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Gold Systems in Argentina: Diversity in Types, Times and Space

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INTRODUCTION

Argentina has always been well known for its world-class porphyry/epithermal copper-gold districts, such as the Farallón Negro Volcanic Complex, which hosts the world-class Bajo de la Alumbrera porphyry Cu-Au deposit or the Farallón Negro-Alto de la Blenda epithermal low sulfidation Au-Ag-Mn deposits. In the past 10-15 years, however, other exciting districts have been extensively explored and significant deposits have been discovered and are presently exploited. For example, the Deseado Massif in Patagonia has only been known since 1985 but is now well known for its Jurassic epithermal low-sulfidation style gold mineralization. To the north, Barrick is currently building the infra-structure to exploit the giant Pascua-Lama epithermal high-sulfidation gold deposit and, when operational in 2013, will mine a 17.8 Moz ore body that stretches from Argentina into Chile at an altitude of over 4500 m.

Due to extensive Government regulations, and in contrast to Chile, Brazil or Perú, Argentina did not receive the close attention of mining and exploration companies during the mining boom of the 1980's. However, at the beginning of the 1990's, significant new mines and mining districts were opened, e.g., the Cerro Vanguardia Au-Ag deposit in the Deseado Massif, but by the end of the 1990's exploration and mining activity decreased and did not really pick up again until after the recent global financial crisis. Since then several large and junior companies are moving into Argentina, actively and successfully exploring for a variety of Au, Cu, Ag style mineralization. An example is the successful acquisition of the Casposo resource in the San Juan province by Troy Resources which has started mining the epithermal low sulfidation Au-Ag deposit in November 2010. Academically there is a distinct dearth of information on the detailed geological setting, alteration and mineralization style of gold deposits when compared to other "classic" mining countries such as Australia, Canada or Brazil.

This contribution attempts to provide an overview about the diverse gold systems in Argentina, particularly emphasising new exploration areas and also new definitions of gold systems, which previously were perhaps misclassified. Of course many deposits and districts have not yet been studied sufficiently in detail to provide a robust classification or model with respect

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MAIN FEATURES

From the Chairman of the 11th SGA Meeting

Eduardo Campos (edcampos@ucn.cl)

The SGA Council and the SGA2011 Local Organizing Committee has the honour of inviting all professionals and colleagues who work in the field of economic geology to participate in the 11th SGA Biennial Meeting, which will be held in the coastal city of Antofagasta, Chile, from 26 to 29 September, 2011.

Our goal is to promote the exchange of knowledge and experience among geoscientists, and to motivate the participation and integration of international lecturers, researchers and students working in all aspects of economic geology. The conference represents a unique opportunity for as it will provide an international forum for the exchange of ideas, experiences and research advancements, and also to interact with an important group of professionals with an extensive background and expertise on different areas of economic geology. The meeting would also represent an important and ideal occasion for the SGA to promote its activities, particularly in this part of the world where the SGA is still not well represented.

We anticipates that more than 400 geologists from industry, academia and government will participate in technical sessions, workshops and field trips, making this event one of the largest and most important international gatherings of mineral deposit scientists to be held in Chile and perhaps South America.

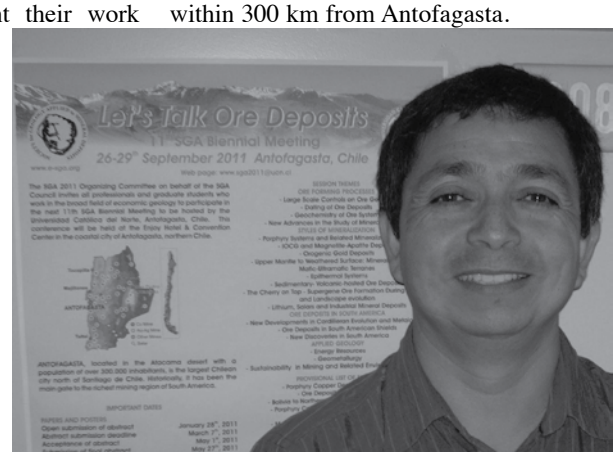
Because the future of Economic Geology depends on the involvement of graduate students and young researchers, we warmly invite and encourage students within the broad area of ore deposits research to submit abstracts and present their work at this highly visible international conference. The 11th SGA Biennial Meeting will be a great opportunity for students to interact with leading scientists and other students in a relaxed and informal atmosphere.

Attractive incentives are being offered to students to promote their participation in the meeting that includes reduced registration fees, a limited number of grants upon the acceptance of abstracts for oral or poster presentation, a cash prize for the best student presentation or poster, a limited number of free field trip registrations for student, and participation in the social evening Student & Industry that will provide the opportunity to meet with corporate sponsors and representatives from mining companies from around the world.

The Central Andes (Chile, Perú and Argentina) are characterized by the great abundance of diverse metal resources and long history of mining. It is one of the key metal mining regions of the world and will likely remain so in the foreseeable future. Metal accumulation was facilitated by the unique geodynamic environment characterizing the region and offers great opportunities for advancing the knowledge of metallogeny and mineralizing processes.

The region is an important producer of copper, molybdenum, gold, silver, antimony, bismuth, cadmium, lead, lithium, molybdenum, tin and tungsten. It is home to a large community of geologist dedicated to exploration and mining. Also extensive research involving local universities and institutions from North America, Europe, Australia is focused on the region.

In particular, the Atacama Desert of northern Chile, hosts one of the world's largest concentrations of ore deposits. Porphyry copper, magnetite-apatite and IOCG systems, manto-type copper deposit, Au-Ag epithermal systems and large supergene copper deposits coexist in the same area with large salars, geyser fields and one of the world's most active volcanic belts, all within 300 km from Antofagasta.



SGA News

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News of the Society

SGA Ordinary Council Meeting, August 22, 2010, Budapest, Hungary

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

F. Tornos (SGA President) welcomed Council Members (G. Beaudoin, P. Eilu, H. Fan, H. Frimmel, J. Pašava, S. Roberts, A. Vymazalová, and P. Weihed) and guests (G. Hedenquist - SEG President and Ch. Bendall - Publishing Editor, Springer-Earth Sciences).

Minutes of Previous Council Meeting (March 25, 2010, Hammamet, Tunisia)

After checking actions it was approved that the Item 5, action 2 (D. Leach to ask all RVPs if they would be willing to assist students and possibly other members with money transfers for membership and dues; any costs associated with this service will be reimbursed by the Treasurer's office.), action 4 (H. Frimmel will also get in touch with past and new RVPs to determine the locations for both types of SGA booths. SGA advertisement posters (large tif. files should be sent to relevant people for translation into Spanish, Portuguese, Chinese and attached to SGA website), item 13, action 2 (F. Tornos and G. Beaudoin to implement highlighting of SGA benefits for joining the Society when linking to the website of Secretariat of Latin-American Metallogeny Courses) to be continued. Then the Minutes were unanimously approved.

Reports of Officers on Council and Matters Arising from These Reports

Reports were submitted by the SGA Executive Secretary, Treasurer's Office, Promotion Manager, Editors of MD, Editor of SGA Website, Regional VP for Australia/Oceania, and Regional VP for South America.

After discussion, Council approved the reports and the following motions:

J. Pašava to thank M. Chiaradia for his work on SGA News 27 which was published in June 2010.

J. Pašava to write a letter to IUGS President informing him about planned African Metallogeny Courses and to ask for co-financing of this important geo-educational event.

H. Frimmel, S. Roberts and F. Tornos to discuss taking a lead in the SGA initiative on "African Metallogeny Courses", originally suggested by G. Borg and F. Tornos and report on the status of this for Society very important issue, at the next Council meeting.

G. Beaudoin to implement script to "share" SGA web information on social media.

D. Leach to ask all RVPs if they would be willing to assist students and possibly other members with money transfers for membership and dues; any costs associated with this service will be reimbursed by the Treasurer's office. For the regions in which the RVPs agree to provide this service, the members in that region will be notified.

Frimmel will also get in touch with past and new RVPs to determine the locations for both types of SGA booths. SGA advertisement posters (large tif. files should be sent to relevant people for translation into Spanish, Portuguese, Chinese and attached to SGA website).

J. Pašava to inform David Huston about approval of a bulk sum of EUR 3000 for all SGA keynotes for SGA organized sessions at the 34th IGC (Brisbane 2012).

J. Pašava to thank E. Ferrari for his exceptional SGA promotional activities in SA.

Council greatly appreciated generous financial help of EUR 2500 from the Springer Publishing House in association with replacement of depleted promotional items.

Council greatly appreciated efforts of Filipa Marquez in managing SGA facebook.

Status of Planning for SGA 2011 in Antofagasta (E. Campos and F. Tornos)

The report was presented by F. Tornos. Council greatly appreciated hard work of the LOC and after discussion recommended the following changes in the proposed Report and actions:

- Include a general session with the title: New advances in the study of mineral deposits
- The session "Hydrothermal processes and the genesis of ore deposits" overlaps with many other sessions and Council recommended to be changed to "Geochemistry of ore deposits", having Thomas Driesner as convener. Council also suggested Jiang S.Y. from the Nanjing University as a co-convener in order to include someone from China. Hartwig Frimmel to provide a contact to E. Campos. The council proposes Frank Bierlein, Georges Beaudoin, David Huston, Massimo Chiaradia, Alain Cheilletz, John Dilles, Roberto Xavier, John Ridley, David Leach, Gregor Borg, Robert Moritz and Gemma Olivo as other co-convenors. The final list has to be approved by the SGA Council.
- F. Tornos to send to E. Campos accepted list of conveners and keynote speakers. F. Tornos and E. Campos to contact them as soon as possible.
- Session chair can´t be keynote, unless there is a special reason; all the keynote speakers should be preferably SGA members. Council disagreed on having general keynote presentation on Geometallurgy.
- Add a session on remote sensing that could be chaired by Rockwell (USGS) and suggest a Chilean co-convener if possible.
- The role of SEG will be clarified in the near future (could be SEG session on epithermal deposits, by J. Hedenquist and Ch. Azevedo, short course on Andean tectonics and porphyry Cu deposits extended into the epithermal environment, by C. Mpodozis and J. Perello, and possibly SEG keynote speaker). However, all these events are conditioned to the existence of a MOU that would assure the same treatment for SGA in the SEG meeting in Peru 2012.
- The role of IAGOD will be clarified in the near future (similar conditions were offered as to SEG).
- Two mornings devoted to keynote presentations should be sufficient. This issue should be revisited only if both IAGOD and SEG accepted to send keynote speakers. It is also very important to reserve some time (min. 45 min) for a brief opening addresses and presentation of SGA awards.
- A management fee of about 10-15 EUR should be added per each field trip participant to be included in the general conference income.
- More promotion is needed to attract more workshops/short courses organizers. SGA Council members to suggest topics/coordinators –

the final list should be announced in the Second Circular which will be distributed in November 2010.
•It is very likely that future Books of SGA Conference Papers (including one for SGA 2011) will be published by the Springer Publishing House (negotiation in progress). This would mean a slight modification of template (will be decided by the time of the Second Circular distribution – J. Pašava will inform E. Campos).
•It is important to proceed with well coordinated effort to seek industry and other conference sponsorship (LOC with D. Leach and E. Ferrari)
•It is important to have a list of session with covenors, keynote speakers and organizers of field trips and workshops ready for the Second Circular.
•It is important that E. Campos will participate in the next SGA Council Meeting (April 7-10, 2011, Madrid, Spain), after the acceptance of the abstracts. At that time we should know which sessions will be definitive.
•E. Campos to liaise with P. Garofalo who is willing to organize the Final Meeting of IGCP 540 in Antofagasta.
To distribute announcement on SGA 2011 meeting to SEG Newsletter, IAGOD Newsletter, Elements and other journals, especially Latin American ones. Also inform other Geo-Societies (E. Campos jointly with H. Frimmel). The first circular was emailed by J. Pašava to both SEG and IAGOD executive officers for further promotion.

Status of planning for SGA 2013 in Uppsala (P. Weihed)

The information was given by P. Weihed. Next meeting of the LOC will be held in late September 2011.

Suggested changes in SGA Constitution (J. Pašava)

Following the approved minor changes in Hammamet (Article III - newly: "this Society is an international scientific nonprofit and not self-orientated activity organization.") and XV (newly: "If the Society is to be dissolved, its net wealth (credit balance) will be transferred to an international non-profit geoscientific Society."), Council reversed the part on approval of Student Representative to become a part of Executive Committee which was approved in Hammamet and recommended to revise SGA Constitution with the aim to lower the number of executive officers (J. Pašava to prepare a proposal for the next Council meeting).

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

The report was presented by P. Eilu . During past 5 months SGA got 103 new members thanks to D. Groves, D. Leach, R. Goldfarb and J. Kabete who successfully promoted SGA at various short courses worldwide. Council greatly appreciated their effort. The present membership is 913. Despite "personal reminders" introduced in 2010, unfortunately, the loss of members remains a big issue. Council approved the report with great thanks and recommended to improve "reminding process" as follows:
Sabine Lange to send reminder for membership fee payment to SGA members at least two weeks before payment deadline and to non-paying members on time shortly after the payment deadline.
Sabine Lange to prepare a list of people who didn't renew SGA membership in the format:
Country/ Name of SGA Member/Email address/ Phone number/ Name of Responsible SGA Council Member to Follow Up.
The Responsible person should be the Regional Vice-President or Other Member of Council. Australasia, where there are several Members on Council could be subdivided into east and west and New Zealand. BUT there must be a delegated person. They should send to Sabine a list of people contacted.
Our Council is so large that there is a tendency to assume that someone more compulsive obsessive will do it and no action is required.
After a month, a list could be sent out showing those still not contacted so that pressure can be brought to bear so that these can be followed up.
Council members should help with correcting names and/or other coordinates of new SGA members that are regularly published in SGA News (this is very important for future communication with membership).

Council also greatly appreciated recent SGA promotion by D. Groves and Karen de Luca (Country Manager - Egypt and Eritrea, Thani Dubai Mining Limited), which resulted in another 25 new applications for student membership.

Status of development of SGA Student and Young Scientist network (A. Vymazalova and J. Relvas)

The report was presented by F. Tornos. After a broad discussion A. Vymazalová briefly informed about implementing "student issues" at the SGA 2011 and also informed Council members about SGA Students Conference (April 15-18, 2011, Prague, Czech Republic). This info was published in the recent SGA News no. 27. Possible SGA keynote speakers are H. Frimmel, B. Lehmann, P. Eilu, F. Tornos.
All Council members are encouraged to promote SGA Student Conference in Prague.

Requests for sponsorship

-GAC-MAC-SEG-SGA 2011 – request for sponsorship of student's fieldtrip
Council agreed to provide sponsorship in the amount of 2000 USD for student's field trip to Flin Flon field but under condition that only SGA student members will be supported. J. Pašava to inform A. Conly.
-UNESCO-SEG-SGA Metallogeny Course (October 11-22, 2010 Concecpcion, Chile) – USD 3000 (B. Dold and L. Fontboté)
Council approved 2500 USD for the course to be used preferentially for SGA speakers and/or participants - SGA members. F. Tornos to inform B. Dold.

Any other business

-Insurance for SGA (presentation of proposal by G. Waas - F. Tornos, J. Pašava)
J. Pašava presented summary on SGA insurance issue. Council members are asked to investigate by what type of insurance at which insurance company are covered similar international societies and report to D. Leach and F. Tornos. This issue will be revisited at the next Council meeting.

-SGA promotion at SEG Keystone (Sept-Oct 2010) – SGA booth – D. Leach, K. Kelley, S. Roberts - update
On behalf of K. Kelley, the report was presented by J. Pašava. Steve Roberts confirmed his willingness to help in staffing the SGA booth in Keystone.

-Goldschmidt 2011 – Prague – August 2011 – update (J. Pašava)
J. Pašava presented update on Theme 11-Earth sciences: Ores

Elections for SGA Council 2012-2013

If you are interested to serve in the SGA Council please contact Dr. F. Tornos (Chair, Nominating Committee, f.tornos@igme.es) **before March 15, 2011**

which is sponsored by SGA. To date 5 major topics were suggested by the theme leaders and members and a public call for sessions was launched.

-Strategy on future SGA Publications – revival of SGA Special Publication Series (R. Foster, Ch. Bendall)
Ch. Bendall presented a proposal for revival of one- to two- or multi-authors series SGA Special Publications (topical/e-books/ hard copies) that used to be published with the Springer Publishing House in the past. The topics could be "Metals", "Regional Metallogenetic Syntheses" or "Processes" and editors for sub-series might be appointed. E-books would be available for SGA membership free of charge. Chief Editor would get 500 EUR and a royalty (10%) and 5 free copies of book. Authors would get free copy of the book. SGA Council agreed in principle with the concept and asked Ch. Bendall to come up with a draft of written proposal. In the meantime, Publication Manager in collaboration with the Council will begin to identify suitable editors for various topics. Ch. Bendall also informed Council that the Springer is digitizing old mineral deposit books and these will become accessible free of charge to all SGA members during next year. Ch. Bendall will inform G. Beaudoin when ready.
J. Pašava then presented on behalf of R. Foster - Publication Manager's report. Council approved the concept in principle – the proposed manner in which the publication process will be managed. Council postponed a decision on the proposal that the post of Publication Manager becomes executive position (see above section "Suggested changes in SGA Constitution" in this document).

