without the farsight and commitment of those who dedicate their time, efforts and resources to this professional society. I am, therefore, very grateful to the SGA leadership and to Barrick for bestowing me with this award and hope that my future work will satisfy the high standards set forth by my predecessors. Thank you for listening.

The SGA Award for the Best Paper in Mineralium Deposita.

The award (established in 1999) is presented every two years at the Society Biennial Meetings and consists of a citation, certificate, EUR 1500 and travel expenses for the first author associated with the receipt of the award.

Based on pre-selection of five papers by Chief Editors, MD, and after Council vote it was decided that the paper by Cornel de Ronde, Massoth G, Butterfield D, Christenson B, Ishibashi J, Ditchburn R, Hannington M, Brathwaite R, Lupton J, Kamenetsky V, Graham I, Zellmer G, Dziak R, Embley R, Dekov V, Munnik F, Lahr J, Evans L, Takai K (2011) Submarine hydrothermal activity and gold-rich mineralization at Brothers Volcano, Kermadec Arc, New Zealand, published in *Mineralium Deposita* 46: 541-584, will receive the award.

After introduction by J. Pašava and citation by G. Beaudoin, the award was presented by G. Beaudoin (Chief Editor, *Mineralium Deposita*, North American Office), P. Weihed (SGA President) and J. Pašava (SGA Executive Secretary). The acceptance speech was presented by Cornel de Ronde.

The SGA Awards for the Best Student Oral and Poster Presentation

In order to encourage students to participate in the SGA activities and to reward excellence in their scientific work, the Best

Oral and Poster Presentations given by students were awarded.

A Conference Student Committee constituted by Richard Goldfarb, Tony Christie, Brian Rusk, Karin Högdahl, Rodney Allen, Roberto Xavier, Jorge Relvas, and Anna Vymazalová based on high quality and scientific merit of the student's presentations decided to attribute the awards to three students for oral presentations and two students for poster presentations (each of them received a certificate and 250 euro).

The following students were awarded for:

The best student oral presentations:

Pedro Acosta-Gongora: Trace element geochemistry of magmatite and its relationship to mineralization in the Great Bear magmatic zone, NWT, Canada.

Michael Tucker: Geology, alteration and mineralization of the Conrad Zone, Yukon Territory – a new Carlin-type gold discovery.

Koen Torremans: Structural analysis and distribution of layer-parallel veins at the Nkana stratiform Cu-Co deposit, Zambia.

The best student poster presentations:

Emily Firth: Mesozoic quartz-vein hosted Au (Ag-Pb-Zn-Cu) mineralization at the Mineral de Talca, Coastal range, Chile: the role of felsic intrusives.

Dora Kavecsanszki: Magma mingling between sulfide-rich and carbonatite magmas to form a multi-commodity metal deposit: reconstruction using QEMSCAN® analysis.

On behalf of SGA, we wish to congratulate once more to all awardees!



>>> FORTHCOMING EVENTS <<<

* marks a new entry

2014

***March 20-21**

NAC 2014 — North Atlantic Craton Conference, St Andrews, United Kingdom. This event is organised by the Cardiff and St. Andrews University Chapters of the Society of Economic Geologists, and the Applied Mineralogy Special Interest Group of The Mineralogical Society of Great Britain and Ireland, in conjunction with the British Geological Survey and Geological Survey of Denmark and Greenland. This workshop, on the mineral potential of the North Atlantic Craton (NAC) as a whole, is aimed at initiating and furthering trans-Atlantic collaboration in understanding the Archaean cratonic controls on ore deposit formation through time. Contact: <http://www.nac-conference2014.org.uk/>

***March 22-23**

Gordon Research Seminar: Natural Gas Hydrate Systems, Galveston, Texas, United States. Contact: http://www.grc.org/programs.aspx?year=2014&program=grs_natgas

***March 31-April 1**

Joint Interpretation of Geophysical and Geochemical Data, Singapore, Singapore. Contact: <http://www.eage.org/events/index.php?evp=12108&ActiveMenu=2>

***April 27-May 2**

EGU 2014 European Geosciences Union General Assembly 2014, Vienna, Austria. Contact: <http://www.egu2014.eu/>

***May 4-14**

6th Orogenic Lherzolite Conference, Marrakech, Morocco. Contact: <http://www.gm.univ-montp2.fr/Lherzolite/>

***May 16-18**

ACROFI V — Asian Current Research on Fluid Inclusions, Xi'an, China. Contact: http://es.nju.edu.cn/ACROFI_V/Home.htm

***May 20-22**

Biosignatures across space and Time, Bergen, Norway. Contact: <http://www.nordicastrobiology.net/Biosignatures2014/>