-Proposal for SGA award for recognition of special services to the society (D. Huston, F. Tornos et al.)
On behalf of D. Huston the proposal was presented by F. Tornos and J. Pašava. Council agreed that:
- the award will be called "SGA Medal for outstanding services" and will be made of a metal,
- call for medal will be announced every 2 years similarly as other SGA awards, the first recipient
will be awarded in 2013 at the 12th SGA Biennial Meeting in Uppsala, Sweden,
- active SGA officers are not eligible for the award,
- SGA Promotion manager will prepare a proposal for a material(s) and design(s) of the medal.

-Report from the Ore Deposits Models and Exploration Workshop China University of Geosciences in Wuhan (CUG), May 24-29, 2010 – S. Scott, D. Leach et al.
SGA Council accepted the Report with great thanks and highly appreciated successful SGA promotion which resulted in a great number of new SGA student´s membership applications.

-Report from the 11th International Platinum Symposium (June 2010) – M. Lesher
SGA Council accepted the Report with great thanks.

-SGA-SEG collaboration
J.W. Hedenquist (SEG President) thanked SGA Council for the invitation and informed about recent arrangements with the aim to improve communication between both Societies - exchange of Minutes and other Council documents. He reminded a very good collaboration in joint projects as e.g., Latin-American Metallogeny Courses. He also explained a system of organization of SEG biennial meetings with often only one session and a majority of invited presentations. F. Tornos (SGA President) greatly appreciated past SGA-SEG collaboration and emphasized that SGA was always positive in enabling SEG to have a certain module at SGA Biennial meetings. It is therefore important for SGA membership to see similar attitude from SEG at future SEG biennial meetings. This could be a subject of a simple MOU between both Societies. F. Tornos offered J.W. Hedenquist a SEG module for the SGA 2011 biennial meeting (Chile) under a condition that SGA will get similar treatment in the SEG 2012 biennial meeting (Peru). J.W. Hedenquist promised to discuss this issue with SEG executive in the near future. Hopefully, this issue will be sorted out by November 2010 when the Second Circular for the SGA 2011 will be distributed.

Date and Place of the Next Council Meeting

The next Council Meeting will be held from April 7 to 10, 2011 in Madrid, Spain (the precise venue and agenda will be announced in due time).

SOCIETY FOR GEOLOGY APPLIED TO MINERAL DEPOSITS

SGA COUNCIL 2010

President	F. Tornos (Spain)
Vice-President	P. Weihed (Sweden)
Executive Secretary	J. Pasava (Czech Republic)
Treasurer	D. Leach (USA)
Promotion Manager	H. Frimmel (Germany)
Chief Editors	B. Lehmann (Germany) - MD European Office
	P, Williams (Australia) - MD Australian Office
	M. Chiaradia, C. Heinrich (Switzerland) - SGA News
	G. Beaudoin (Canada) - SGA website
Student Represent.	A. Vymazalová (Czech Rep.)

Regional Vice-Presidents

Asia	Z. Hou (China)
Australia/Oceania	D. Huston (Australia)
Europe	A. Cheilletz (France)
Middle East	H. Harbi (Saudi Arabia)
North Africa	S. Bouhlel (Tunisia)
North America	A. Conly (Canada)
South Africa	J. Kabete (Tanzania)
South America	E. Ferrari (Peru)

Councillors: term ending on December 31, 2011

F. Bierlein (Australia)
K. Kelley (USA)
P. Williams (Australia)
R. Foster (UK/Turkey)
R. Presnell† (USA)
V. Shatov (Russia)

Councillors: term ending on December 31, 2013

S. Roberts (U.K.)
S. Diakov (Canada, East Asia)
P. Eilu (Finland)
A. Piestrzynski (Poland)
F. Hongrui (China)
J. Relvas (Portugal)
R. Smith (Australia, China)
E. Campos (Chile)

Ex officio Members, SEG

President	J. W. Hedenquist (Canada)
Executive Director	B. G. Hoal (USA)

Ex officio Members, IAGOD

Secretary General	S. Cherkasov (Russia)
Publication Manager	R. Seltmann (U.K.)

LIST OF NEW SGA MEMBERS (April 30, 2010 - October 31, 2010)

55 Regular, 113 Student and 1 Corporate Members applied for membership (30/04-31/10/2010)

REGULAR MEMBERS

Mr. Carlos BILBAO COLQUE Exploraciones Av. Alem 136 8160 Tornquist, Provincia de Buenos Aires ARGENTINA

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>>> page 1 Gold systems in Argentina

to the different gold systems. Nevertheless an attempt is made to provide the most detailed system classification possible. The first part of this paper provides an overview of the major geological provinces (i.e., geotectonic areas) in Argentina which is followed by a brief summary of the geological setting and description of gold mineralization in the three most important gold districts in Argentina, the Farallón Negro Volcanic Complex, El Indio-Pascua gold belt, and Deseado Massif. Finally the paper will provide a preliminary synthesis of the different gold systems in Argentina through time and space.

GEOLOGICAL PROVINCES AND GEOTECTONIC SETTING OF ARGENTINA

The geological provinces in Argentina are displayed in Figure 1 and following Rolleri (1976) are defined by a characteristic stratigraphic succession, structural style, and specific geomorphological features, together expressing a particular geological history. Argentina consists of a series of principal orogenic systems (Fig. 2) that developed from the Precambrian to Quaternary. Several of these are important for the understanding of the geological setting and evolution of gold systems.

The Pampeano cycle comprises Neoproterozoic to Early Cambrian rocks that are related to the marine Puncoviscana basin that was located on the western border of Gondwana (Fig. 2). During the Early Cambrian, granites intruded the Puncoviscana Formation. At the end of the Pampeano cycle the Tilcárica orogeny resulted in significant uplift of the Central Argentina craton. The uplifted block is now called the Sierra Pampeanas (Fig. 1) and contains many of Argentina's orogenic gold deposits (Fig. 3).

The Late Cambrian to Devonian Famatiniano cycle is found mainly in north Argentina (Fig. 2) and is characterized by significant magmatism: the Pampeano (Cambrian), Famatiniano (Ordovician to Devonian), and Carboniferos (Carbonic) granitoids. This cycle terminated at the end of the Devonian with the Chánica orogeny that was caused by the Chilenia terrane colliding with the western border of Gondwana, which resulted in the uplift of the proto-Precordillera.

The Gondwánico cycle (Carboniferous to Triassic; Fig. 2) includes all the Carboniferous basins in Argentina, e.g., the continental Paganzo and Calingasta-Uspallata basins and marine Rio Blanco basin in the Cordillera Frontal (Fig. 1). This orogeny is the result of the subduction of an unknown terrane to the west during the Carboniferous and the subsequent extension during the Late Permian-Triassic. The extensional phase produced significant magmatism with intercalation of granitoids and volcanic rocks forming the regionally important Choiyoi Group. The Choiyoi Group crops out in the Cordillera Frontal, Bloque de San Rafael, small areas in the Cordillera Andina (south of Mendoza) and the Cordillera del Viento and Cerro Chachil (central and north Neuquén). The transition of the Permian to Triassic was accompanied by a change of rock types from andesites, dacites and granitoids to rhyolites and granites. The Triassic Choiyoi Group hosts Troy's new flagship epithermal low sulfidation Au-Ag Casposo deposit in the San Juan province (Fig. 3).

The Jurassic to Cretaceous Patagonídico cycle (Fig. 2) saw the opening of the Atlantic Ocean with significant flood basalts in large areas of Mesopotamia of Argentina, Brazil and Uruguay. In the west continued subduction caused arc-related plateau-type magmatism in the, for example, Deseado Massif. The Middle Jurassic produced mainly andesites and basalts (Bajo Pobre Formation), whereas the Late Jurassic is mainly characterized by rhyolites of the

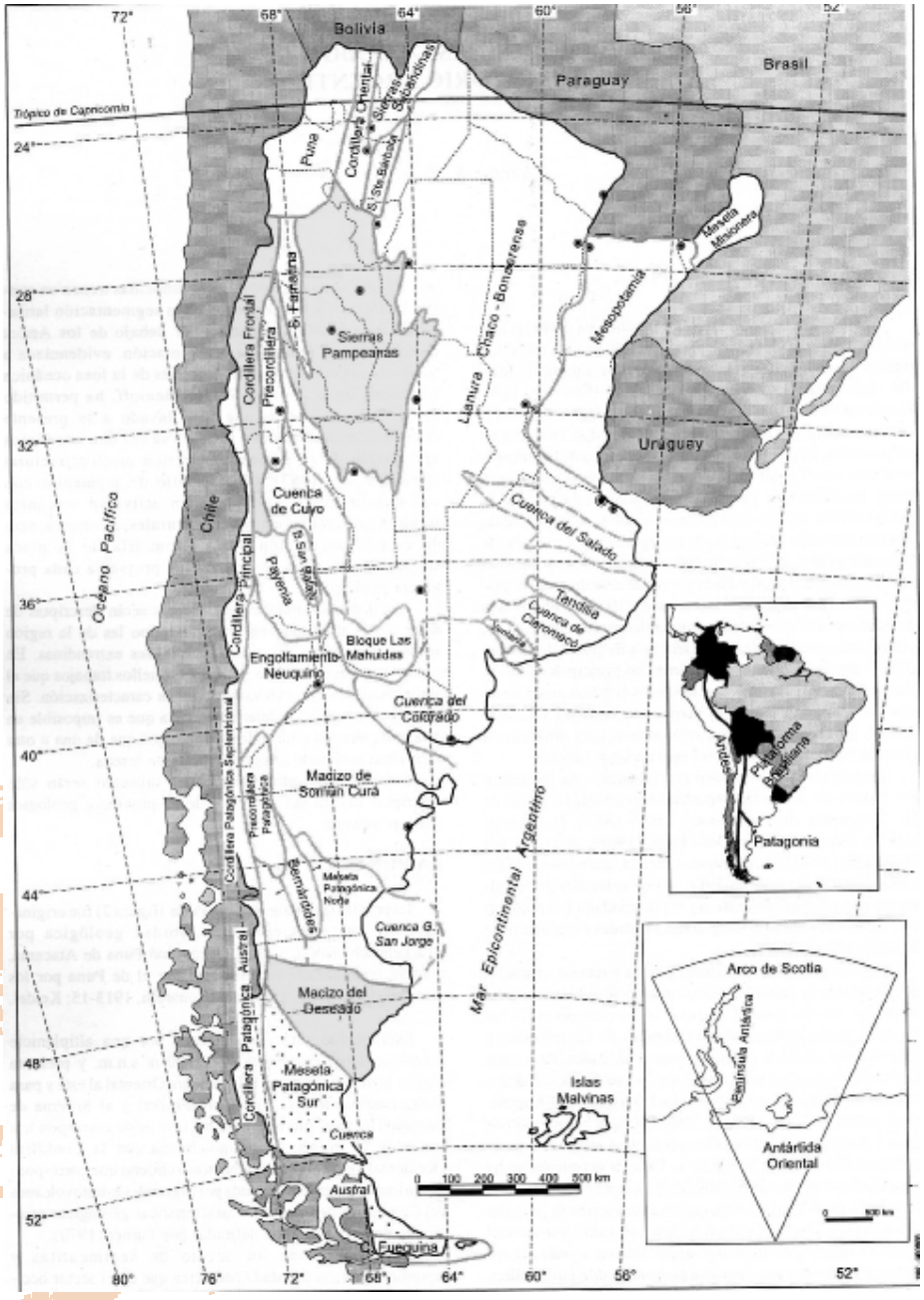

Figure 1: Geological provinces of Argentina. Provinces are based on physiographic divisions (e.g., Puna is characterised by a high plateau (average 4000m) in northern Argentina that continues to the Bolivian altiplano in the north). Modified after SEGEMAR (1999).

Chon Aike Formation. The latter is the host rock of Anglo Gold Ashanti's epithermal low sulfidation Au-Ag Cerro Vanguardia deposit (Fig. 3).

The Tertiary to Quaternary Andico cycle (Fig. 2) is expressed mainly in the Andean Cordillera with significant arc-related magmatism in the Early to Medium Miocene in the Sierras Pampeanas (e.g., Farallón Negro Volcanic Complex that hosts the world class Bajo de La Alumbrera Cu-Au porphyry deposit), Famatina (e.g., Nevados del Famatina Cu-Mo-Au deposit), and Late Miocene dacitic magmatism in the El Indio-Pascua gold belt (e.g., the Veladero epithermal high sulfidation deposit). Volcanism is related to the subduction of the Nazca plate and produced significant andesite rocks.

GOLD SYSTEMS IN ARGENTINA

Data Base

The following summary of gold systems in Argentina is based on an extensive literature search including www-sites of major companies that operate in Argentina and experience by the authors working and visiting a range of gold systems in Argentina. Figure 3, which illustrates the location of gold systems in Argentina, subdivides gold systems in major gold districts (black boxes), active and inactive mines, advanced exploration and exploration projects. The geological map of Argentina is a simplified version of the 1:100,000.00 geological map of the Geological Survey of Argentina. Many brief deposit descriptions can be found in Recursos Minerales de la Republica Argentina, which was edited by Zappettini (1999), published by the Geological Survey of Argentina (SEGEMAR) and represents a large and significant source of information. The classification of gold deposits in genetic types is based on the literature and own interpretation and include epithermal high- and low-sulfidation Au-Ag, porphyry-skarn Au-Cu, orogenic, intrusion-related, polymetallic and unknown type deposits. Caution should be applied to this classification as in many localities significant data-sets, such as geochronology and fluid sources, are incomplete. Therefore, our classification is considered at best tentative. High-level geological research on gold systems in Argentina is currently under way which will result in a much better understanding and classification of deposits and districts in the future.

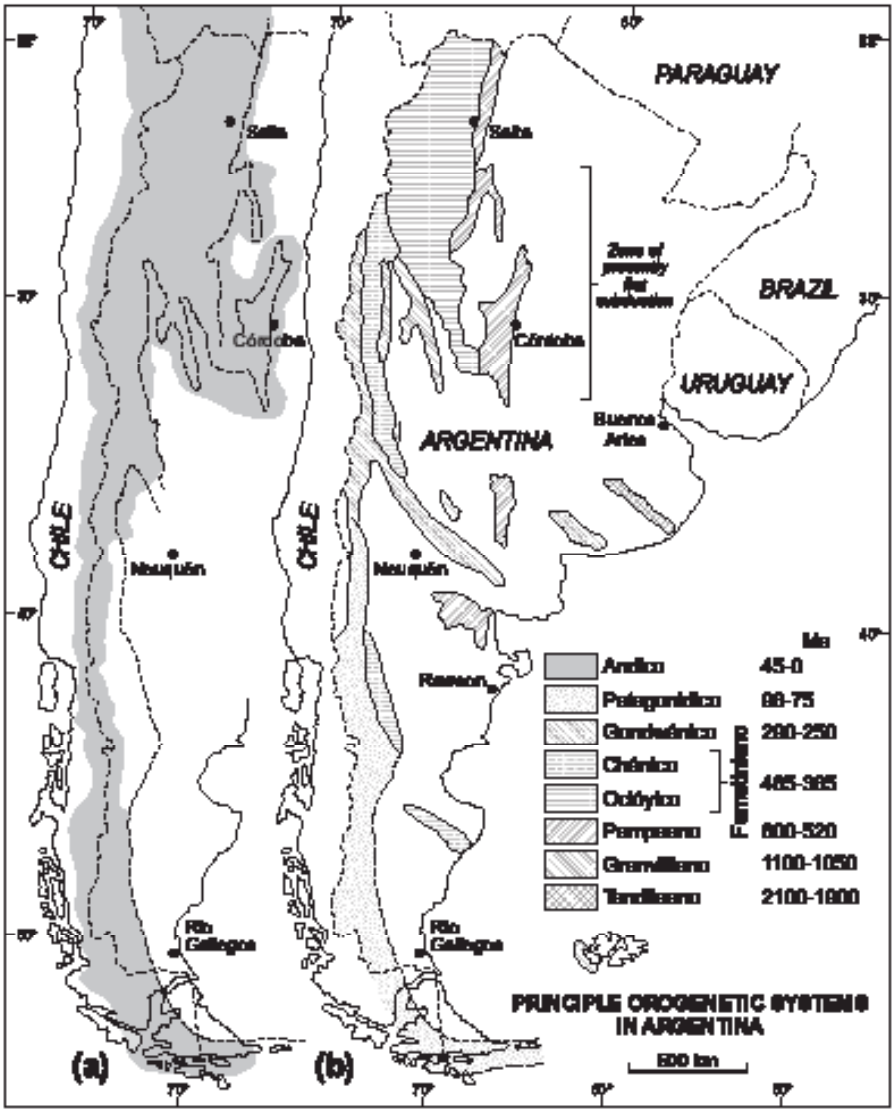

Figure 2: Principal orogenic belts in Argentina; (a) Ándica orogeny, (b) Pre-ándica orogeny (Ramos, 1999).

Companies operating in Argentina

Currently there are approximately 23 significant major and junior companies operating in Argentina (Table 1) that either have deposits, advanced exploration areas and it is likely that at least the same number of companies have exploration teams on the ground. Reserves and resource numbers are currently difficult to constrain, but based on information of company web-sites and government sources, the approximate annual production of gold in Argentina was about 42,046 metric tons in 2008 (USGS 2008).

Diverse gold systems

The most important gold system in Argentina is arguably the epithermal low-sulfidation one (Fig. 3), with major districts (from north to south) in the Farallón Negro Volcanic Complex (Farallón Negro and Alto de la Blenda deposits, 479,286 tonnes ore at 6.1 g/t Au and 112 g/t Ag; SEGEMAR, 1999), Casposo-Castaño area (Casposo deposit, reserves of 328,000 oz Au, 9 Moz Ag; Troy Resources Nov. 2010), Cordon Esquel area, and Deseado Massif. The latter contains currently four producing deposits [Cerro Vanguardia, 6 Moz total ore reserves and resources (Schalamuk et al., 1997); San José (reserves 152,000 oz Au and 1.9 Moz Ag; Minera Andes November 2010); Manantial Espejo (7,341,000 tonnes at 2.19 g/t Au and 153 g/t Ag; Pan American Silver November 2010); Martha (reserves 6,097,000 oz Ag, resource 100,000 oz Au; Fernándes et al., 2008; Coeur D'Alene Mines November 2010)] and the large Cerro Negro (indicated resource of 2.5 Moz Au and 23.5 Moz silver; Andean Resources July 2010) and Cerro Moro (612,000 oz Au equivalent; 357,000 oz Au and 15.3 Moz Ag; Extorre Gold Mines November 2010) advanced exploration projects by, respectively, Goldcorp and Extorre Gold Mines, besides numerous other exploration areas (Fig. 3).

Producing epithermal high sulfidation deposits are new and rare, the most prominent examples being Barrick's now about

12 Moz Au Veladero deposit and the future Pascua-Lama deposit (17.8 Moz Au) at the Chile-Argentina border in the El Indio-Pascua gold belt (Barrick November 2010). Inactive epithermal high-sulfidation deposits include Famatina (La Mejicana), La Porteña and Los Menucos, whereas Diablillos currently represents an advanced exploration area (Fig. 3) with about 21.6 Mt of ore averaging about 111 g/t Ag and 0,922 g/t Au (Sylver Standard Technical Report, 2009).

Porphyry- and skarn-related Au deposits are presently relatively rare when compared with epithermal low sulfidation gold deposits (Fig. 3). The only producing Au porphyry deposit is X-strata/Goldcorp/YamanaGold's Baja de la Alumbrera (402 Mt at 0.54% Cu and 0.64 g/t Au; Proffett, 2003). YamanaGold's Gualcamayo deposit (reserves of 2.5 Moz Au; YamanaGold, November 2010;) has recently begun production and appears to be a gold skarn. Advanced Au porphyry exploration projects, for example, include (from the north to south) the Lindero, Taca Taca, Josemaria, Nevados del Famatina, Agua Rica, El Altar, and San Jorge (Fig. 3).

Orogenic gold systems are not very common in the Andes even though Haeberlin et al. (2001) proposed an 1800 km long Paleozoic orogenic gold belt stretching from northern Perú to north-central Argentina. In Argentina there are two mineralization epochs identified: (1) Ordovician turbidite-hosted quartz vein lodes, and (2) Devonian shear- and fault zone-hosted mesozonal lodes (Skirrow et al., 2000). The Jujuy province in the north-western corner of Argentina hosts numerous now abandoned turbidite gold quartz vein deposits, e.g., El Torno, Eureka, Minas Zules and Farillión, in the Rinconada district in the Sierra Rinconada. Further south, in the Catamarca province, the inactive Incahuasi deposit is hosted by the same turbidite sequence (Ordovician Santa Victoria group) and controlled by quartz veins and breccias as the deposits in the Rinconada district.

The abandoned Culampajá deposits (also in the Catamarca province) lack significant quartz veins and are hosted entirely by granitoids, therefore may represent an intrusion-related gold system. The Devonian Candelaria and Sierra de Las Minas and Ulapes deposits in the Córdoba province are hosted by metamorphosed schists, granites and gneisses and are currently inactive. The Andacollo deposit in Neuquén province is hosted by tonalities and granodiorites and

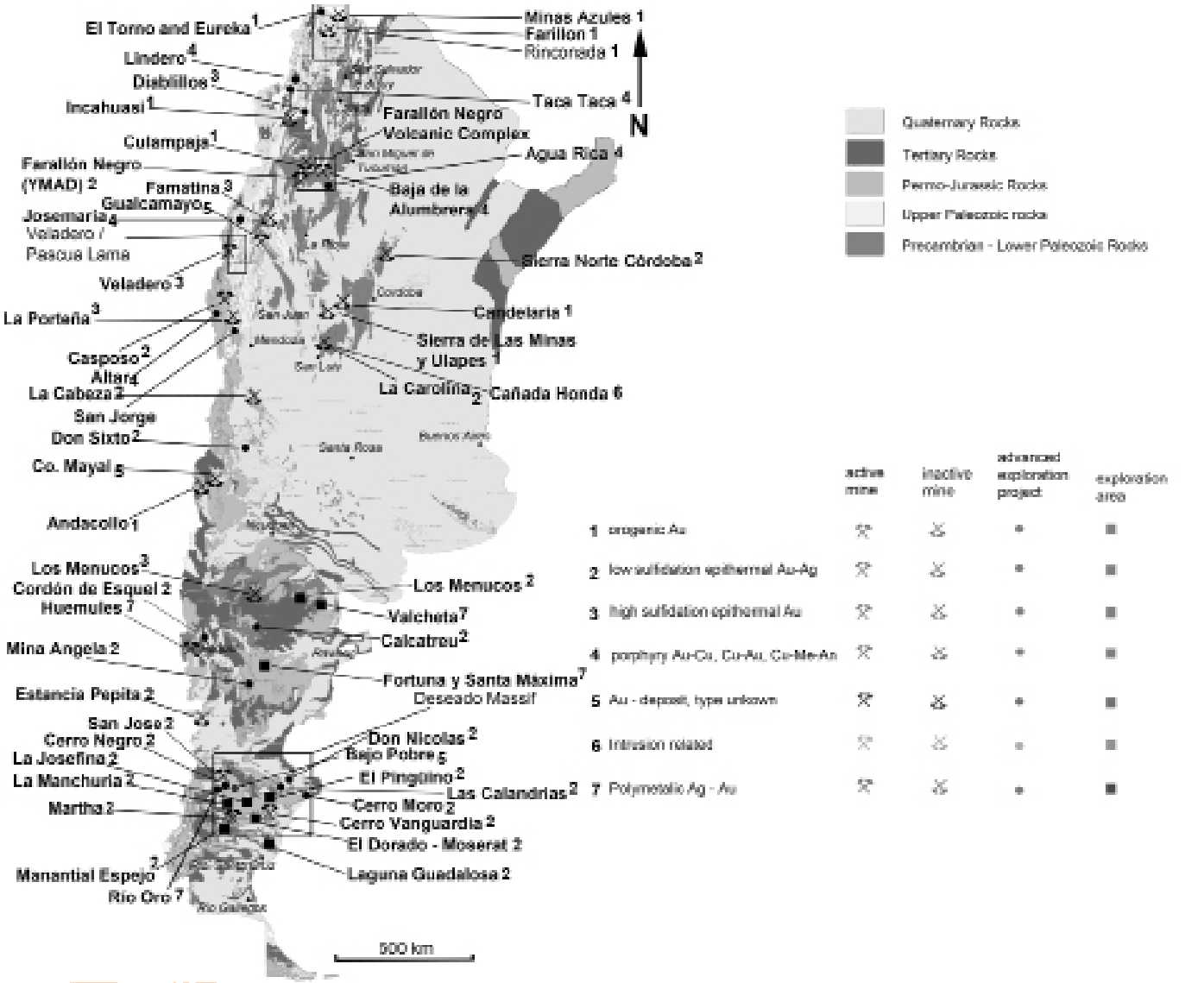

Figure 3: Geological map of Argentina (modified after geological map shown in Zappettini, 1999) displaying major gold systems including significant gold districts (e.g., Veladero/Pascua Lama belt, Farallón Negro Volcanic Complex, and Deseado Massif), active and inactive mine sites, advanced exploration projects, and exploration areas. Gold systems are sub-divided into high- and low-sulfidation epithermal, porphyry-skarn, orogenic, intrusion-related, and polymetallic gold systems.

The SGA website

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currently also inactive.

There are presently no producing Au-bearing polymetallic lodes but the Fortuna and Santa Máxima and Río Oro areas in Patagonia represent advanced exploration project (Fernández et al., 2008). The advanced Pinguino project in Santa Cruz province contains an indium-rich, base-metal (Zn) Ag-Au style mineralization, which may represent a new variation of the epithermal low-sulfidation gold-silver system commonly encountered in the Deseado Massif. Placer-style gold mineralization exists, but only minor occurrences were reported, from, e.g., Jujuy province.

MAJOR GOLD DISTRICTS IN ARGENTINA

The following description concentrates on the three significant gold districts in Argentina that have producing gold deposits, namely the: (1) *Farallón Negro Volcanic Complex* in the Sierras Pampeanas/Catamarca province with the gold-producing Bajo de la Alumbrera (Xstrata, Goldcorp, YamanaGold) and Farallón Negro/Alto de la Blenda (YMAD) deposits, (2) *El Indio-Pascua* Gold Belt that contains Barrick's combined 29.8 Moz gold giant Veladero/Pascua-Lama deposits (the latter currently being constructed) in the Cordillera Frontal, straddling the international boundary between Chile and Argentina, the latter within the San Juan province, and (3) *Deseado Massif* in the Santa Cruz province with numerous epithermal low-sulfidation Au-Ag deposits including Anglo Gold Ashanti's Cerro Vanguardia deposit.

Farallón Negro Volcanic Complex

The Farallón Negro Volcanic Complex (FNVC) is located in the northern part of the Sierras Pampeanas Occidentales, close to the SW-NE trending Tucuman lineament which marks the boundary between Puna to the north and Sierras Pampeanas and confined basins to the south. The basement consists of low-grade metamorphic rocks intruded by granites and granodiorites. Overlying the basement are middle Tertiary continental clastic sedimentary rocks (El Morterito Formation). The late Miocene-Early Plicocene FNVC intruded the El Morterito Formation and is partly covered by Pliocene sandstone and tuff (El Cajón Formation), and Quaternary sediments. According to Harris et al. (2008) porphyry-style mineralization is spatially and temporally related to the emplacement of three porphyries: (1) plagioclase–phyric dacite P2 porphyries (including the Northeast Porphyry and Los Amarillos Porphyry), (2) biotite–plagioclase–phyric dacite Early P3 porphyries, and (3) hornblende–plagioclase–phyric dacite Late P3 porphyries. These intrusions form an intrusive complex approximately 800 m in diameter, with a known vertical extent of approximately 1 km and open at depth (Harris et al., 2008).

At the FNVC, two gold systems, that formed during the Late Miocene, are encountered: (1) Porphyry Cu-Au, e.g., Bajo de la Alumbrera, and (2) Epithermal low sulfidation Au-Ag-Mn, e.g., Farallón Negro, Alto de La Blenda. Ulrich and Heinrich (2002) proposed that Au in the Bajo de la Alumbrera deposit is associated with potassic alteration and Cu and Au co-precipitated as chalcopyrite and native gold during cooling from 400° to 305°C. Phyllic alteration at lower (<200°C) temperatures, is caused by mixing of meteoric water and residual brine and largely devoid of mineralization (Ulrich and Heinrich, 2002; Harris et al., 2005). Harris et al. (2008), using multiple chronometers, concluded that the hydrothermal system at Bajo de la Alumbrera deposit was active episodically over at least a three million and possibly up to a four million year period.

The Farallón Negro and Alto de la Blenda are epithermal low sulfidation Au-Ag-Mn deposits hosted in magnetite-rich monzonite. Malvicini and Llambías (1963) indicate that the hydrothermal alteration minerals in the host rock of Farallón Negro and Alto de La Blenda include sericite, carbonate, chlorite, quartz, and pyrite. In Farallón Negro Rama Norte, Martinez (2009) reports the irregular distribution of proximal sericite and carbonate and distal chlorite, epidote and carbonate with respect to the veins and breccias which contain pyrolusite, psilomelane, hematite, pyrite, chalcopyrite, Ag-sulfosalts and gold.

Table 1: Selected companies operating in Argentina and their mines or advanced exploration projects.

Major and Junior Companies	
Anglo Gold Ashanti Ltd.	Cerro Vanguardia Mine
Barrick Gold Corp.	Veladero
Yamana Gold Inc.	Gualcamayo, (100%) Alumbrera (12.5%), Agua Rica (100%)
X-strata Plc.	Alumbrera (50%)
Goldcorp	Alumbrera (37.5%)
Pan American Silver	Manantial Espejo
Silver Standard	Diablillos
Soltera Mining Corp.	El Torno, Eureka
Coro Mining Corp.	San Jorge
Coeur Exploration	Marta
Hochschild Mining Argentina	San José
Hunt Mining Comp.	La Josefina, Bajo Pobre, El Gateado and Lobuno
Cardero resource Corp.	Mina Angela
Lumina Copper Corp.	Taca Taca
Mansfield Minerals	Lindero
Troy Resources NL	Casposo
Andean Resources	Cerro Negro

El Indio-Pascua Gold Belt

The El Indio-Pascua gold belt is characterized by Miocene magmatic rocks which are confined between two reverse faults with opposite dips, the Baños del Toro fault in the west and the Colanguil fault in the east (Fig. 5). Late Paleozoic granites form the basement to the gold deposits.

The high-sulfidation Veladero Au deposit is hosted by Late Oligocene and Middle Miocene volcanic and volcaniclastic rocks and minor Permian rhyolitic pyroclastic rocks. Structurally a series of normal faults underlay the tabular Veladero ore body (Charchaflié et al., 2007). Gold mineralization is centered on a north-northwest elongated high-siliceous (alunite) zone that crosscuts the stratigraphy and contains hematite, goethite, jarosite, Fe-sulphates, and very fine-grained, disseminated pyrite (Chouinard et al., 2005; Charchaflié et al., 2007). According to Jones et al. (1999) hydrother-

mal alteration consists of three zones: (1) silica-rich zone of the surrounding Tertiary diatreme with 30-75 vol% silica, (2) argillic (illite-rich) zone with 30-60 vol%, 30-70 vol% silica, and (3) outer propylitic zone consisting of chlorite, calcite, epidote and illite with 2-20 vol% silica.

The Pascua-Lama Au-Ag deposit is hosted by several discrete hydrothermal breccia bodies and surrounding vein systems which crosscut granitoids and minor rhyolite tuff. Hydrothermal alteration is characterized by a widespread and thick blanket of advanced argillic alteration, minor vuggy quartz, argillic and propylitic alteration (Deyell et al., 2004). Styles of mineralization include breccias veins and disseminations with the largest Au resource hosted in a pyrite-enargite assemblage with intergrown alunite (Chouinard, 2003; Deyell et al., 2003). The alunite-pyrite-enargite ore formed from acidic, H2S-dominant magmatic fluid, and precipitated from about 200° to 350°C (Deyell et al., 2004). Deyell et al. (2004) concluded, based on isotopic and geomorphological studies, that ore deposition in the El Indio-Pascua gold belt was strongly influenced by pediment erosion and semiarid climate conditions (cf. Bissig et al., 2002) and that the dominance of magmatic condensates during ore deposition is consistent with an arid climate and limited availability of meteoric water.