***May 21-23**

GAC/MAC: Geological Association of Canada /Mineralogical Association of Canada Annual Meeting, Fredericton, New Brunswick, Canada. Contact: <http://www.unb.ca/conferences/gac-mac2014/>

***June 8-13**

2014 Goldschmidt Conference, Sacramento, CA, United States. Contact: <http://goldschmidt.info/2014/>

***June 8-13**

ZEOLITE 2014 — The 9th International Conference on the Occurrence, Properties and Utilization of Natural Zeolites, Belgrade, Serbia. Contact: <http://www.inza.unina.it/upcoming-events/111-zeolite-2014-full>

***June 21-27**

Research at High Pressure — Gordon Research Seminar/Utilizing High Pressure Techniques to Elucidate the Behavior of Matter from Deep Within Earth's Crust, to the Biotic Communities of the Ocean and Crustal Environments to the Cores of Gas Giants and Onto the Structures of Tomorrow, University of New England, Biddeford, ME, United States. Contact: <http://www.grc.org/meetings.aspx?year=2014>

***June 28-July 4**

Shechtman International Symposium on Sustainable Mining, Minerals, Metal and Materials Processing, Cancun, Mexico. Contact: <http://www.flogen.org/ShechtmanSymposium/>

***June 30-July 4**

Asteroids, Comets, Meteors, Helsinki, Finland. Contact: <http://www.helsinki.fi/acm2014/>

August 11-14

XII International Platinum Symposium, Ekaterinburg, Russia. Contact: <http://12ips.uran.ru>

***August 25-September 3**

EMU School 2014 - Planetary mineralogy, Glasgow, Scotland, United Kingdom. Contact: <http://eurominunion.org/?p=571>

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 1-5**

IMA 2014 General Meeting — 21st General Meeting of the International Mineralogical Association, Sandton, Gauteng, 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 4-6**

ERES 2014 — The 1st conference on European

Rare Earth Resources, Milos, Greece. Contact: <http://milos.conferences.gr/>

September 10-12

Planet Formation and Evolution 2014, Kiel, Germany. Contact: <http://www1.astrophysik.uni-kiel.de/~kiel2014/main/>

***September 21-25**

UMH VII - 2014 — Uranium Mining and Hydrogeology 2014 International Conference, Freiberg, Germany. Contact: <http://tu-freiberg.de/umh-vii-2014>

September 27-30

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

***October 19-22**

2014 Geological Society of America (GSA) Annual Meeting, Vancouver, British Columbia, Canada. Contact: <http://www.geosociety.org/meetings/2014/>

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 16-21**

2015 Goldschmidt Conference, Prague, Czech Republic. Contact: <http://www.geochemsoc.org/programs/goldschmidtconference/>

August 24-27

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

***September 20-25 24-27**

8th Hutton Symposium on Granites and Related Rocks, Florianópolis, Brazil. Contact: <http://www.hutton8.com.br>

***November 1-5**

Geological Society of America Annual Meeting, Baltimore, MD, United States. Contact: <http://www.geosociety.org/meetings/>

2016

***June 26-July 1**

2016 Goldschmidt Conference, Yokohama, Japan. Contact: <http://www.geochemsoc.org/programs/goldschmidtconference/>

D. Groves – Geology of Gold Deposits: SGA Education Fund Short Course

Nikola Denisová (1), David Dolejš

(1) Luleå University of Technology, Sweden

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The SGA Education Fund, established in 2013, funded as its first educational activity the student-oriented short course on Gold Deposits: From Theory to Exploration Practice. The short course was presented by Professor David Groves, University of Western Australia and hosted by the SGA Student Chapter Prague on September 14-16, 2013. David Groves is an Emeritus Professor at the University of Western Australia, where he helped establish the Center for Exploration Targeting. He has co-authored more than 500 publications mainly in the fields of Archean evolution, komatiite-associated Ni-Cu deposits, orogenic gold deposits, the

role of lithosphere in global metallogeny, and prospectivity mapping. During his career, he also supervised over 85 Ph.D., 55 M.Sc. and 120 B.Sc. Hons. thesis projects at the University of Western Australia and elsewhere. He was elected President of the SGA, SEG and the Geological Society of Australia, and for his career-long achievements he received both the SGA-Newmont Gold Medal and the SEG Penrose Gold Medal. His willingness to organize this short course symbolizes his personal gift to the SGA Education Fund.