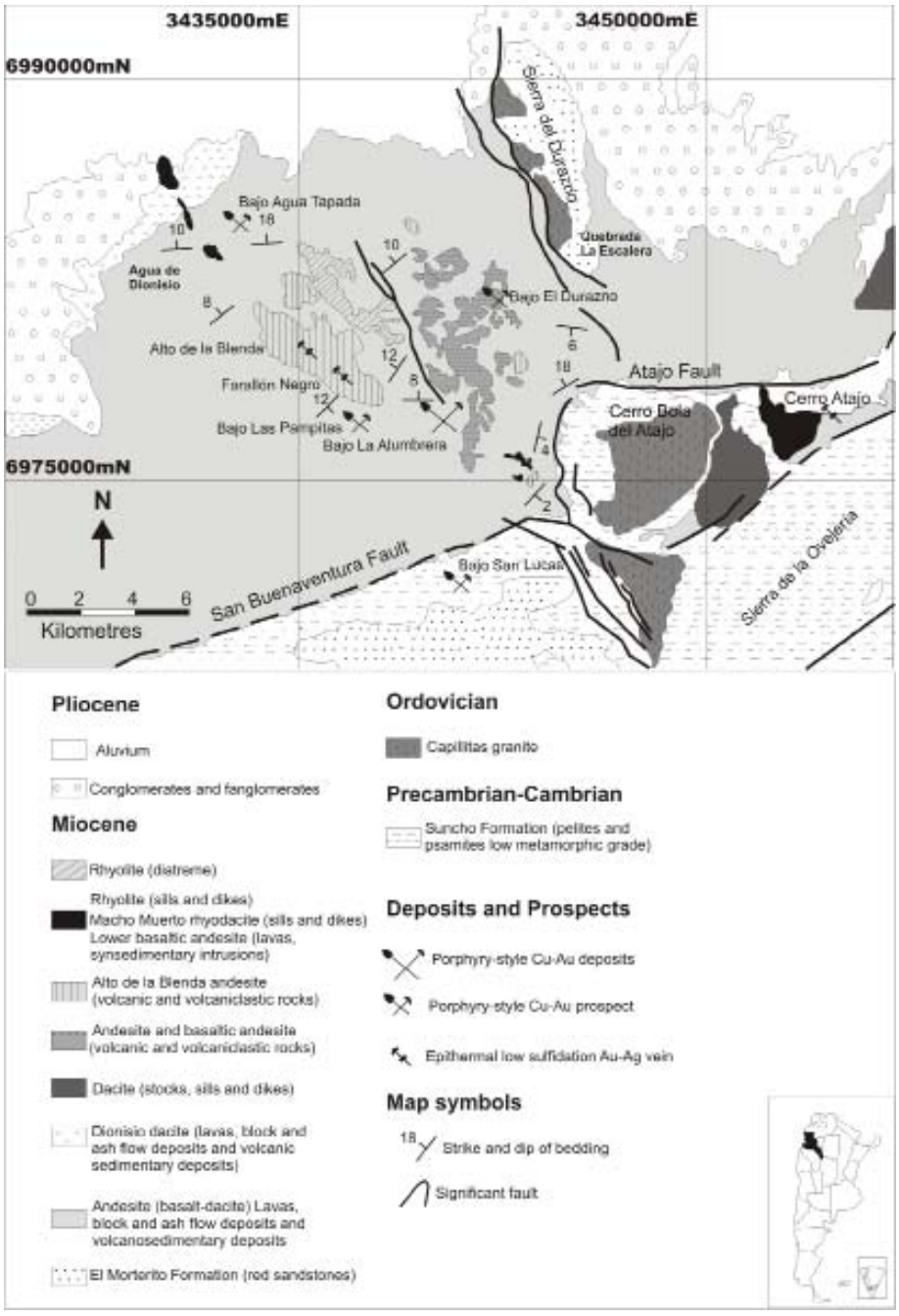

Figure 4: Geological map of the Farallón Negro district in north-western Argentina (modified after Harris et al. 2004 and 2006) showing the location of major porphyry deposits, epithermal veins, and diatremes.

Deseado Massif

The Deseado Massif is composed of Proterozoic metamorphic basement rocks (phyllites) which are unconformably overlain by Lower Cambrian and Upper Silurian metamorphic rocks. Early Permian-Late Triassic continental sedimentary rocks and Triassic – Lower Jurassic granitoids and subvolcanic rocks overlay Neo-Jurassic to Cretaceous basalts and andesites. The Jurassic is characterized by acid volcanism, ignimbrites, rhyolites and rhyo-dacites and tuffs. Overlying the Jurassic stratigraphy are Cenozoic basalts and marine and continental Tertiary rocks. Structurally, the Deseado Massif represents a horst- and graben-setting in a Paleozoic basin. During the Jurassic, extension was simultaneous with volcanism which was centered on the down-dropped blocks.

The Deseado Massif is characterized by low-sulfidation Au-Ag mineralization in the Late Jurassic but, significantly, post-Jurassic volcanism. Gold mineralization is dominantly composed of multi-stage fracture filling, locally stockwork and disseminated. Hydrothermal veins display crustiform-colloform textures and consist of quartz and chalcedony, minor barite, calcite besides ore minerals including native gold, electrum, native silver, argentite, minor tetrahedrite, galena, sphalerite, chalcopyrite, silver sulfosalts and gold tellurides (Schalamuk et al., 1997). The most important hydrothermal alteration types are silicification, although argillization, sericitization and propylitization are also recorded. The latter is the most common alteration type in basaltic and andesitic host rocks of the Bajo Pobre Formation (Schalamuk et al., 1997). Based on a comprehensive review on the metallic association, Fernandez et al. (2008) suggested that deposits related to Jurassic volcanism in Patagonia, including those in the Deseado Massif, can be divided into: (a) Au-Ag and Ag>Au, (b) polymetallic with Ag-Au or only Ag, and (c) complex polymetallic mineralization with Ag-Au. The largest deposit in the Deseado Massif is Cerro Vanguardia with a reserve of 2.4 Moz Au, resource of 3.6 Moz Au and average grade of 10 g/t Au and 120 g/t Ag (Schalamuk et al., 1997).

SYNTHESIS OF DIVERSE GOLD SYSTEMS IN ARGENTINA

Time epochs and geological provinces

Significant time epochs that lead to major gold systems in Argentina are: (1) Ordo-

vician with turbidite-hosted orogenic gold mineralization (e.g., Incahuasi in the Puna Austral), (2) Devonian with granite-gneiss-hosted mesozonal orogenic gold mineralization (e.g., Candelaria in the Sierras Pampeanas), (3) Jurassic with epithermal low-sulfidation Au-Ag mineralization (e.g., Cerro Vanguardia in the Deseado Massif), (4) Permian-Triassic with epithermal low-sulfidation Au-Ag mineralization (e.g., Casposo in the Cordillera Frontal), and (5) Miocene with porphyry Au-Cu mineralization (e.g., Bajo de la Alumbrera, Agua Rica in the Sierras Pampeanas, Lindero in the Puna or San Jorge in the Cordillera Frontal), possible skarn mineralization (e.g., Gualcamayo in the Precordillera), epithermal high-sulfidation Au mineralization (e.g., Veladero in the Cordillera Real), and low-sulfidation epithermal Au mineralization (e.g., Farallón Negro in the Sierras Pampeanas). Most of the porphyry-type gold mineralization in Argentina is linked to the same Miocene magmatic periods that control skarn gold and epithermal high-sulfidation style gold mineralization. The epithermal low-sulfidation style mineralization in the Permian-Triassic time period is not yet well established.

Argentina contains a range of diverse gold systems that are located in distinct geological provinces (Fig. 1). Au-rich porphyry deposits or advanced prospects, are known in the Sierra Pampeanas (e.g., Bajo de la Alumbrera), Cordillera Frontal (e.g., Taca Taca), and Cordillera Principal (e.g., San Jorge) but operating mines are surprisingly rare with the exception of the world class Bajo de la Alumbrera porphyry Au-Cu deposit (Fig. 3). Au-skarn deposits are rare with the only operating mine being the Gualcamayo Au deposit in the Cordillera Principal (Fig. 3). Low-sulfidation type gold mineralization is mainly located in the Deseado Massif (e.g., Cerro Vanguardia), Sierras Pameanas (e.g., Farallon Negro) and Cordillera Frontal (e.g., Casposo). In the past 15 years, models for porphyry/epithermal gold mineralization in the Miocene of the central Andean ore districts (e.g., the Maricunga Au-Ag belt in Chile and El Indio-Pascua Au belt in the border region of Chile and Argentina) and the Farallón Negro Au-Ag-Cu volcanic complex in Argentina have been linked to shallow dipping subduction zones and associated oxidized, hydrous, possibly mantle-related magmas, in a thickened crust near the end or at the beginning of a volcanic episode (Kay and Mpodozis, 2001). However, as pointed out by, e.g., Bissig et al. (2001) and Shatwell (2004), this model cannot be universally applied to Miocene gold mineralization in the Andes. For example, gold mineralization in the Maricunga Au-Ag belt predates the shallowing subduction zone by 5 to 10 million years, and therefore cannot be linked to the same geodynamic processes as the other mineral districts. Amongst others Bissig et al. (2001) proposed a link between locally generated dacitic magmas, with little or no mantle input, and gold-silver mineralization in the El Indio-Pascua belt.

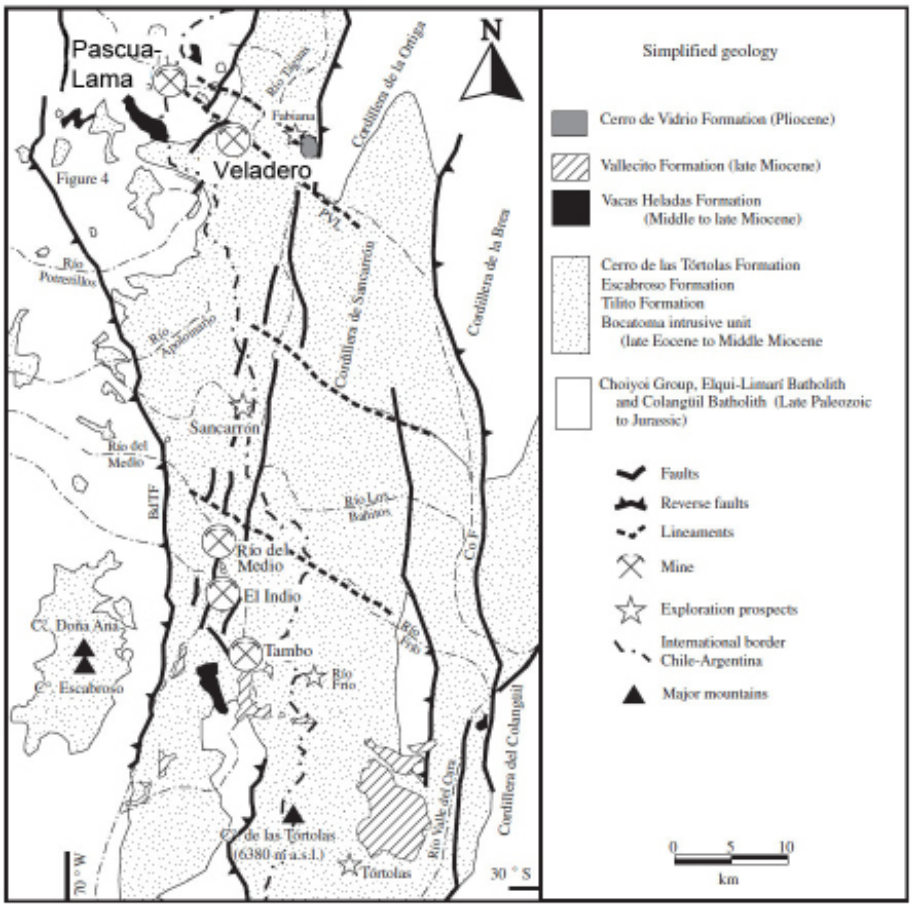

Figure 5: Regional geology of the El Indio-Pascua belt and location of major mines, modified from Bissig et al. (2001). BdT = Baños del Toro fault, CoF = Colangüil fault, PVL = Pascua-Veladero lineament.

Orogenic gold systems

Orogenic gold systems are not well known in the Andean countries of South America in general, and in Argentina in particular. Skirrow et al. (2000) published the first comprehensive study on orogenic gold systems in the Sierras Pampeanas, within the Córdoba, San Luis and La Rioja provinces. These results were the outcome of a joint investigation between the Geoscience Australia (formerly Australian Geological Survey Organisation) and the Servicio Geologico Minero Argentino (SEGEMAR) in the period 1995-1997. Skirrow et al. (2000) defined a Devonian metallogenic epoch that is temporally and spatially related to the Achalian orogeny and commenced during a period of emplacement of peraluminous to metaluminous granites between 403±6 and 382±6 Ma. Orogenic gold mineralization is localized in transcurrent and reverse fault and shear zones that host complex and deformed quartz vein systems. Host rocks to mineralization vary from gneiss, mylonite, granodiorite to granite. Veins contain mainly gold, pyrite, sphalerite, galena, chalcopyrite, arsenopyrite, hematite and are surrounded by variably intense alteration zones of proximal sericite and distal chlorite and carbonate±hematite±sericite. Fluid inclusion trapping temperatures indicate mesozonal mineralization temperatures between 260° to 370°C. Based on oxygen and hydrogen isotope values from gold-related hydrothermal quartz, sericite, and chlorite Skirrow et al. (2000) interpret the ore fluids to be meteoric water that reacted with metasedimentary rock or felsic magmatic fluids or both.

Rodriguez and Bierlein (2005) classified the Minas Azules deposit in Jujuy province, northwestern Argentina, as an example of Ordovician turbidite-hosted orogenic gold deposit. This fold-thrust belt-hosted, structurally-controlled quartz reef-style mi-

neralization is widespread in the Sierra de la Rinconada (e.g., the Minas Azules, Rinconada, Fig. 7) and has been described previously by Segal et al. (1997) and Zappettini and Segal (1999). Host rock, deformation, structural control and the mineralization style of these deposits are similar to gold deposits in the western Lachlan fold belt in Victoria Australia (e.g., Cox et al., 1991; Foster and Gray, 2000) or the metasedimentary-hosted New Holland deposit in the Yilgarn craton of Western Australia (Ackroyd et al., 2001). Recently, Hagemann and Fogliata (2010) classified the Incahuasi gold deposit, at the border of the Catamarca and Salta provinces, as a turbidite-hosted, structurally-controlled orogenic gold deposit, thereby extending this style of orogenic gold mineralization 300 km further to the south. The granitoid-hosted Culampajá gold deposits in the Sierras Pampeanas are located entirely in granitoids and, therefore, may be an example of an intrusion-related gold system (Hagemann and Fogliata, 2010).

In summary, orogenic gold deposits in Argentina are of two types: (1) Ordovician turbidite-hosted mesozonal, and (2) Devonian granitoid-gneiss-hosted mesozonal. Both were formed during the compressional phase, late in the orogeny. These deposits form part of the South American orogenic gold belt that stretches from central Argentina to northern Perú, and perhaps even to northern Colombia (Haeberlin et al., 2002; Witt et al., 2009; Hagemann and Fogliata, 2010).

CONCLUSIONS AND OUTLOOK

Argentina is an emerging exploration and mining country in South America. Unlike its neighbours Brazil, Chile and Perú it did not experience the intense exploration activity during the gold boom periods in the 1980's and 1990's and mid 2000. This makes it an ideal country to invest in exploration and mining, which is reflected in the significant increase in major and junior companies now actively exploring and mining for a variety of different gold systems. The world-class Bajo de la Alumbrera porphyry Cu-Au and the giant Veladero epithermal high-sulfidation Au deposits are evidence that the geological potential for significant gold mineralization is enormous. Low sulfidation style Au-Ag deposits formed during three different time period indicating that the potential for gold mineralization is not confined to one single time period, rather spans the Jurassic to Miocene, a 500 Ma golden time window for epithermal and, by extension, porphyry/skarn-type Au mineralization. New concepts, such as the existence of an orogenic gold belt in the eastern part of the Andes, may provide completely new targets for exploration and mining.

Academic research on the different gold systems and styles of gold mineralization throughout Argentina is currently limited, therefore, significant opportunities and synergies exist for both industry and academia in unravelling the location and characteristics of further significant gold systems.

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REFERENCES

Ackroyd, B.J., Hagemann, S.G., Neumayr,

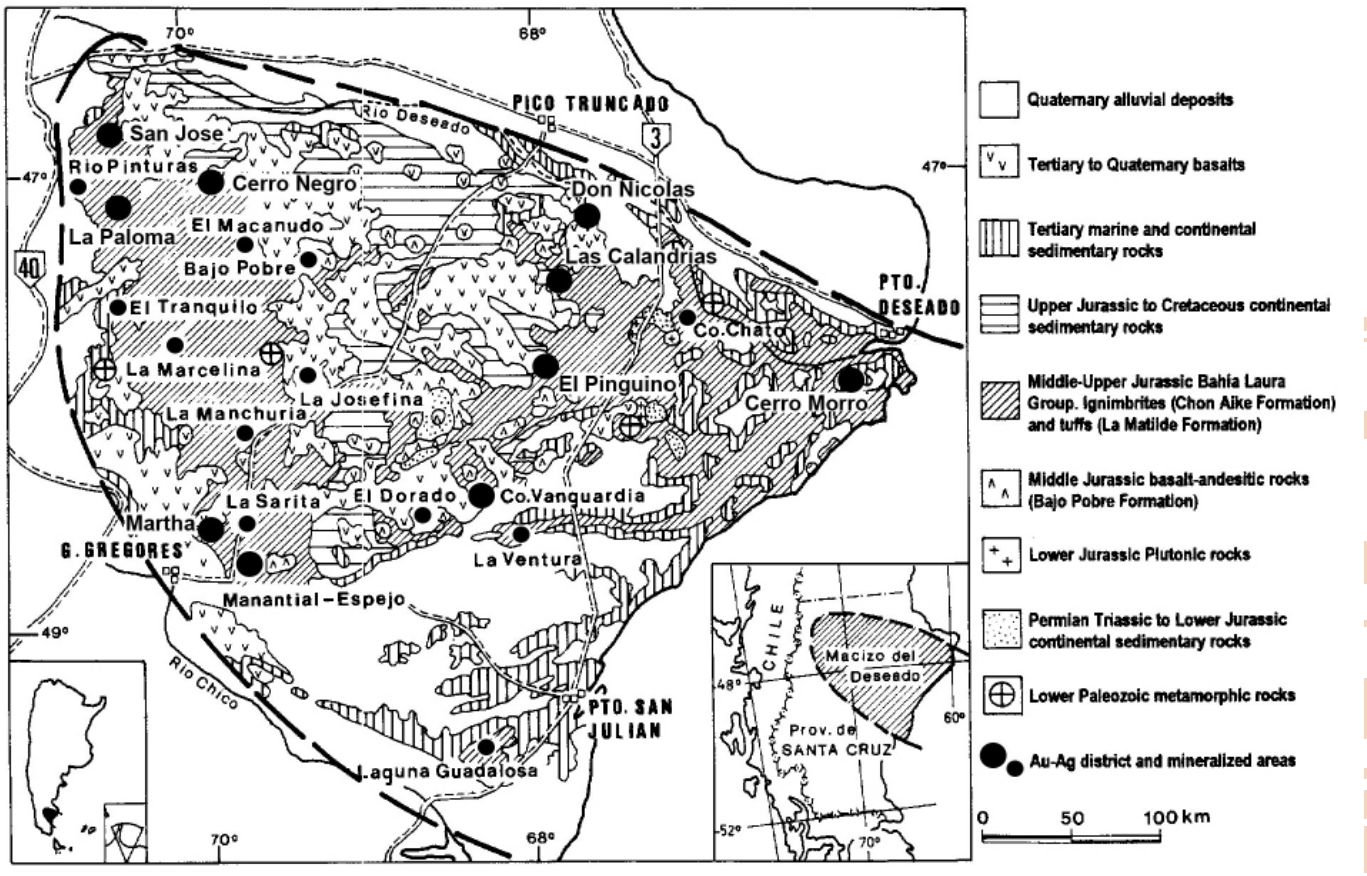

Figure 6: Generalized geological map of the Deseado Massif in Patagonia displaying significant low sulfidation epithermal deposits and exploration areas (modified from Schalamuk et al., 1997).

P., Ingle, L.J., Inwood, N.A., and Smolonogov, S., 2001, Hydrothermal alteration and gold mineralization at the sandstone-hosted New Holland gold deposit, Agnew-Lawlers gold camp, Western Australia: in Hagemann, S.G., Neumayr, P., Witt, W., (eds), Gold camps in the Norseman-Wiluna belt, Yilgarn craton, Western Australia: Geological Survey of Western Australia, p. 99-126.

Andean Resources, 2010: http://www.andean.com.au/

Barrick Gold Corporation website: http://www.barrick.com

Bissig, T., Clark, A. H., Lee, J. K. W and Von Quadt, A., 2001, Petrogenetic and metallogenetic responces to Miocene slab flattening: new constraints from the El Indio-Pascua Au-Ag-Cu belt, Chile/ Argentina: Mineralium Deposita, v. 38, p. 844-862.

Bissig, T., Clark, A.H., and Lee, J.K.W., 2002, Miocene landscape evolution and geomorphologic controls on epithermal processes in the El Indio-Pascua Au-Ag-Cu belt, Chile and Argentina: Economic Geology, vol. 97, pp. 971-996.

Charchaflie, D., Tosdal, R.M., and Mortensen, K., 2007, Geologic Framework of the Veladero high-sulfidation epithermal deposit area, Cordillera Frontal, Argentina: Economic Geology, vol. 102, no 2, p. 171-192.

Cox, S. F., Wall, V. J., Etheridge, M. A., and Potter, T. F., 1991, Deformational and metamorphic processes in the formation of mesothermal vein-hosted gold deposits—examples from the Lachlan fold belt in central Victoria, Australia: Ore Geology Reviews, v. 6, p. 391–423.

Chouinard, A., Williams-Jones, A.E., Leonardson, R.W., Hodgson, C.J., Silva, P., Téllez, C., Vega, J., and Rojas, F., 2005, Geology and genesis of the multi-stage high sulfidation epithermal Pascua Au-Ag-Cu deposit, Chile and Argentina: Economic Geology, v.100, p. 463-490.

Deyell, C.L., Bissig, T., and Rye, R.O., 2004, Isotopic evidence for magmatic-dominated epithermal processes in the El indio-Pascua Au-Cu-Ag belt and relationship to geomorphologic setting: economic Geology, Special Publiscation 11, p. 55-73.

Extorre Gold Mines, 2010, http://www.extorre.com.

Fernándes, R.R., Blesa, A., Moreira, P., Echeveste, H., Mykietiuk, K., Andrada de Palomera, P., Tessone, M., 2008, Los depósitos de oro y plata vinculados al magmatismo Jurásico de la Patagonia: revisión y perspectivas para la exploración: Revista de la Asociación Geológica Argentina 63 (4): 665-681.

Foster, D.Fernández, R. R., Blesa, A., Moreira, P., Echebeste, H., Mykietuiuk, K., Andrada de Palomera, P. y Tessone, M., 2008, Los depósitos de oro y plata vinculados al magmatismo Jurásico de la Patagonia: revisión y perspectivas para la exploración: Revista de la Asociación Geológica Argentina, v. 63 (4), p. 665-681.

Foster, D. A., and Gray, D. R., 2000, Evolution and structure of the Lachland Fold belt (orogen) of Eastern Australia: Annual Review of Earth and Planetary Science, v. 28, p. 47-80.

Hagemann, S.G., and Fogliata, A. S., in press, Gold districts in the Austral Puna and northern Sierra de Pampeanas, Argentina: orogenic and/or (reduced?) Paleozoic intrusion-related types of gold mineralization?: Bi-annual SEG meeting in Denver 2010, abstract volume.

Harris, A. C., Allen, C. M., Bryan, S. E., Campbell, I. H., Holcombe, R. J., and Palin, J. M., 2004, ELA-ICP-MS U-Pb zircon geochronology of regional volcanism hosting the Bajo de la Alumbrera Cu-Au deposit: implication for porphyry-related mineralization: Mineralium Deposita, v. 39, p. 46-67.

Harris, A.C., Golding, S.D., White, N.C., 2005, The genesis of Baja de la Alumbrera deposit: stable isotope evidence for a porphyry-related hydrothermal system

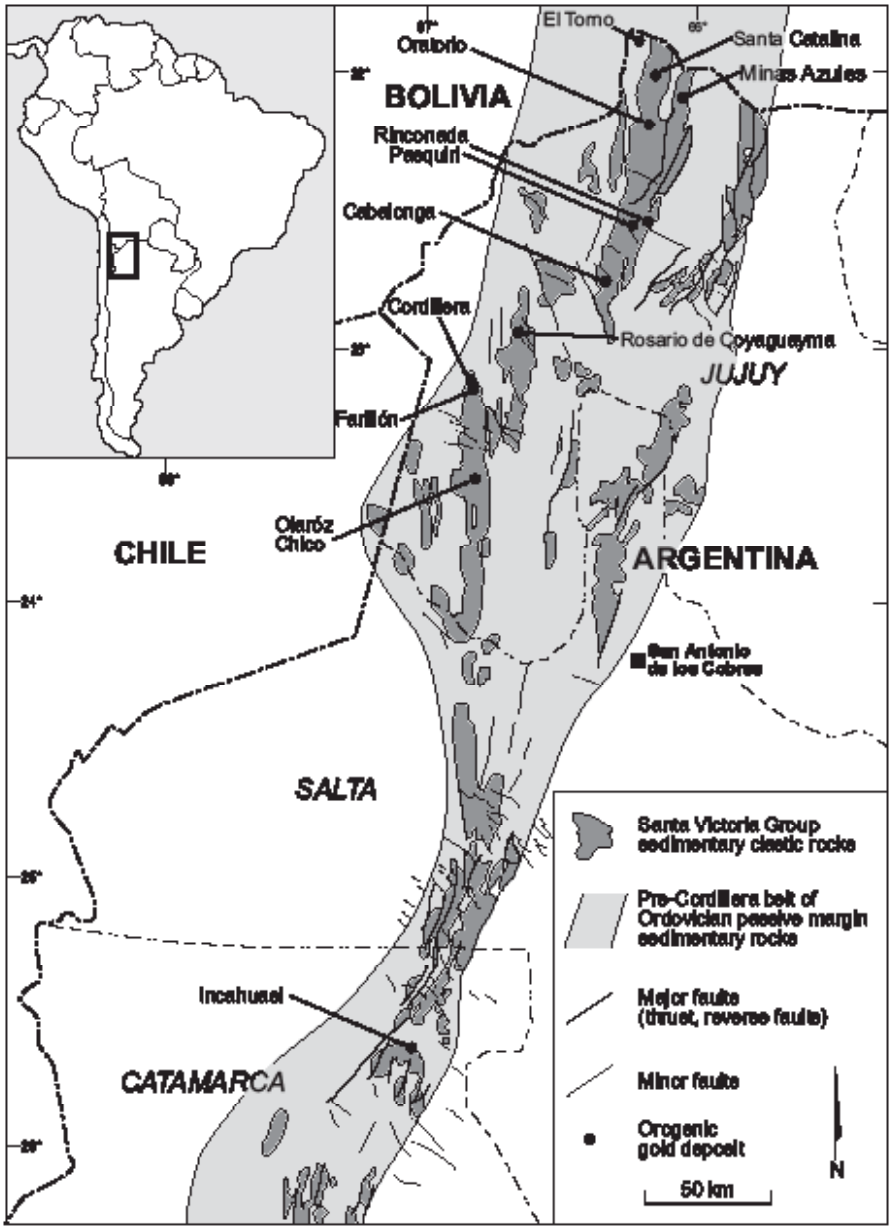

Figure 7: Distribution of the Ordovician Santa Victoria Group sedimentary rocks in the north-western part of Argentina, which host turbidite-hosted orogenic gold style mineralization. The Incahuasi deposit is located in the northern part of the Catamarca province (map modified from Cardero Resources).

dominated by magmatic aqueous fluids. Economic Geology, vol. 101, p. 71-94.

Harris, A. C., Dunlap, W. J., Reiners, P. W., Allen, C. M., Cooke, D. R., White, N. C., Campbell, I. H. And Golding, S.D., 2008, Multimillion year thermal hystory of the porphyry copper deposit: application of U-Pb, 40Ar/39Ar and (U-Th)/He chronometers, Bajo de la Alumbrera cpper-gold deposit, Argentina: Mineralium Deposita, v. 43, p. 295-314.

Haeberlin, Y., Moritz, R. and Fomboté, L., 2002, Paleozoic orogenic gold deposits in the eastern Central Andes and its foreland, South America: Ore Geology Reviews, v. 22, p. 41-59.

Kay S.M., Mpodozis C., Ramos V.A., and Munizaga, F., 1991, Magma source variations for mid-late Tertiary magmatic rocks associated with a shallowing subduction zone and a thickening crust in the central Andes, in Harmon R.S., and Rapela, C. (eds), Andean magmatism and its tectonic setting, Geological Society of America Special Paper 265, Littleton, Colorado, p. 113–137.

Kay S. M., Mpodozis, C., and Coira, C., 1999, Neogene magmatism, tectonism and mineral deposits of the Central Andes, in Skinner B. J., (ed), Geology and ore deposits of the central Andes, Society of Economic Geologists Special Publication No 7, College Station, Texas, p. 27–59.

Kay S. M., and Mpodozis, C., 2001, Central Andean ore deposits linked to evolving shallow subduction systems and thickening crust, GSA Today, Geological Society America 11(3), p. 4–9.

Llambías, E. 1972, Estructura del Grupo Volcánico de Farallón Negro, provincia de Catamarca, República Argentina: Revista de la Asociación Geológica Argentina, v. 27, p. 161 – 196.

Malvicini, L. y Llambias, E., 1963, Mineralogía y origen de los minerales de manganeso y sus asociados en Farallón Negro, Alto de la Blenda y Los Viscos, Hualfín, provincia de Catamarca: Revista de la Asociación Geológica Argentina v. 18, p. 177 – 179.

Martínez, F., 2009, Estudio geológico de la veta Farallón Negro Rama Norte, Farallón Negro, provincia de Catamarca: Tesis de Grado, Facultad de Ciencias Naturales e Instituto Miguel Lillo, Universidad Nacional de Tucumán: Inédito, 85 p.

Proffett, J. M., 2003, Geology of the Bajo de la Alumbrera porphyry copper-gold deposit, Argentina: Economic Geology, v. 98, p. 1535-1574.

Ramos, V., 1999, Las provincias geológicas del territorio argentino. En: Caminos, R. (Ed.): Geología Argentina, Instituto de Geología y Recursos Minerales, Servicio geológico Minero Argentino, Anales 29: 41-96, Buenos Aires.

Rodríguez, G. A. and Bierlein, F. P., 2002, The minas Azules deposit-an example of orogenic lod gold mineralization in the Sierra de Rinconada, Northern Argentina: International Geology Review, v. 44, p. 1053-1067.

Rolleri, E.O., 1976, Sistema de San Barbara, 6th Congress Geologico Argentino, Actas 2: 240-255.

Segal, S. J., Zappettini, E., and Craig, J. R., 1997, Metalogénesis del oro en la sierra de Rinconada: Serie de contribuciones técnicas, Recursos Minerales No. 2, Servicio Geológico Minero Argentino, p. 6–31.

Schalamuk, I. B., Zubia, M., Genini, A. And Fernández, R. R., 1997, Jurassic epithermal Au-Ag deposits of Argentina: Ore Geology Reviews, v.12, p 173-186.

Shatwell, D., 2004, Subducted ridges, magmas, differential uplift, and gold deposits: examples for South and Central América: The Ishishara Symposium: Granites and associated Metallogenesis: Geoscience Australia, p. 1-59.

Skirrow, R. G., Camacho, A., Lyons, P., Pieters, P. E., Sims, J. P., Stuart-Smith, P. G. And Miró, R. , 2000, Metallogeny of the southern Sierras Pampeanas, Argentina: geological, 40Ar-39Ar dating and stable isotope evidence for Devonian Au, Ag-Pb-Zn and W ore formation: Ore Geology Review, v. 17, p. 39-81.

Skirrow, R.G., Camacho, A., Lyons, P., Pieters, P.E., Sims, J.P., Stuart-Smith, P.G., Miro, R., 2000, Metallogeny of the southern Sierras Pampeanas, Argentina: geological, 40Ar – 39Ar dating and stable isotope evidence for Devonian Au, Ag – Pb –Zn and W ore formation, Ore Geol. Rev. 17, 39– 81.

Silver Standard Technical Report, 2009: Silver Standard website: http://www.silver-standard.com

Troy Resources, Nov. 2010: http://www.troyresources.com

USGS, 2008: http://minerals.usgs.gov/minerals/pubs/country/sa.html#ar

Ulrich, T. and Heinrich, C. A., 2002, Geology and alteration geochemistry of the porphyry Cu-Au deposit at Bajo de la Alumbrera, Argentina: Economic Geology, v. 97, p. 1865-1888.

Witt, W.K., Hagemann, S.G., Villanes, C., and Ojala, J., submitted, Late Carboniferous orogenic and Cenozoic porphyry-related gold mineralization in the Pataz gold mining district, Peru: Economic Geology.

Zappettini, E. O. and Segal, S. J., 1999, Los depósitos auríferos vetiformes de la sierra de Rinconada, Jujuy, En: Recursos Minerales de la República Argentina (Ed. Zappetttini, E. O.): Instituto de Geología y recursos Minerales SEGEMAR, Anales 35, p. 507-514.

Zappettini, E. O., 1999, Recursos Minerales de la República Argentina (Ed. Zappettini, E. O.): Servicio geológico Minero Argentino, Subsecretaría de Minería de la Nación, Instituto de Recursos Minerales, v. 1 y 2, 2172 p.

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- facilitate the interchange of ideas, knowledge, experience and research interests
- allow the development of field trips, short courses, regional student meetings, conferences and seminars
- opportunity to establish research collaboration, including scholarship exchange and advancement of careers
- enhance opportunities to visit ore deposits and metallogenic districts
- allow individuals in universities without Chapters to be part of and benefit from other members of the network
- individual Chapters are connected in their region

SGA at IMA2010 in Budapest

Hartwig Frimmel
SGA Promotion Manager (hartwig.frimmel@uni-wuerzburg.de)

While the really big events on SGA's conference calendar, the Biennial SGA Meetings, take place every odd year, one might be lulled into the thought that the even years are dull interludes. To prove the opposite, SGA was involved in a series of other activities one of which was this year's 20th General Meeting of the International Mineralogical Association. The IMA General Meetings are held every four years and this year it was Hungary's turn. From 21-27th August, more than 1800 delegates from 74 countries gathered in Budapest to present over 1600 papers or posters. The impressive number of 81 scientific sessions covered a huge diversity of fields, ranging from high-pressure experiments to clay science, from environmental applications to teaching, from mining to atomic structures.