The course consisted of four lecture sessions devoted to exploration techniques and

strategies (first day), with focus on geological settings, mineralization and alteration styles and global geodynamic context during the following days. The principal focus of the second-day presentations aimed at intrusion-related, iron-oxide copper gold and Carlin-type deposits, whereas the last day was devoted to orogenic gold mineralization styles. The big-picture and general-perspective approach was particularly welcome as were detailed genetic models and controls on each mineralization setting. During the closing afternoon, Jiří Zachariáš, associate professor of economic geology at the Charles University, presented his lecture



Economic geologists surrounding the speaker (left to right): Professor Miroslav Štemprok, Professor David Groves, Dr. Jan Pašava (SGA executive secretary) and Professor Zdeněk Pertold.

on the Mokrsko gold deposit, located 50 km south of Prague, which served as model example of speculative origin for subsequent discussion between the principal presenter, students and other academic attendees. The discussion was lively and ignited, and ultimately it divided the room into supporters of an orogenic gold type and intrusion-related style.

More than 45 students from the SGA student chapters in Prague, Baltic countries, Barcelona and Siberian region as well as from the Technical University of Ostrava, Comenius University in Bratislava, Technical University Bergakademie in Freiberg, University of Halle and ETH Zürich, and it was hosted in the Faculty of Science, Charles University in downtown Prague. The SGA student chapter members had many opportunities to meet and get to know each other, be it during the coffee breaks or during the Ice Breaker party organized by the Prague Chapter on the first evening.

The organizing committee of the SGA Student Chapter Prague would like to acknowledge the SGA Educational Fund for supporting this event, Professor Groves for commitment to relentless presentations, and finally to a large number of local students who helped with organization and logistics of the course.



Professor David Groves teaching in the historic lecture hall at Charles University.

News from the Baltic Student SGA Chapter

Marta Sosnicka (1), Nikola Denisová (2)

(1) AGH University of Science and Technology, Cracow, Poland

(2) Luleå University of Technology, Sweden

The 5th annual Baltic Student SGA Chapter Meeting “Ore Deposits of Northern Fennoscandia” was held by the University of Oulu, Finland in November 4-6, 2013. Twelve representatives from the member institutions participated in this event: Joonas Kurtti from the University of Oulu (Finland), Jenni Nevalainen from the University of Turku (Finland), Marta Sośnicka, Joanna Kołodziejczyk from the AGH University of Science and Technology (Poland), Friederike Minz, Sanna Naalisvaara, Nikola Denisová, Nicole Breng, Nils Edblom, Nikolay Zhivkov, Anton Lidström and Thomas Kearney from Luleå University of Technology LTU (Sweden). The Meeting was organized by Friederike Minz, Joonas Kurtti and Tomasz Ćwiertnia, with a support of Tobias

Weisenberger from University of Oulu.

The SGA BSC Meeting program included one day of lectures and seminars at the University of Oulu and two days of field trips dedicated to ore deposits of northern Fennoscandia.

The first day of the Meeting commenced with the registration and welcome coffee, after which the lectures began. The first lecture was given by Professor Eero Hanski from the University of Oulu, who talked about komatiites of Central Lapland and associated Ni-PGE deposits, for example the Kevitsa layered intrusion. The second talk was given by Professor Ferenc Molnár from the GTK whose lecture covered PGE-rich sulfide ores in the footwall of layered igneous complexes with examples from

northern Finland compared to well known deposits like the Sudbury Igneous Complex. After lunch, the Meeting continued with presentations of the students' doctoral projects, the talks were given by Shenghong Yang and Fangfang Guo from the University of Oulu and by Joanna Kołodziejczyk and Marta Sośnicka from AGH University of Science and Technology. The next lecture was by Doctor Tobias Weisenberger from the University of Oulu who spoke about hydrothermal phonolite alteration in the Kaiserstuhl volcanic complex in Germany. The last talk of the day by Professor Krister Sundblad from the University of Turku concerned the metallogeny of indium in the Fennoscandian Shield and the history of its discovery in the region.



Fig. 1 Participants in the Pyhäsalmi underground mine



Fig. 2 Participants at the entrance of the Timo shaft, the Pyhäsalmi underground mine



Fig. 3 Studying the drilling techniques applied in the Pyhäsalmi underground mine