Economic Geology played a remarkably big role in the scientific programme. SGA as official co-sponsor of the meeting organized a Special Session on "Crustal Fluids and Gold". Gold clearly hasn't lost any of its shine as this session, chaired by Georges Beaudoin, Pasi Eilu and Hartwig Frimmel, turned out to be one of the most successful sessions of the entire meeting. Over two days, a large crowd followed a series of talks that covered various genetic aspects of sediment-hosted, epithermal, orogenic, intrusion-and VMS-related gold deposits, regional case studies and new insights in the analyses of fluid inclusions associated with gold mineralization. The 21 talks were supplemented by 12 posters, one of which, the poster by Edina Szappanosné-Vágó et al. on "Fluid inclusion investigation and Re-Os dating of the Pataz-Parcoy intrusion-hosted gold deposits, Eastern Cordillera, Peru", won an EMU prize. Highlights were the keynote talk by Robert Moritz, who gave an overview on "Gold deposits along the Tethys belt: products of diverse tectonic and magmatic settings", and the invited lectures by Ross Large on "Genesis of sediment-hosted Au-As deposits: a two-stage process of early syngenetic gold followed by later epigenetic upgrading" as well as by Poul Emsbo on "Gold in Sedimentary Basins: Role of Reduced Basinal Brines and Hydrocarbons".

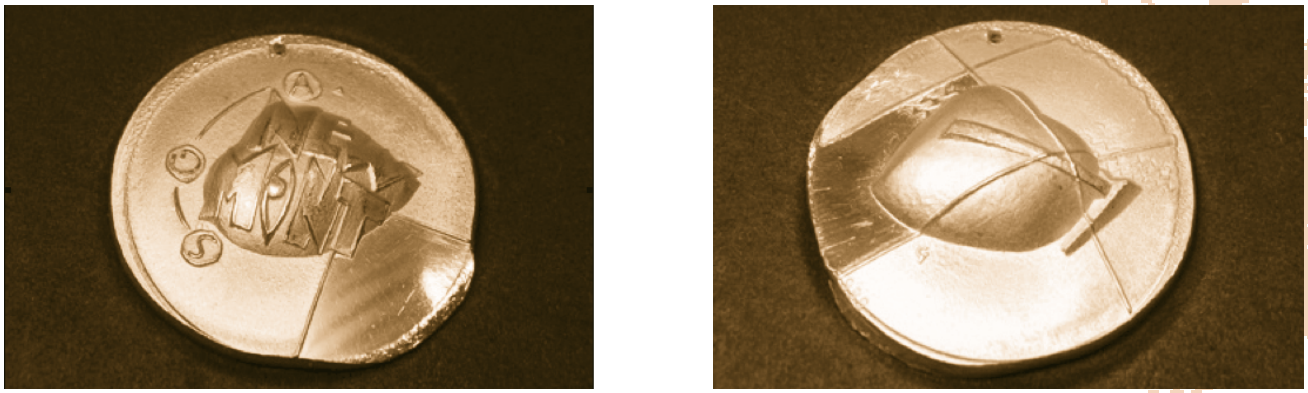
The SGA Gold Session was also used as a platform for a get-together of participants in the IGCP Project 540 on gold and fluid inclusions under the leadership of Paolo Garofalo from the University of Bologna. A total of 11 contributions were presented within the framework of this IGCP project.

Call for SGA award nominations

Dave Huston
Chair SGA Award Committee, Geoscience Australia (David.Huston@ga.gov.au)

At Antofagasta 2011, the Society for Geology Applied to Mineral Deposits will recognise the achievements of two scientists for geological research applied to mineral deposits. The SGA-Barrick Young Scientist Award, which recognises scientists at the beginning of their careers, consists of a citation, prize money of EUR1500 and travel to Antofagasta 2011. Previous award winners have included Noreen Vielreicher (2003), Alexandre Raphael Cabral (2005), Gilles Levresse (2007) and David Holwell (2009).

The SGA-Barrick Young Scientist Award is based mostly upon senior-authored papers published early in the candidate's career. To be eligible for this award, the awardee must be less than 40 years on 01 January 2011 (i.e. born after 01 January 1971). Eligibility is not restricted by the candidate's nationality, place of employment, or membership in the Society. Nomination forms can be downloaded from the Society's web site (e-sga.org/index.php?id=111). Nominations should include a biographical summary of the candidate, a list of publications upon which the award is based, a statement explaining the significance of the research, other scientific contributions and accomplishments and the name and contact details of the nominator. In addition, copies of abstracts for most important (maximum five) papers upon which the nomination is based should be attached to the application.



The SGA-Newmont Gold Medal

The SGA-Newmont Gold Medal recognises the career of the awardee involving "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, a 999.99 fine gold medal, and travel to Antofagasta 2011. Previous medallists include Zdenek Johan (2007) and Shunso Ishihara (2009).

The SGA-Newmont Gold Medal is based upon career accomplishments. It must be stressed that published scientific research is only one measure; other measures include leadership, both in research and in industry; success in exploration or mining geology; and service to SGA and like organisations. The award covers all aspects of research applied to mineral deposits, from field geology and mineral exploration, through development of analytical techniques, ore system models and metallogeny, and to the management of research and exploration projects and institutions. Eligibility is not restricted by the candidate's nationality, place of employment, or membership in the Society, and nomination forms can be downloaded from the Society's web site (e-sga.org/index.php?id=133). Nominations must include the name and address of the candidate as well as a summary of the candidates education, significant accomplishments and publications, and the name and address of the nominator.

For both awards, letters of support from three SGA members are required. All nomination forms and letters should be sent to the SGA Executive Secretary with a copy to the Chairman of the Awards Committee, whose addresses can be found on the nomination form.

All nominations and letters of support (either digital or hard copy) must be received by 31 March 2011.

11th International Platinum Symposium Meeting Report

Michael Lesher and Pedro Jugo
Laurentian University

Every 4 years or so since 1970 academic researchers, government geologists, and industry geologists have gathered together to discuss current research on the geology, mineralogy, geochemistry, and origin of platinum group element (PGE) and nickel-copper-(PGE) deposits. Past meetings have been held in Melbourne (Australia), Denver and Billings (USA), Pretoria and Rustenberg (South Africa), Toronto (Ontario), Espoo and Oulu (Finland), Perth (Western Australia), and Moscow (Russia).

The 11th IPS was in June 2010 on the Laurentian University campus in Sudbury, Ontario and was attended by 295 participants (244 professionals and 51 students) from 26 countries, including Albania, Australia, Austria, Belgium, Brazil, Canada, Chile, China, Egypt, Finland, France, Germany, Hungary, Japan, Morocco, New Zealand, People's Republic of China, Romania, Russia, South Africa, Spain, Netherlands, Turkey, United Kingdom, USA, and Zimbabwe. The meeting included:

Three pre-meeting workshops: PGE in Mantle Melts organized by Steve Barnes (CSIRO) and Marco Fiorentini (U Western Australia), PGE-Chromite Connection organized by Jim Mungall (U Toronto), and Layered Intrusions organized by Jim Miller (U Minnesota-Duluth) and James Scoates (UBC).

Three and a half days of technical sessions, including 86 morning-afternoon oral presentations and 57 late-afternoon poster presentations: PGE Deposits organized by Dave Peck (Consultant) and Gordon Chunnett (U Witwatersrand), Ni-Cu-(PGE) Deposits organized by Michael Lesher (LU) and Peter Lightfoot (Vale), PGE Geochemistry organized by Sarah-Jane Barnes and James Brenan (U Toronto), and PGE Mineralogy and Beneficiation organized by Michelle Huminicki (Brandon U) and Paul Sylvester (Memorial U). The meeting was opened by Christine Kaszycki (Ontario Assistant Deputy Minister of Mines and Minerals) and keynote speakers included Tony Naldrett (U Toronto/U Witwatersrand), Jean-Pierre Lorand (CNRS-Paris), Ed Ripley (Indiana U), and Louis Cabri (Consultant). Ray Goldie (Salman Partners) gave an evening public lecture. The meeting was dedicated in honour of Reid Keays, who co-organized the first IPS in Melbourne and who has been a world leader in PGE research.

Nine pre- and post-meeting field trips organized by Michael Easton (OGS) and Dave King (Quadra-FNX): Levack Mine and North Range SIC led by Steve Dunlop, Steven Gregory, and Renée Parry (Quadra-FNX) and Walter Peredery (Consultant), McCreedy West Mine and North Range SIC led by Roger Lichty, Mynyr Hoxha, and Thomas Maxwell (Quadra-FNX) and Walter Peredery (Consultant), Podolsky Mine and Whistle Offset led by Judd Fee and Chelsey Protulipac (Quadra-FNX), Sudbury Footwall Deposits planned by Jake Hanley (St Mary's) and led by Mike Sweeny (Xstrata) and Attila Péntak (Wallbridge), Sudbury Contact and Offset Deposits led by Paul Golightly (Consultant) and Ed Pattison (Consultant), Abitibi Komatiites and Ni-Cu-(PGE) Mineralization led by Michel Houlé (GSC), Sonia Préfontaine (OGS), and Brian Atkinson (OGS), Lake Superior Ni-Cu-(PGE) and PGE-(Cu)-(Ni) led by Jim Miller (U Minnesota-Duluth) and Mark Smyk (OGS), and River Valley PGE-Cu-Ni led by Mike Easton (OGS), Richard James (LU), and Scott Jobin-Bevans (Caracle Creek).

Three laboratory tours: Ontario Geoscience Laboratories led by Ed Debicki and Marcus Burnam (OGL), MIRARCo 3D Virtual Reality Theatre led by Bob Anderson and Pavel Vasak (MIRARCo), and the LU LA-ICP-MS Geochemical Fingerprinting Laboratory led by Balz Kamber and Thomas Ulrich (LU), and the Xstrata Process Support facility led by Lori Kormos.

The meeting was hosted by the Mineral Exploration Research Centre and Department of Earth Sciences at Laurentian University and the Ontario Geological Survey, and was sponsored by Quadra-FNX and Stillwater Mining Company (Platinum Level), the Mineral Exploration Research

Centre and Sudbury Geological Discussion Group (Rhodium Level), Marathon PGM, Mineralogical Association of Canada, Society for Geology Applied to Mineral Deposits, and the City of Greater Sudbury (Iridium Level), the Mineral Deposits Division of the Geological Association of Canada (Osmium Level), and the Society of Economic Geologists and Stillwater Mining Company (Palladium Level).

Readers interested in receiving information about future PGE and Ni-Cu-(PGE) meetings should contact Sarah-Jane Barnes (sarah-jane_barnes@uqac.ca), who manages the MAGSUL_L list server.

Ore Deposits Models and Exploration Workshop China University of Geosciences in Wuhan (CUG), May 24-29, 2010

Huashan Sun
China University of Geosciences, No. 388 Lumo Road, Wuhan, China, sunhsh@cug.edu.cn
Steven D. Scott
Department of Geology, University of Toronto, Toronto, ON, Canada, scottsd@geology.utoronto.ca

Workshop 2010 on Ore Deposits Models and Exploration, the fifth in a series stretching back to the SGA meeting in Beijing in 2005, was held May 24-29 in the Academic Exchange Center of China University of Geosciences (CUG) in Wuhan, China. The workshop was co-sponsored by the Society for Geology Applied to Mineral Deposits (SGA), Society of Economic Geologists (SEG), Asia Now Resources Corporation, China University of Geosciences (Wuhan), University of Toronto, Educational Bureau of Hubei Province, China and Wuhan Institute of Geology and Mineral Resources of the Chinese Ministry of Land and Resources. The organizing committee was led by Steve Scott, who is a long time SGA member, an Emeritus Professor at the University of Toronto in Canada and an Honorary Professor of China University of Geosciences in Beijing.

The purpose of the workshop is to introduce Chinese practicing exploration geologists and students to modern concepts in mineral exploration based on ore deposits models. The tens of thousands of present and future explorationists in China have a huge appetite for such knowledge. The instructors of the course, most of whom are SGA members, included Zhaoshan Chang, Huayong Chen and David Cooke from CODES, University of Tasmania, Australia; David Leach from the USGS in Denver, USA; Craig Hart from the University of British Columbia, Canada; Chusi Li from Indiana University, USA; Steve Scott from the University of Toronto, Canada; and Noel White and Kaihui Yang from Asia Now Resources, Toronto, Canada. Joan Scott organized the laboratory sessions and handled logistics.

The workshop covered a wide range of topics, including VMS deposits (Steve Scott), sedex and MVT deposits (David Leach, David Cooke), iron and manganese ores (Noel White), porphyry and low sulfidation epithermal deposits (David Cooke), skarn deposits and high sulfidation epithermal deposits (Zhaoshan Chang), gold ores (Craig Hart), iron oxide-copper-gold (Huayong Chen), magmatic Ni-Cu deposits (Chusi Li), the importance and application of ore deposit models to exploration (Noel White) and implication of the course for exploration in China (Kaihui Yang). The workshop featured a two-hour daily lab session with over 550 representative samples as well as maps/sections/photos from typical well-known ore districts world-wide displayed for the course participants to

From the left to the right these people are respectively:
Qidong Xu, Jianwei Li, Huayong Chen, Chusi Li, Qi Zhou, Yuansheng Du, Yuxun Zhuang, Yanxin Wang, Noel White, David Cooke, Craig Hart, Jingao Zhang, Steve Scott, Joan Scott, Yong Xu, David Leach, Changqian Ma, Chris Fozard, Xinong Xie, Tingze Lan, Junhao Wei, Huashan Sun, Xiaojun Zhang, Zhanlin Gao.

inspect. The workshop concluded with a panel discussion of questions submitted by the participants.

The workshop attracted 262 participants, including young professors and students from 5 Chinese universities, researchers from institutes of both the Chinese Academy of Sciences and the Chinese Academy of Geological Sciences and professionals from domestic government-run companies and international exploration companies. Enthusiasm prevailed throughout the course. The sample-display area was always filled with people during lab sessions and breaks. The instructors were frequently surrounded by participants, answering questions or discussing research/exploration issues.

The workshop not only taught advanced knowledge of ore deposits models and exploration but also provided a good opportunity to meet distinguished foreign experts and to learn about SGA. Thirty-three attendees applied for SGA membership. A survey at the end of the workshop showed that the vast majority of the participants were excited about learning modern ideas, meeting world experts, and having a chance to see samples from world-class deposits.

The next Ore Deposit Models and Exploration Workshop will be held in Beijing, China in the fall of 2011. It will be sponsored primarily by the China Geologic Survey with anticipated co-sponsorship by SGA, SEG, Asia Now Resources and other institutions in China. More than 200 registrants are again expected. Information about registration may be directed in Chinese or in English to Dr. Yuxun ZHUANG, Director of Regional Mapping and Training, China Geological Survey, Beijing <zyuxun@cgs.gov.cn>.

SGA at the XV Peruvian Geological Congress in Cuzco

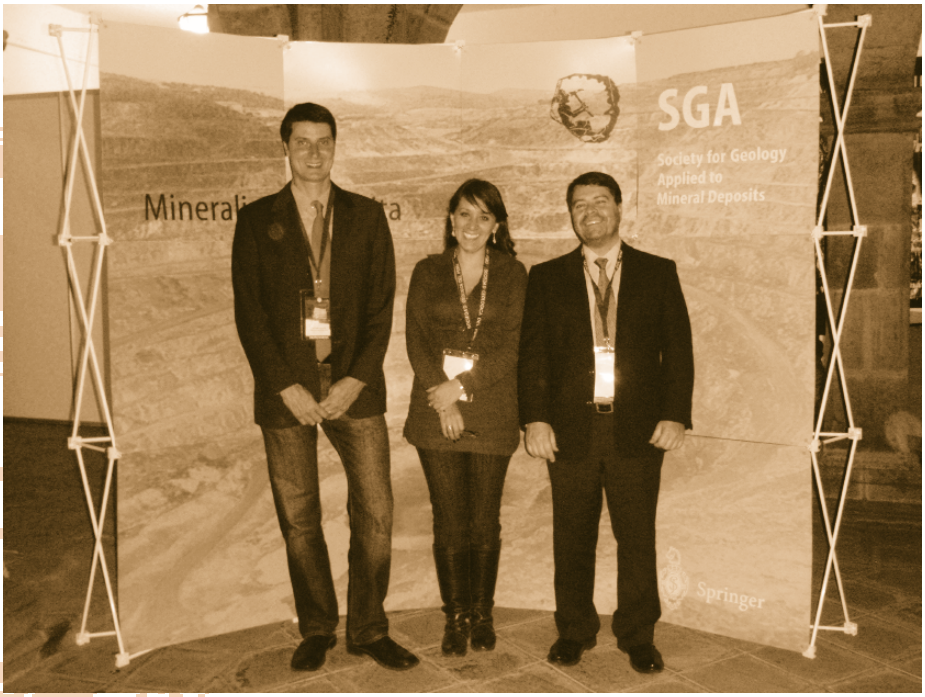
Eugenio Ferrari
SGA Regional Vice-President for South America (Eugenio.Ferrari@vmetais.com.pe)

Hosted by the Geological Society of Peru, the XV Peruvian Geological Congress was held in the, always attractive, city of Cuzco from September 27th to October 1st, 2010 under the motto "Including and Integrating Resources for the Society".

The congress was attended by approximately 1,000 participants, including 300 students from local universities.

The conference encompassed eight invited lectures, five pre and post-meeting short courses, workshops and six field visits. The scientific and technical presentations included 259 oral presentations and 68 posters.