Fig. 4 At the massive core of the VMS ore body, the Pyhäsalmi underground mine



Fig. 5 The VMS ore, the Pyhäsalmi underground mine



Fig. 6 Participants in front of the shaft of the Kemi underground mine

On the 5th of November, during the second day of the SGA BSC Meeting, the participants visited the Pyhäsalmi underground mine, which is the deepest metal mine in Europe, reaching the depth of over 1410 meters. The mine, which belongs to the Inmet Mining company, is actively exploiting the volcanogenic massive sulphide Zn-Cu deposit (Kuroko-type VMS) situated in the Svecofennian Savo Schist Belt. The mined ore body is called by the local miners a “potato”. The estimated volume of this ‘potato’-shaped Cu-Zn ore body is 422x37x202m³ with total resources of 65.2Mt. Despite the ore is low-grade and contains 0.94% of Cu, 1.93% of Zn and 42.61% of S, the high proficiency of extracting makes its exploitation economically profitable. The ore body is internally heterogeneous and consists of 5 types of ores: massive pyrite, spotty massive pyrite, shear zone ore, Zn-bearing ore and Cu-bearing ore. The core of the ‘potato’ is composed of the massive pyrite ore surrounded by the zone of Cu-bearing ore, which in turn contacts with the outermost Zn-bearing ore zone. The main ore minerals are pyrite, chalcopyrite and sphalerite. The Cu-bearing ores mostly comprise massive pyrite and chalcopyrite, whereas the Zn-bearing ores are composed of massive pyrite and sphalerite, which is frequently accompanied by barite and carbonates. At the depth reaching 1400 meters the participants could examine and collect samples

of the pyrite-bearing and Zn-bearing ores, trace the sharp contact between the barren, banded metavolcanites and VMS ore, and learn about the core logging and drilling techniques applied in the mine. The students were also given an opportunity to follow the ore processing stages in the nearby concentration plant and collect samples of the three different final products of the ore processing: concentrates containing Cu, Zn and pyrite. The Cu and Zn concentrates are sold to the nearest smelters, whereas the pyrite concentrate is sold and transported to China. The interesting and informative underground tour in Pyhäsalmi mine and in the nearby ore processing facilities was guided by the chief geologist Timo Mäki and two junior geologists: Anssi Kangas and Mikko Numminen.

On the third day of the Meeting, the 6th of November, the group visited the Kemi chromite mine, owned by the Outokumpu mining company. The Kemi layered intrusion hosts a chromitite deposit containing 33 Mt of chromite ore at 29 % Cr₂O₃. The intrusion dips 70° to the NW, and is about 15 km long and between 0.2 and 2 km thick. Originally, the intrusion had been funnel-shaped, with layers thinning out towards the edges of the intrusion. The age of the intrusion has been determined at 2.44 Ga. The whole area underwent lower amphibolite facies metamorphism. The main chromitite layer is on average 40 m thick and contains

chromite and metamorphic minerals such as talc, chlorite (e.g. kammererite), serpentine, amphibole and carbonate. The chromitite layer was mined in an open pit, but in 2003, the underground mine was opened and it goes down to the depth of 600 m. The participants visited the underground mine and saw the underground facilities – the core shed, workshops and offices. The participants also observed a production drill rig preparing the blasting holes. The underground tour was lead by chief geologist Timo Huhtelin and junior geologist Jaakko Hietava.

A special thank you belongs to all those, who arranged and supported this successful Meeting.

References

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- Alapieti, T., and Huhtelin, T., 2005, The Kemi intrusion and associated chromite deposits, in Alapieti, T., and Kärki A., eds., *Geological Survey of Finland, Guide 51a: Geological Survey of Finland*, p. 13-32.

News from the Siberian Student Chapter

Andrey Vishnevskiy, Maria Cherdantseva

Sobolev Institute of Geology and Mineralogy, Siberian Branch of RAS, Novosibirsk, Russia

In 2013, we organized many short field trips to mineral deposits and geological natural monuments of the Novosibirsk region. During field trips the students looked at the technology of mining, occurrence of geological bodies and mineral deposits, folded and faults-made forms, structural features of different types of rocks, organic residues and ore mineralization. Also during the trips were conducted panning classes to get heavy fraction (concentrate). The excursions was also attended by research staff of Geological and Geophysical Department of Novosibirsk State University, specializing in different fields of geology, which

enabled a comprehensive study of geological objects. During the excursions, students have acquired skills to work with geological compass, GPS-navigator, geological and topographical maps. Some samples of rocks and minerals have been added to the collection of NSU.

Bugotak Hills. In this area there are many basic and felsic subvolcanic intrusions intruding Middle Devonian volcanogenic strata. In this area it is possible to compare the geological features of the shallow intrusive magmatism of different composition. In the walls of the open pits, most of which does not in operation now, we can see clear-

ly columnar jointing. Basic rocks exposed greenstone changes, sometimes pyritized and often contain hydrothermal epidote-quartz-albite veins.

Coal mines of Novosibirsk region. Coal deposits are located in Gorlovka trough, which is a deep narrow graben-synclinal structure stretches in a southeasterly direction at 50 kilometers south of Novosibirsk. Coal-bearing is the uppermost part of the sedimentary sequence - Balahonskaya series, which was formed from the Middle Carboniferous to Early Permian. Coals is mined in the three open pits, two of which (Urgunsky and Kolyvansky) are in operation



Panning classes on the Ob' river bank



Field trip in Bugotak Hills



One of the coal quarries of Novosibirsk region



In the abandoned limestone quarry

now, and temporarily stopped Gorlovka pit, which we visited. These coals are anthracite and are of high quality: low-ash, low sulfur, high carbon and high mechanical strength. Coals and shales contain carbonized tree trunks, substituted by siderite, moreover, in certain points we have found zones with pyrite crystals.

Marble and limestone quarries. These deposits are also located to the south and southeast of Novosibirsk. We visited two of them – Shipunovskoe and Petenevskoe.

Shipunovsky deposit is confined to the block of the Upper Devonian reef limestones. The field is developed for raw materials for cement plant, but close to operating quarry is located in an abandoned open pit which has produced a monolithic limestone for construction work. Limestones in Petenevsky quarry were exposed to repeated brecciation, recrystallization and the formation of hematite and carbonate veins.

We also visited other places in the Novosibirsk region, and next year we are plan-

ning a trip to the gold deposits in Altai Mts. In addition, we as in the past year, were engaged in the organization and conduct of scientific and popular lectures for students and schoolchildren, and one of our members - Maria Cherdantseva has received financial support from SGA for travel to the meeting in Uppsala. Our student chapter is gradually increasing and in the next year we join few students engaged in ore geology and mineralogy.

Shiny and bright future for minerals deposit research for a high tech world

Erika Ingvald

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Uppsala is the city where the latest, the 12th, biennial SGA meeting was organized. Headlined, "Minerals deposit research for

a high tech world" the meeting gathered almost 700 researchers, including about 200 students, presumably a new record, which is

reassuring for the future. One of the popular sub-events to this meeting was the student industry evening, held at the Department of

Earth Sciences at Uppsala University, drawing full houses, considered a success by both industry representatives and students.

The place

One reason for the huge interest to this conference is said to be its location. Uppsala is located just south of 60th parallel North, on the same latitude as the southern tip of Greenland, however since about 10 000 years without the land ice and definitely without the polar bears. The University of Uppsala was founded in 1477 and long before that the city used to be the capitol of Sweden. It is situated in the easternmost part of Bergslagen, a region that has been prominent for its mines for more than a thousand years. This is the region where the Sala Silver mine, the Falu Copper mine, the Zinkgruvan Zink mine and the Dannemora Iron ore mine are situated, and just close to the city of Uppsala is where the first signs of early use of charcoal milns, some 1500 years ago, were identified. A number of participants have expressed that Sweden's long history of mining, adding to the know-how in so many ways for such a long period of time, make this country all the more interesting to visit when an opportunity like the SGA conference is given.

Also the number of excursions to mining regions of interest "nearby" added to the interest. Apart from excursions to the Swedish mining regions, there were also trips to Greenland, Russia, Finland and Norway, regions that all have a geology of great and growing interest when it comes to mining and exploration research.

The society

Rarely has this line of research been so important to society. The global demand for metals, base metals as well as high tech metals, is an extremely important driver for societal, tech and economic development, in all parts of the world. Consequently the public's demand on mining companies to decrease the impact of mining to environment grows as do the demand on CSR.

Less known perhaps is that the mining industry already years ago identified the huge wins to be made on well designed, more automatized mining operations, taking out more metals by the tonne, both by the volume and by the number of metals extracted from a single operation, not only saving in effort and energy costs and an overall better economy of their operations, but also decreasing the environmental costs. Some companies are also in the driver's seat since

years, when it comes to communicating and collaborating with and paying back to the local society, whereas others still have miles to go on that part.

The 12th biennial SGA meeting reflected this development to its full. A number of talks, from key note speakers and others, posters and sessions focused on mining and sustainability. The mining industry is since a number of years acknowledging the importance of those issues, taking leaps to develop their MO. The scientific community in large parts hold its own, and politicians as well as government agencies are working hard at their end. What was addressed by a number of participants to the meeting is that what still needs improvement is the communication and collaboration between the players in this triple helix.

The science

Over the last decades a number of new techniques have developed, enabling researchers of different geoscientific disciplines to collect much more data at a lower cost, as well as more detailed information from each sample. During this period a number of researchers have evolved expertise to those different techniques. This conference showed that now the time has come when



Norrlands nation student club hosted the SGA ice breaker and conference lunches.

collaboration between the different lines of expertise has taken the trade of minerals deposit research to a new level.

The networking

Many participants stressed the importance of collaboration as a key issue for the future. For collaboration to actually happen, networking is a key issue and SGA conferences are important for making new contacts as well as for getting an overview of all of what's state-of-the-art. The possi-

lities for networking during the 12th biennial SGA meeting were outstanding, with the student-industry event, with the icebreaker at Norrlands nation student club, with the conference dinner at Uppsala Castle, with the very popular and well visited poster sessions.