Lectures were given by David Enfield from the National Oceanic & Atmospheric Administration, NOAA, USA (Climate Change: How safe is it? What do you portend? and What we can do?), Massimo Chiaradia from University of Geneva and representing the SGA (Magma Chemistry, Geodynamic Evolution and the Formation of Porphyry-related Deposits in the Andes), Victor Ramos from the Buenos Aires University, Argentina (Allochthonous and Parautocthonous Terranes at the Andes Basement), Enrique Diaz Martinez from the Geological and Mining Institute of Spain (Geological Heritage and Geodiversity: concepts, developments and perspective), Emilio Custodio from the Polytechnic University of Catalunia, Spain (The Relationship of Wetlands with Groundwater) and Suzanne Lacasse representing the Geotechnical Institute from Norway (Landslide Risk Assessment). Distinguished professional from the industry disserted on the following topics; Situation and Perspectives of the Energy Sector in Peru (Carlos del Solar del Solar from Hunt Oil, Peru) and Geothermal Exploration and Potential in South America (Catherine Hickson from Magma Energy Corp., Canada)



Dr. Massimo Chiaradia, Auri Morro and Eugenio Ferrari at the main hall promoting SGA activities.

Short courses and workshops addressed different aspects of the geological sciences including; Geology and Magmatic Geochemistry Applied to Porphyry and Epithermal Exploration by Miriam Mamani from the Peruvian Geological, Mining, and Metallurgical Institute (Ingemmet) and Introduction to Hydrochemistry and Environmental Isotope Designed to Knowledge and Evaluation of Groundwater by Emilio Custodio (Polytechnic University of Catalunia, Spain). In addition to the mentioned above, Dr. Enrique Diaz Martinez, from the Geological and Mining Institute of Spain (IGME), lead the Sequence Stratigraphy and Sedimentology short course.

Six interesting field trips were a key part

of the congress activities, including the visit to the Pongo de Mainique region at the Urubamba River in Cusco, lead by Hugo Valdivia (Pluspetrol), the visit to the polimetalic skarns deposits of Huanzala, Antamina and Contonga guided by Rolando Carrascal (National University of Engineering, Lima) and Jhon Espinoza (Antamina Mining Company), and the fieldtrip to the high sulphidation gold deposits of Huisamarca, Anabi, Cusco, lead by Cesar Velazco from the Aruntani Mining Company.

Massimo Chiaradia from the University of Geneva, and representing the SGA, giving his talk on Magma Chemistry, Geodynamic Evolution and the Formation of Porphyry-related Deposits in the Andes.

The SGA booth was well frequented throughout the meeting providing us an extraordinary opportunity to keep going with the diffusion campaign in progress in Peru and, in particular, to promote the upcoming 11th Biennial SGA meeting to be held in Chile next year. Results include six new members and several indication of interest to join the society.

We are grateful to the congress organizing committee to support the SGA promotional activities providing a well located stand, to Dr. José Macharé Ordoñez (congress organizing committee president), to Dr. Massimo Chiaradia for his active participation representing the SGA and to the members and volunteers that supported our booth during the conference, especially to the SGA member Ms. Auri Morro.

CHANGE OF ADDRESS FORM

If you have changed (or will change in the near future) your address please fill in this form and send it to:

SGA Treasurer's Office - c/o Sabine Lange
Rixenweg 2, D-24147 Klausdorf
GERMANY
e-mail: sabine-klausdorf@t-online.de and treasurersga@aol.com

Name _____

Old address _____

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Complete new address (including phone, fax and e-mail) _____

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"The world of crystals" Review of a scientific movie

Fernando Tornos
Fernando Tornos, Instituto Geológico y Minero de España, Madrid (Spain) (f.tornos@igme.es)

Educational films dealing with geology and ore deposits are rather uncommon in the media, where most scientific education is oriented towards biology, something that seems to be more eye-catching and attractive for the general public. This is a field in which we as geologists must give our best trying to produce attractive and scientifically coherent films that can show the world what we do and why this is interesting. This is especially true in the world of the ore deposits, where the general public sees mines as ugly, dark and dirty places with a lot of noise. Thus, a video-document such as "The mystery of the giant crystals" (http://elmisteriodeloscristalesgigantes.com) is welcome.

This video, which has been produced by a well known Spanish movie director, Javier Trueba, in collaboration with the Spanish crystallographer Juan Manuel Garcia-Ruiz (http://garciaruiz.com/) and two other scientists well-known in ore deposit research (Carlos Ayora and Angels Canals), is a major outcome for all geologists and mineralogists. The authors start with the history of the Roman city of Segóbriga in Central Spain and explain why such a city, built almost in the middle of nowhere, was so important during the first and second centuries. It had the largest mines of lapis specularis (transparent crystals of gypsum) of the whole empire and it only declined when the fabrication of flat glass became commercially available after the first century BC. With this attractive beginning, the authors describe the giant gypsum crystals found in vugs in porphyry copper and epithermal deposits, such as El Teniente and Naica. These crystals can be up to almost 12 meter long and one meter wide. Using a simple language, they describe how they worked – perhaps in somewhat novelistic fashion, attractive for the general public – and the techniques used for determining the origin of the gypsum, its temperature of formation and the nature of the fluids from which it has precipitated. Their final conclusion is that the crystals grew slowly from hot meteoric water that was supersaturated in gypsum due to the dissolution of abundant anhydrite located underneath in the magmatic-hydrothermal systems. The film ends with a call for the preservation of these localities, not an easy task as we know that the crystal caves will be flooded as soon as the enormous pumping associated with mining activities will end.

This is a great film for the general public, even people unrelated with the geology will find it fascinating and perhaps a motivation for going underground and visit a mine. This is why the movie can be also very useful for teaching at High Schools and Universities as the notions of crystals, crystal growth, crystal properties, fluid inclusions, ore deposits, etc. are smoothly introduced. And this is a major outcome. The DVD of the Mystery of the giant crystals" is available at http://www.trianatech.com/ at a price of 18 Euro.

Ottawa will host the 2011 joint annual meeting of the Geological Association of Canada, the Mineralogical Association of Canada, the Society of Economic Geologists, and the Society for Geology Applied to Mineral Deposits. Canada's Capital offers a unique blend of culture, history, and natural beauty, all in the heart of the city. It lies at the junction between the rocky edge of the Canadian Shield and the Cambrian and Ordovician deposits of an ancient sea, and is ideally situated for its two universities and the Geological Survey of Canada. The painting by artist Judi Pennanen shows the majestic limestone banks of the Ottawa River at Parliament Hill and highlights this meeting's opportunity to showcase the societal relevance of the Earth Sciences to federal decision makers.

Committed to exploring both the scientific and societal aspects of Earth Sciences, Ottawa 2011 will feature symposia and sessions that revolve around Navigating Past & Future Change.
Join us May 25-27th, on the downtown University of Ottawa Campus, to make this meeting a success!

Details on registration, programs, and events are available on our website:
www.gacmacottawa2011.ca

Contact us:
Simon Hanmer (Chair)
Geological Survey of Canada
Vox: (613) 992-4704
Email: shanmer@nrcan.gc.ca

André Lalonde (Co-Chair)
University of Ottawa
Vox: (613) 562-5985
Email: deansci@uottawa.ca

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SEG
www.segweb.org

Ottawa 2011

SGA sponsored

SGA Student Conference

"Mineral Resources for the Society"

Venue: **Faculty of Science, Charles University, Prague**

Date: **15-19 April 2011 (Friday - Tuesday)**

The conference and field excursions are open to all students, interested in economic geology, mineral deposits, modelling, petrology and mineralogy, geochemistry, mining and environmental impacts.

Welcome to Prague - the capital city of the Czech Republic, located in the heart of Europe.



Conference venue - conference will take place at the Faculty of Science, Charles University, situated in the centre of Prague.

Preliminary conference program

April 15 - *Ice breaker Party*
Chlupáč Museum of the Earth and Life History, Faculty of Science, Charles University
April 16 - *Scientific sessions*
Introduced by a plenary lecture by SGA invited speaker, oral presentations, posters
Sightseeing and social evening "Prague by night" – organized by students of the Prague Chapter
April 17 - *Scientific sessions*
Introduced by a plenary lecture by SGA invited speaker, oral presentations, posters
Announcement of the best student oral and poster presentation
April 18 - *One day field trip to Příbram and surroundings*
Included in the registration fee, return to Prague in late afternoon
April 19 - *One day field trip to Jáchymov and surroundings*
Optional, field trip fee: 20 EURO, return to Prague in late afternoon

SGA sponsored

Important dates and information
Registration (and abstract submission) deadline - **January 30** (Registration fee: 60 EURO)

Registration fee includes - icebreaker party, morning and afternoon refreshments, lunches, conference bag and abstract volume - CD; one day field trip (Monday - April 18) - transportation, lunch, entrance fee to mines and museum and the field trip guidebook.
Optional field trip - second day field trip to Jáchymov is not included in the registration fee. Extra fee for this field trip will be 20 EURO.

Field trips

Day 1 - Monday, April 18 (included in the registration fee):
Příbram is one of the most famous old Czech silver and lead ore districts. The mining history began there as early as in the 10th or 11th century. Second period of mining was associated with uranium exploration and Příbram uranium ore deposit was the largest Uranium vein type deposit in the Czech Republic, operated between 1948 and 1991.



Day 2 - Tuesday, April 19 (not included in the registration fee, extra 20 EURO):

Jáchymov ore district is the most extensive ore district in the Czech Republic renowned for mining of polymetalic vein mineralization (Bi-Co-Ni-U-Ag) and also well known health resort with radioactive waters (the first radon spa in the world). We will visit the underground workings of the Svornost mine to see old galleries, mineralization exposures and technical facilities for pumping of radioactive water for balneal usage. Our steps will lead to mineral collection, royal mint of old Czech coinage – Thaler, museum of mining and history of the town and one of the famous bathhouses.



For further information please visit:

http://sga.cuni.cz/

Contact person: Kateřina Schlöglová (schloglo@gmail.com)

>>> FORTHCOMING EVENTS <<<

* marks a new entry

2011

***January 5-7**
CERCAMS-14 Workshop Ore Giants of Asia, London, United Kingdom - Contact: http://www.nhm.ac.uk/research-curation/research/projects/cercams/index.html

***January 5-7**
GeoPRISMS Implementation Workshop: Subduction Cycles and Deformation, Austin, Texas, United States - Contact: Conference Organizer Columbia University Palisades New York USA 10964; phone: (+1-845-653-6432); website: http://www.nsf-margins.org/SCD/2011/

***January 10-15**
CPS 7th International School of Planetary Sciences, Seapal Suma, Kobe, Japan - Contact: https://www.cps-jp.org/~pschool/pub/2011-01-10/index.html

***February 6-8**
PROEXPLO 2011-VI, Lima, Peru Contact: http://www.proexplo.com.pe

***April 3-8**
European Geosciences Union General Assembly 2011, Vienna, Austria - Contact: http://meetings.copernicus.org/egu2011/

April 4-8
AMC 2011 — Asia Mining Congress 2011, Marina Bay Sands, Singapore - Contact: weblink: http://www.terrapinn.com/2011/asiamining/index.stm

April 15-18
MINERAL RESOURCES FOR THE SOCIETY, SGA Student Chapter Conference with field trip, Division of Geology, Charles University, Prague, Czech Republic - Contact: http://sga.cuni.cz/, Katerina Schloglová, schloglo@gmail.com

***May 2-6**
XVIII Geological Congress of Argentina, Neuquen, Argentina - Contact: http://www.congresogeologico.org.ar/

May 9-10
SRCR '11 — Sustainability through Resource Conservation and Recycling '11, Falmouth, United Kingdom. weblink: http://www.min-eng.com/srcr11/

May 11-12
CCMI '11 — Climate Change and the Minerals Industry '11, Falmouth, United Kingdom. weblink: http://www.min-eng.com/climate-change11/index.html

***May 11-13**
IMCET 2011 — 22nd International Mining Congress of Turkey, Ankara, Turkey - Contact: http://imcet.org.tr/

***May 15-19**
EMAS 2011 — 12th European Workshop on Modern Developments and Applications in Microbeam Analysis, Angers, France - Contact: http://www.emas-web.net/

May 25-27
GAC-MAC-SEG-SGA Conference, University of Ottawa, Ottawa, Canada - Contact: Simon Hanmer (Chair), Geological Survey of Canada, shanmer@nrcan.gc.ca, tel. 613 992 4704; André Lalonde (Co-Chair), University of Ottawa, deanscl@uottawa.ca; www.gacmacottawa2011.ca

***May 29-30**
GIA Symposium 2011: Advances in Gemological Research, Carlsbad, CA, USA - Contact: http://symposium2011.gia.edu

June 21-22
Computational Modelling '11 - Contact: weblink: http://www.min-eng.com/modelling11/

June 27-July 8
IUGG 2011 — XXV IUGG General Assembly: Earth on the Edge: Science for a Sustainable Planet, Melbourne, Australia. Organizer: International Union of Geodesy and Geophysics (IUGG). weblink: http://www.iugg2011.com/

***July 4-9**
Seventh Hutton Symposium on Granites and Related Rocks, Avila, Spain - Contact: http://www.seventh-hutton.org/meeting/Welcome.html

July 20-27
INQUA — XXVIII Congress of the International Union for Quaternary Research, Bern, Switzerland. weblink: http://www.inqua.tcd.ie/

***August 1-5**
ICAM 2011 — 10th International Congress for Applied Mineralogy, Trondheim, Norway - Contact: http://www.icam2011.org

***August 14-19**
Goldschmidt 2011, Prague, Czech Republic - Contact: http://www.goldschmidt2011.org/

***September 4-7**
ECMS 2011 — 7th European Conference on Mineralogy and Spectroscopy, Potsdam, Germany- Contact: http://www.physchemgeo.com/ECMS/

***September 5-8**
II International Geology & Mining Forum, Magdan, Russia - Contact: http://gold-pacific.ru

September 6-9
AIMEX06, Sydney, New South Wales, Australia - Contact: weblink: http://www.aimex.reedexhibitions.com.au/

***September 7-9**
Ore Deposits in an Evolving Earth, The Geological Society, Burlington House, London - Contact: http://www.fermor2011.org.uk

September 26-29
11th SGA Biennial Meeting, Antofagasta, Chile. Contact: Av. Angamos 0610, Antofagasta, Chile, Tel. +56 (55) 355967, Fax +`56 (55) 355977; weblinks: www.e-sga.org, www.ucn.cl; e-mail: edcampos@ucn.cl

October 9-12
GEOLOGICAL SOCIETY OF AMERICA: 123rd Annual Meeting, Minneapolis, Minnesota, USA - Contact: GSA Meetings Department, P.O. Box 9140, Boulder, CO 80301-9140, USA. Phone +1 303 447 2020, Fax: +1 303 447 0648, E-mail meetings@geosociety.org, http://www.geosociety.org/meetings/index.htm

December 12-16
American Geophysical Union — 2011 Fall Meeting, San Francisco, California, United States. contact: AGU Meetings Department 2000 Florida Avenue, NW Washington DC USA 20009; phone: (202-777-7333); email: meetinginfo@agu.org; weblink: http://www.agu.org/

2012

***January 7-9**
International conference of the Geology of the Arabian Plate and the Oman Mountains, Muscat, Oman - Contact: http://www.geoman2012.com

***June 24-29**
Goldschmidt 2012; Montréal, Canada - Contact: http://www.goldschmidt2012.org/

August 5-15
34th International Geological Congress, Brisbane, Queensland, Australia. Contact: phone: (+61 62499556); weblink: http://www.ga.gov.au/igc2012

December 14-18
American Geophysical Union — 2012 Fall Meeting, San Francisco, California, United States. Contact: AGU Meetings Department 2000 Florida Avenue, NW Washington DC USA 20009; phone: (202-777-7333); email: meetinginfo@agu.org; weblink: http://www.agu.org/

SGA

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

MEMBERSHIP APPLICATION FORM

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

- Type or Print -

Name / Corporation	
First name	
Title	
Mailing address	
Phone	
Fax	
e-mail	
Academic degrees	

Check only one of the two boxes below

☐ I want to receive Mineralium Deposita and membership privileges for the current calendar year including back issues

☐ I want to receive Mineralium Deposita and membership privileges for the next calendar year

Select your Membership Dues

☐ 75.00 EUR Regular Member (Print+Internet **Mineralium Deposita** and **SGA News**)

☐ 60.00 EUR Regular Member (Internet only **Mineralium Deposita** and **SGA News**)

☐ 10.00 EUR Student Member (Internet only **Mineralium Deposita** and **SGA News**, max. 4 years, up to Ph.D.- certificate required)

☐ 60.00 EUR Senior Member (Print+Internet **Mineralium Deposita** and **SGA News**, after retirement - certificate required)

☐ 300.00 EUR Corporate Member (includes 3 copies of **Mineralium Deposita**) (for industry only, no academic)

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

☐ VISA ☐ MASTERCARD/EUROCARD ☐ AMERICAN EXPRESS

Card No: _____ **Expiry date (MM/YY):** _____

Signature . _____ Place and date _____

(if you do not intend to pay by credit card, an invoice will be issued after acceptance of your application)

Sponsor (SGA member):