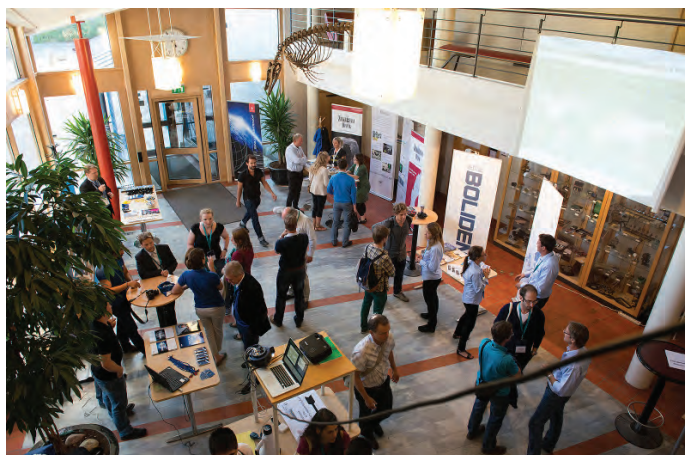
All-in-all, this conference shows that there is a future for research in mining deposits for a high-tech world, that might be shining and bright, given that all the players on the arena of mining and exploration are willing

to play their part in a sustainable way.

The Geological Survey of Sweden wish to express its gratitude to the SGA board for choosing Uppsala, to the organizing committee, the excursion organizers who worked hard to make this conference a success, to all the participants of the 12th Biennial SGA meeting who actually made it what it was, and to the sponsoring companies; Boliden, LKAB, Agnico Eagle and Mawson for making this possible.



The Hall of the Uppsala University main building hosted the conference exhibition, and was a natural meeting point for coffee and networking.



Several companies, universities and other organisations were on exhibition in the Hall.



Welcome address by Per Klingbjer, SGU, chair of the organizing committee.



On their way to the conference dinner at the ancient castle of Uppsala, the Vasa Castle.



Uppsala University's Aula Magna is prepared to welcome the participants of the 12th biennial SGA-meeting.



Preparations for the conference dinner.

Habachtal and Knappenwand – precious stones deposits in Hohe Tauern: a field trip report from the SGA Student Chapter Prague

Luboš Vrtiška 1,3, Jan Soumar 2,3

(1) Institute of Petrology and Structural Geology, Faculty of Science, Charles University, Prague, Czech Republic

(2) Institute of Geochemistry, Mineralogy and Mineral Resources, Faculty of Science, Charles University, Prague, Czech Republic

(3) Department of Mineralogy and Petrology, National Museum Prague, Czech Republic

The first field trip organised by the SGA Student Chapter Prague in 2013 led to the famous Alpine deposits Habachtal and Knappenwand in Austria. Habachtal emerald deposit has been known since the Roman times. This locality provides the best emeralds in Europe and it is the only location where emeralds of gem quality occur. The mine has been active until these days, where the Steiner family has been irregularly mining the precious stones using just a simple technology. Access to the adit collar is rather difficult requiring good physical conditions.

The emerald deposit is located at the tectonic contact of ortho-gneiss and basic to ultrabasic metamorphosed rocks: amphibolite, mica schist, serpentinite and talc schist.

The most important emerald bearing rocks are biotite-, talc- and actinolite schists occurring at the margins of serpentinite bodies. The emeralds mostly appear in the form of automorphic hexagonal columns in a size up to 4–5 cm. The emeralds can be found in the Habach valley under the adit where they are transported by water.

Knappenwand is a deposit of high quality epidote crystals discovered in 1865. Similar to Habachtal, this deposit has been occasionally mined for collecting purposes until nowadays. The place is also accessible with difficulties. The deposit is located in epidote amphibolites of the Knappenwandmulde unit, Habach series represented by late

paleozoic crystalline schists penetrated by granite, granodiorite and tonalite intrusions of Variscan age metamorphosed during the Alpine orogeny. The banded amphibolites rich in metamorphic mobilised epidote are tectonically affected by numerous shear zones of the Alpine orogeny. The hydrothermal mineralisation in cavities is bound with these shear zones and is represented by actinolite, albite, epidote, titanite, apatite and others.

We were lucky to find some nice specimens of emeralds and a few epidote samples as well, so the trip had not only educational contribution but also some tangible benefit.



Habachtal valley, view from the adit collar (photo L. Vrtiška)



Emerald sample (photo L. Vrtiška)



Ancient method of mining used in the Habachtal mine today (photo L. Vrtiška)



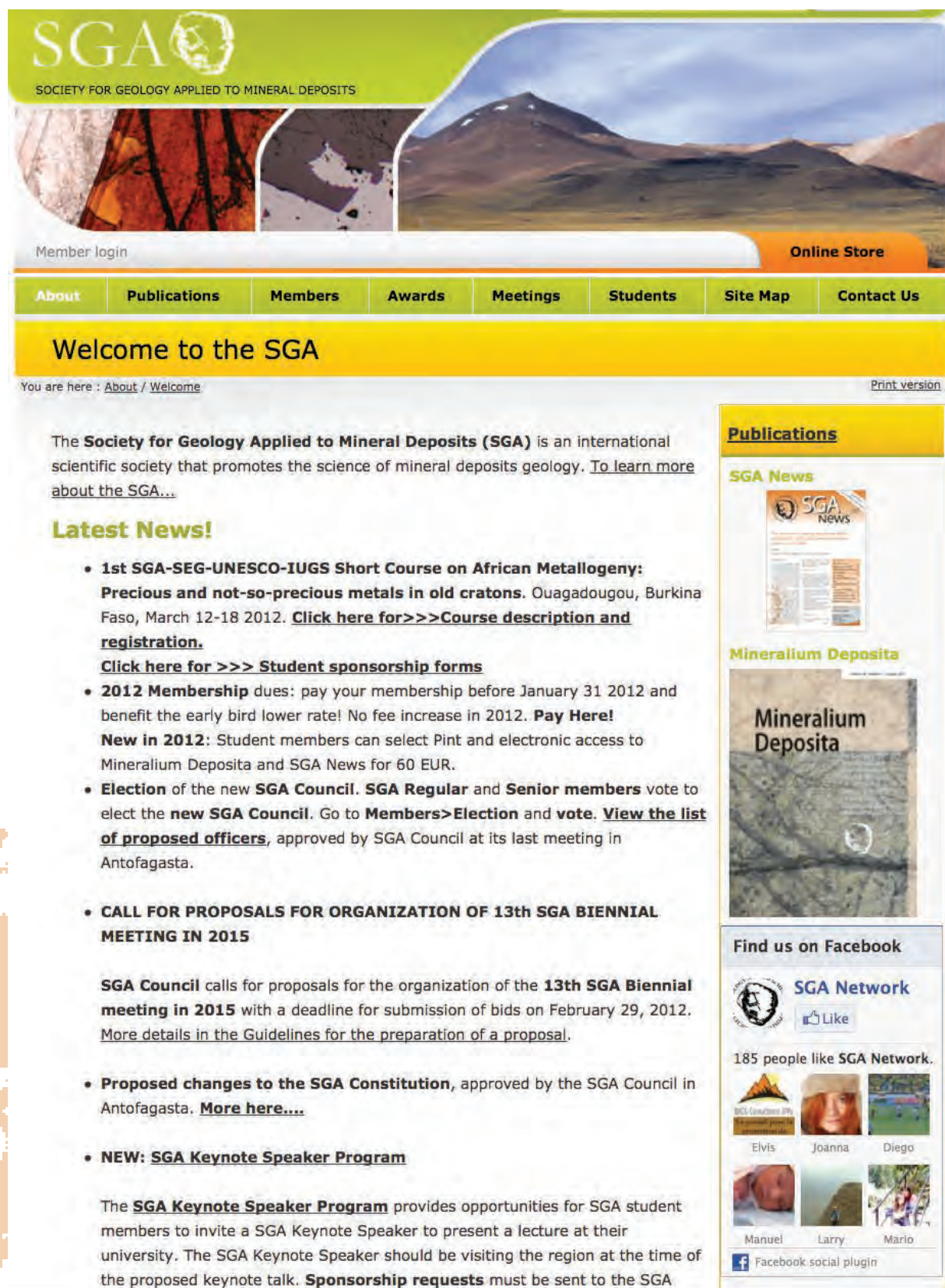
Knappenwand adit (photo J. Bubal)

The SGA website

Nikola Koglin, Chief Editor SGA website

Lehrstuhl für Geodynamik und Geomaterialforschung, Julius-Maximilians-Universität Würzburg, Am Hubland, 7074 Würzburg
email: nikola.koglin@uni-wuerzburg.de

<http://www.e-sga.org>



The screenshot shows the homepage of the Society for Geology Applied to Mineral Deposits (SGA). The header features the SGA logo and the text "SOCIETY FOR GEOLOGY APPLIED TO MINERAL DEPOSITS". Below the header is a navigation bar with links: About, Publications, Members, Awards, Meetings, Students, Site Map, and Contact Us. A "Member login" link is also present. The main content area is titled "Welcome to the SGA" and includes a "You are here" breadcrumb trail: About / Welcome. The text describes the SGA as an international scientific society promoting mineral deposits geology. A "Latest News!" section lists several updates, including a short course on African Metallogeny, 2012 membership dues, an election for the SGA Council, a call for proposals for the 13th SGA Biennial Meeting in 2015, proposed changes to the SGA Constitution, and a new SGA Keynote Speaker Program. On the right side, there are sections for "Publications" (SGA News and Mineralium Deposita) and "Find us on Facebook" (SGA Network, with 185 people liking it and a list of members: Elvis, Joanna, Diego, Manuel, Larry, Mario).