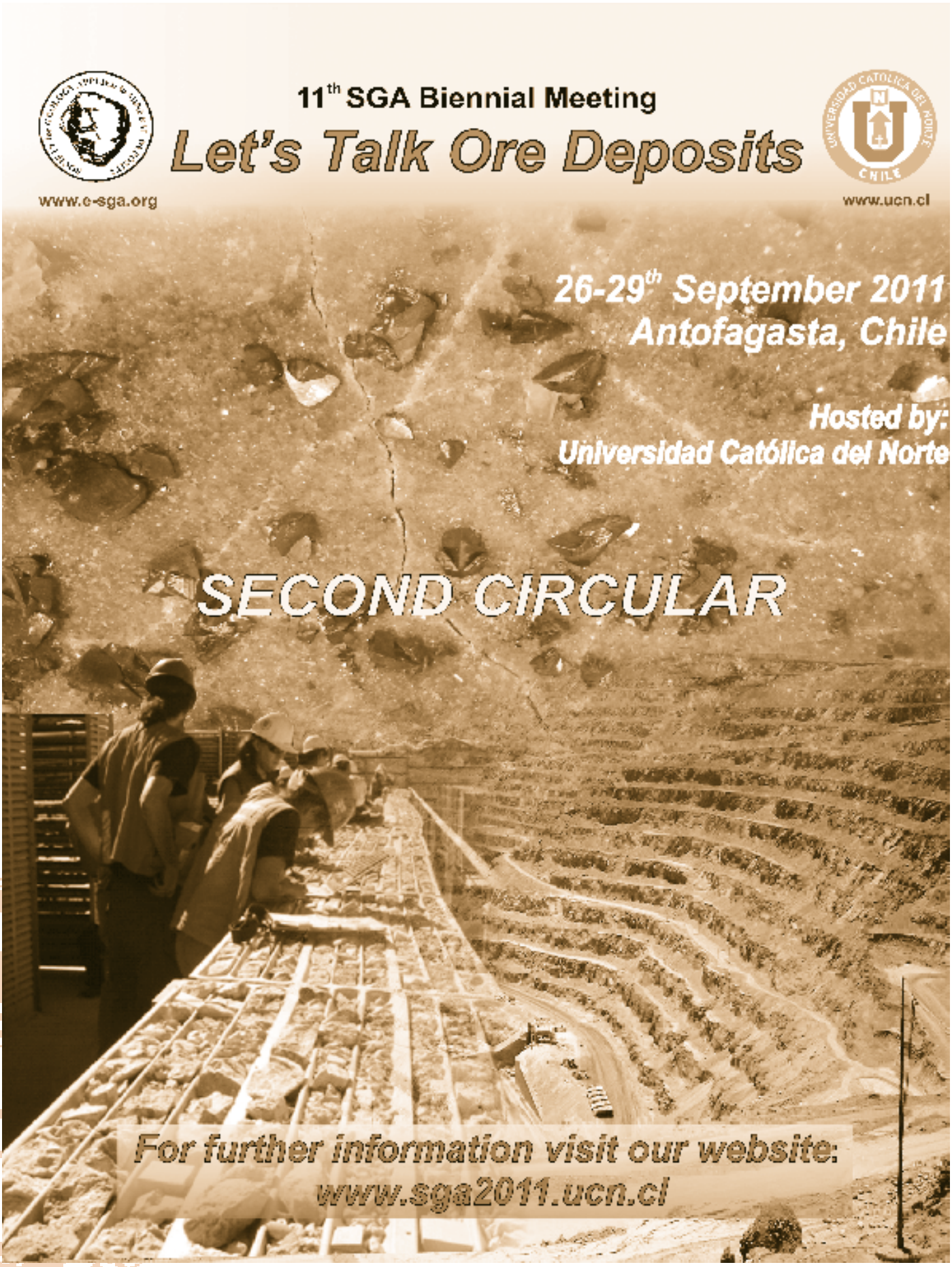
Name Place Date Signature

1. _____

Send the Membership Application Form to:

Dr. Jan Pasava
SGA Executive Secretary
Czech Geological Survey
Klárov 131/3
CZ-118 21 Praha 1
CZECH REPUBLIC

Phone: ++(420)-2-51085506
Fax: ++(420)-2-51818748
E-mail: secretary@e-sga.org


11th SGA Biennial Meeting
Let's Talk Ore Deposits
www.e-sga.org
www.ucn.cl
26-29th September 2011
Antofagasta, Chile
Hosted by:
Universidad Católica del Norte
SECOND CIRCULAR
For further information visit our website:
www.sga2011.ucn.cl

www.e-sga.org

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Dates and deadlines

Papers and posters	
Abstract submission opening	January 28, 2011
Abstract submission deadline	March 7, 2011
Confirmation of abstract acceptance	May 1, 2011
Final abstract submission deadline	May 27, 2011
Abstract submission for deadline	May 27, 2011
Registration	
Open for professionals and students presenting abstract	January 28, 2011
Open for students not submitting Abstract	May 16, 2011
Early registration ends	**June 3, 2011**
Field trip registration deadline	July, 29, 2011
Support for students submitting abstracts	
Student financial support application opening	January 28, 2011
Student financial support application deadline	March 27, 2011
Student financial support awards	May 15, 2011
SGA2011 MEETING	**September 26th-29th, 2011**

Registration fee

Early Registration Fee			
SGA Members	Non-SGA Members	SGA Students	Non-SGA Students
US$ 400	US$500	US$100	US$150
Late Registration Fee			
SGA Members	Non-SGA Members	SGA Students	Non-SGA Students
US$500	US$600	US$150	US$200

Registration fee includes:
Access to all technical and plenary sessions
Lunch
Morning and afternoon refreshments
Ice breaker party
All meeting materials including the final program and conference abstract volume in digital format.

Exhibits

Limited space is available for exhibits at the conference center. The exhibits will provide outstanding exposure and advertising for companies, universities and government organizations. Please contact SGA2011@ucn.cl about reservations and details on how your company can benefit from an exhibit.

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Welcome

The SGA Council and the SGA2011 Local Organizing Committee invites all professionals and students who work in the field of economic geology to participate in the 11th SGA Biennial Meeting, which will be held in the coastal city of Antofagasta, Chile, at the Enjoy Resort and Casino.

Our goal is to promote the exchange of knowledge and experience among geoscientists. The SGA2011 conference represents an exceptional opportunity for the exchange of information and experiences among international lecturers, exploration and research geologists and students in economic geology.

Venue

The conference will be held at the Enjoy Resort and Casino, located about 500 m south of the Universidad Católica del Norte main campus.

Organizing Committee

Chairman	Eduardo Campos
Technical Liaison	Fernando Tornos
Treasurer	María Soledad Bembow, David Leach
Students Committee	Andrés Veloso, Anna Vymazalova, Jorge Relvas
Sponsorship	María Soledad Bembow, Eugenio Ferrari, David Leach
Courses	Bernhard Dold, Thomas Bissig, Massimo Chiaradia, Adam Piestrzynski
Field Trips	Shoji Kojima, Bernd Lehmann
Edition and Technical Session	Martin Reich, Fernando Barra, Fernando Tornos, Jan Pašava
Advertising and web page	Rodrigo González, Hartwig Frimmel
Logistics	Hans-Gerhard Wilke, Rodrigo Riquelme

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The main technical program will be held over four days from Monday, September 26 to Thursday, 29 September, 2011, with the following daily structure:

- Monday, 26 and Tuesday, 27 September: Morning plenary sessions, afternoon concurrent technical sessions.
- Wednesday, 28 and Thursday, 29 September: Concurrent technical sessions.

Plenary sessions Keynote speakers

Sergio Rivera (Exploraciones Mineras Sociedad Anónima, filia CODELCO)
Christoph Heinrich (Institut für Geochemie und Petrologie, ETH Zurich)
Martin Reich (Departamento de Geología, Universidad de Chile)
Noel White (Consulting Geologist)
Richard Sillitoe (Consulting Geologist, London)
Constantino Mpodozis (Antofagasta Minerals)
Lluis Fonbote (Département de Minéralogie, Université de Géneve)
Bernd Lehmann (Mineral Resources, Technical University of Clausthal)
Stuart Bull (CODES, University of Tasmania)
Sergei Cherkasov (IAGOD, Vernadsky State Geological Museum of Russian Academy of Sciences)
Fernando Tornos (presidential address)(Instituto Geológico y Minero de España)

Sessions

S1 ORE FORMING PROCESSES
- S1.1 Large Scale Controls on Ore Genesis
- S1.2 Dating Ore Deposits
- S1.3 Geochemistry of Ore Systems
- S1.4 New Advances in the Study of Mineral Deposits

S2 STYLES OF MINERALIZATION
- S2.1 Porphyry Systems and Related Mineralization Styles
- S2.2 IOCG and Magnetite-Apatite Deposits
- S2.3 Orogenic Gold Deposits
- S2.4 Upper Mantle to Weathered Surface: Mineral Deposits in Mafic-Ultramafic Terranes
- S2.5 Epithermal Systems
- S2.6 Sedimentary- and Volcanic-hosted Ore Deposits
- S2.7 The Cherry on Top - Supergene Ore Formation During Climate and Landscape Evolution
- S2.8 Lithium, Salars and Industrial Mineral Deposits

S3 ORE DEPOSITS IN SOUTH AMERICA
- S3.1 New Developments in Cordilleran Evolution and Metallogeny
- S3.2 Ore Deposits in South American Shields
- S3.3 New Discoveries in South America

S4 APPLIED GEOLOGY
- S4.1 Energy Resources
- S4.2 Geometallurgy
- S4.3 Sustainability in Mining and Related Environmental Issues

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Field trips

The Central Andes (Chile, Perú and Argentina) are renowned for their abundant and diverse metal resources, and their long history of mining. The region is one of the key metal mining regions in the world and is an important producer of copper, molybdenum, gold, silver, antimony, bismuth, cadmium, lead, lithium, iodine, tin and tungsten. In particular, the Atacama Desert in northern Chile hosts one of the world's largest concentrations of ore deposits.

The area is home to a large community of geologists dedicated to exploration, mining and academic research. The region is regarded as an ideal natural laboratory to study mineralization associated with subducting plate boundaries.

Field trip participants will have opportunities to visit porphyry and manto-type copper, magnetite-apatite IOCG and Au-Ag epithermal deposits, among other styles of mineralization.

List of Field trips

FT-1. Porphyry Copper Deposits, Central Chile
FT-2. Active Volcanoes and Geothermal Fields
FT-3. Bolivia to Northern Chile: a Metallogenic Transect
FT-4. IOCG and Magnetite-Apatite Deposits, Copiapo Area
FT-5. Porphyry Copper Deposits in Northern Argentina
FT-6. Supergene Copper Deposits, Antofagasta Area
FT-7. Manto-type Copper Deposits, Antofagasta Area
FT-8. Copper and Gold Deposits in the Antofagasta Area
FT-9. Salar Deposits
FT-10. Chanaral-Maricunga transect: Ore Deposits and Geomorphology
FT-11. Copper Deposits, Calama Area

Detailed information concerning all field trips such as itinerary, prices, dates and others will be posted on the web page by the end of December.

Short Courses and Workshops

C1- Understanding controls on mineralization: applied structural geology to exploration and mining.
C2- IOCG deposits
C3- Gold- rich porphyry systems: From petrogenesis to fluid and exploration strategies
C4- LA-ICPMS techniques and applications
C5- Integration of field spectroscopy, ASTER and hyperspectral technology for mineral resources exploration
C6- Sustainability in mining: From the ore, through exploitation, towards final waste management
C7- Skarn deposits

Those interested in offering additional short courses or workshops, please send an email to: SGA2011@ucn.cl.

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Students

Because the future of Economic Geology depends on the involvement of graduate students and young researchers, we warmly invite and encourage students within the broad area of ore deposits research to submit abstracts and present their work at this highly visible international conference. The 11th SGA Biennial Meeting is a great opportunity for students to interact with leading scientists and other students in a relaxed and informal environment.

Attractive benefits are being offered to students to encourage their participation in SGA2011. Student benefits include:

Reduced registration fees: All students are entitled to a reduced registration fee. SGA students are offered by the lowest registration fee.

Student grants: A limited number of student grants will be available to support participation of preferably SGA student members in the conference. Only students who are senior authors of accepted abstracts may be eligible for these grants.

An application form for student financial support will be available on the conference website.

Student grants will be awarded upon the acceptance of an abstract for oral or poster presentation at the conference, and will be based on the financial need and scientific relevance of the submitted contribution.

Students Awards: A cash prize will be presented to the best student oral presentation or poster.

Field trip participation: Several pre- and post-meeting field trips to some of the world's largest ore deposits are being organized. Students are invited to participate in these activities. A limited number of free registrations for students will be offered.

Social evening Student & Industry: We will provide opportunities for students to meet with corporate sponsors and representatives from mining companies from around the world. Students will have many valuable opportunities to discuss their future plans with leading economic geologists in industry, government and academia.

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

The SGA Student Committee: Anna Vymazalová (anna.vymazalova@geology.cz), Jorge Relvas (jrelvas@fc.ul.pt) and Andrés Veloso (eveloso@ucn.cl)

SGA2011 Local Organizing Committee

Avenida Angamos 0610, Antofagasta, Chile. Tel. 56 (55) 355967, Fax 56 (55) 355977

SGA2011@ucn.cl www.sga2011.ucn.cl

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City of Antofagasta

ANTOFAGASTA is located in the Atacama desert, on the Pacific Ocean coast, approximately 1,130 km (702 miles) north of Santiago de Chile. With a population of over 350,000 inhabitants, Antofagasta is the largest city in northern Chile and historically has been the main gate to one of the richest mining regions in South America.

TRAVELLING TO ANTOFAGASTA

Antofagasta is easily reached via Santiago de Chile with connecting flights from Europe, America and Australasia. Alternative means include bus or private transportation from nearby major cities.

LANGUAGE

The official language of Chile is Spanish; however, the official language for the meeting is English.

RESTAURANTS

Antofagasta offers a wide range of dining experiences including local and international restaurants, and a vibrant nightlife.

ACCOMMODATION AND HOTELS

Antofagasta offers a wide variety of lodging from luxury hotels to affordable accommodation.

TOURISM

Antofagasta is the gateway to the Atacama desert and its fascinating attractions, including the mystic and magical pueblo of San Pedro de Atacama, El Tatio geysers, salars, several national parks, a long coastline, volcanoes and high peaks in the Andes mountains. Bolivia, Argentina and Southern Peru are within easy reach from the city of Antofagasta.

For further information visit

www.welcomechile.com/antofagasta
www.municipalidadantofagasta.cl
www.turismochile.com

CLIMATE

The climate is marine influenced. In September temperatures range between a maximum of 19° C (66° F) to a minimum of 13° C (55° F). Rain is almost unheard of, representing less than 4 mm -0.16 in- per year.

PASSPORT AND VISAS

A passport is required for travel to Chile. Participants are advised to check with their local travel agencies or the nearest Chilean Embassy or Consulate for information concerning visas. Citizens from the USA, Canada, Mexico and Australia do not need a visa, but a reciprocity fee, payable in US Dollars cash on arrival, will be charged per tourist.

For further information concerning visa please go to www.extranjeria.gov.cl

CURRENCY

The unit of currency in Chile is the peso ($). Very few commercial locations accept other currencies (i.e. U.S. Dollars). Several currency exchange bureaus are located in downtown Antofagasta and at the Enjoy Resort and Casino.

BANKS

Banks are open Monday to Friday from 9 am to 2 pm. ATMs are widely distributed throughout the city.

CREDIT CARDS

Major credit cards are accepted in most local businesses.

REGISTRATION FORM

to be sent to:
SGA2011 Organizing Committee, SGA2011@ucn.cl (Antofagasta, Chile)
Tel. +56-55-355230 Fax +56-55-355977

First Name _____ *Last Name* _____

Title _____ *Institution*

Address _____

*Postal Code*_____ *City* *Country* *Tel.* *Fax* _____ *E-Mail* _____

REGISTRATION FEE

Early Registration Fee			
SGA Members	Non-SGA Members	SGA Students	Non-SGA Students
US$ 400	US$500	US$100	US$150
Late Registration Fee			
SGA Members	Non-SGA Members	SGA Students	Non-SGA Students
US$500	US$600	US$150	US$200

Registration fee includes:
Access to all technical and plenary sessions, lunch, morning and afternoon refreshments, ice breaker party. All conference materials including the final program and abstract volume in digital format.

Early bird registration fees apply only to registrations submitted before or on May 27th, 2011. Late registration rate will apply to all registrations after May 27th, 2011.

Student's fee applies to FULL time students only. Proof in the form of a school/department certificate indicating full time student status at a Chilean or foreign university must accompany the registration form. Regular registration fee will be charged is required documentation is not provided upon registration.

Registration fee does not include accommodation, transfer and/or other products or services not mentioned above

☐ I order a printed copy of the proceedings volume for an additional US$ 100

Payment:

☐ By check enclosed Bank _____ make payable to "Universidad Católica del Norte"

☐ By credit card
Credit Card Number Expiration Date _____

☐ American Express ☐ Diners Club ☐ Master Card/Eurocard ☐ Visa

To be billed to: _____

Address

Date _____ Signature
(Without your signature we cannot accept payment by credit card)

Cancellation and Refund Policy: If your registrations is cancelled before July 29th, 2011 a 20 % fee will be applied as handling fee. No refunds apply after August 26th, 2011.