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The **Society for Geology Applied to Mineral Deposits (SGA)** is an international scientific society that promotes the science of mineral deposits geology. [To learn more about the SGA...](#)

Latest News!

- **1st SGA-SEG-UNESCO-IUGS Short Course on African Metallogeny: Precious and not-so-precious metals in old cratons.** Ouagadougou, Burkina Faso, March 12-18 2012. [Click here for>>>Course description and registration.](#)
[Click here for >>> Student sponsorship forms](#)
- **2012 Membership** dues: pay your membership before January 31 2012 and benefit the early bird lower rate! No fee increase in 2012. **Pay Here!**
New in 2012: Student members can select Print and electronic access to Mineralium Deposita and SGA News for 60 EUR.
- **Election** of the new **SGA Council**. **SGA Regular** and **Senior members** vote to elect the **new SGA Council**. Go to **Members>Election** and **vote**. [View the list of proposed officers](#), approved by SGA Council at its last meeting in Antofagasta.
- **CALL FOR PROPOSALS FOR ORGANIZATION OF 13th SGA BIENNIAL MEETING IN 2015**

SGA Council calls for proposals for the organization of the **13th SGA Biennial meeting in 2015** with a deadline for submission of bids on February 29, 2012. [More details in the Guidelines for the preparation of a proposal.](#)

- **Proposed changes to the SGA Constitution**, approved by the SGA Council in Antofagasta. [More here....](#)
- **NEW: SGA Keynote Speaker Program**

The **SGA Keynote Speaker Program** provides opportunities for SGA student members to invite a SGA Keynote Speaker to present a lecture at their university. The SGA Keynote Speaker should be visiting the region at the time of the proposed keynote talk. **Sponsorship requests** must be sent to the SGA

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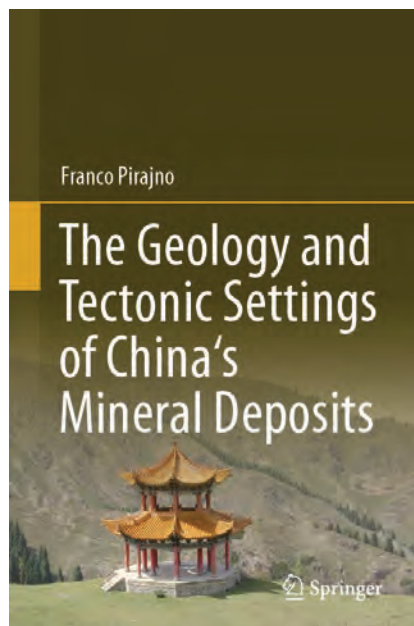
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Franco Pirajno, Geological Survey of Western Australia, East Perth, WA, Australia; The University of Western Australia, Perth, WA, Australia; and Chinese Academy of Geological Sciences, Beijing, China

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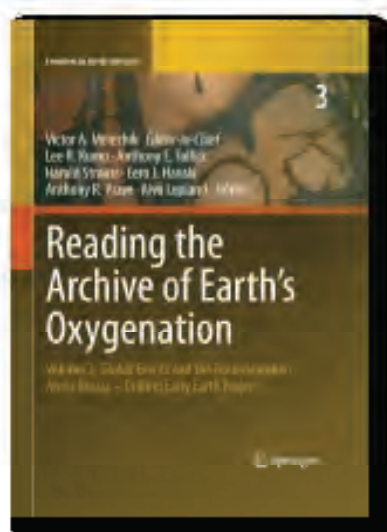
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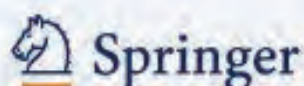
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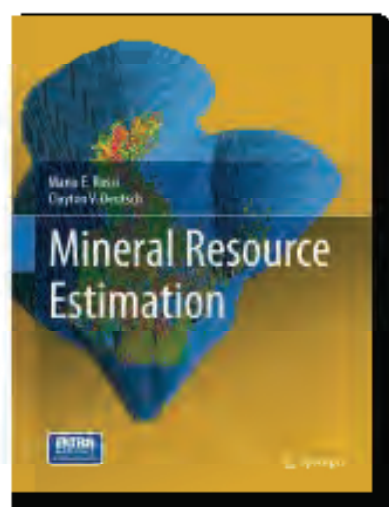


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