



## Mineral Exploration In the Mount Read Volcanics, Tasmania, Australia

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### Introduction

The Mount Read Volcanics (MRV) have been a significant producer of base metals for most of the 20th Century, hosting five major deposits with accumulated resources of > 350 Mt of ore. This review summarises the geology of the belt and discusses exploration techniques used both in the past and in current exploration programs, with emphasis on exploration for Pb-Zn-rich rather than Au or Cu-Au deposits.

### Geological setting

The MRV cover an area of 2990 km<sup>2</sup> (defined for volcanics occurring within 500 m of the surface) and form an apparently arcuate belt on the western and northern margin of the Tyennan

Block (Figure 1), an assemblage of Precambrian metasediments and amphibolite to eclogite grade complexes with Cambrian metamorphic ages (Meffre et al., 2000). Based on available radiometric data (largely U-Pb on zircons) the Mount Read Volcanics have an age of 500-510 Ma (with errors of ±7 Ma). Currently the most widely accepted tectonic model (Crawford and Berry, 1992) is that the Mount Read Volcanics are post-collisional and were erupted in an extensional graben setting after an arc-continent collision at about 510 Ma.

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## IMPORTANT NOTICE

THIS ISSUE OF SGA NEWS INCLUDES EXTENSIVE INFORMATION ON THE 6TH BIENNIAL SGA MEETING JOINTLY ORGANIZED WITH SEG, KRAKOW, POLAND, 26-29 AUGUST 2001

# The Joint 6th Biennial SGA-SEG Meeting

## Mineral Deposits at the Beginning of the 21st Century

Kraków, Poland  
August 26-29, 2001

Adam Piestrzyński

Chairman Organizing Committee of the 6<sup>th</sup> Biennial SGA Meeting

Organizing Committee: Adam Piestrzyński (UMM, Chairman, piestrz@geol.agh.edu.pl), Maciej Podemski (PGI Vice-chairman), Wojciech Mayer (UMM - Secretary), Jadwiga Pieczonka (UMM - Treasurer), Janusz Magiera (UMM - Exhibitions), Zbigniew Sawlowicz (JU - Excursions), and Cezary Bachowski (KGHM PC SA), Marta Basta-Grzywacz (UMM), Pavel Boltruczuk (Ukraine), Heikki Papunen (President SGA), Jan Pasava (Executive Secretary SGA), Tadeusz Peryt (PIG), Slawomir Porzucek (UMM - Internet), Holly Stein (SEG), Chris Stanley (SGA).

The Meeting will be held in Kraków, Poland, at the Main Building of the University of Mining and Metallurgy (UMM). The UMM was established in 1919. The University offers a wide range of education and research opportunities, from the earth sciences through mining engineering to metallurgy, material sciences, and computer sciences. Kraków is the historical capital city of Poland and an education center reaching nearly one million inhabitants of which about 120'000 are students.

So far the following institutions provided financial support to the Organizing Committee and contributed to the organization of the meeting: Ministry of the National Education, University of Mining and Metallurgy, KGHM Polska Miedź S.A., Polish Geological Institute, Billiton Development BV, Argyle Diamond Image (Rio Tinto Australia), Oroya Mining Ltd. - Australia, Archon Resource Technologies Pty. Ltd. - Australia, Arnall - Poland, Strait Resources - Australia, Polish Airlines LOT. Direct sponsorship for participants was declared by several International Geological Correlation Programs: 373, 429, 443, 427 and by GEODE.

The scientific program includes 12 Sessions and one Workshop (W4). All thematic sessions will have a good representation. The most occupied are: S4 (29 abstracts), S5 (57 abstracts), S6 (38 abstracts), S7 (43 abstracts) and S9 (27 abstracts). The total number of submitted abstracts is 304 (including keynote lectures). The full list of accepted abstracts and the scientific program will be presented on the meeting home page (see below).

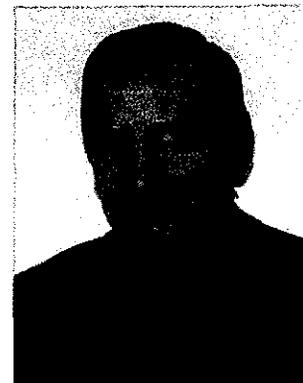
Four invited lectures have been selected for oral presentation during the opening ceremony: Mineral deposits at the beginning of the 21st Century - making the grade and the survival of the fittest (Andy H. Meldrum, Ireland); Metalliferous deposits: tectogenesis and mineralisation controls (Vic Bogacz, Australia); Sediment-hosted stratiform copper (SSC) deposits, other stratabound base metal deposits and the importance of basinal brines and/or evaporates, halotectonics and halokinesis (Rod Kirkham, Canada); New exploration criteria for "megabreccia"-hosted Cu-Co deposits in the Katangan belt, central Africa (Marek Wendorff, Botswana)

Due to insufficient number of participants the Organizing Committee decided to cancel the following field excursions: A1, A2, A3, A4, B5.

The Organizing Committee is grateful to all participants who submitted abstracts and decided to come to Kraków.

More information can be found on this website: <http://galaxy.uci.agh.edu.pl/~sga>

Adam Piestrzyński  
Chairman



## SGA News

N.° 11 June 2001

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# NEWS OF THE SOCIETY

## News of the Council

### Report of the Executive Secretary

Jan Pasava reported on the new membership, from October 11, 2000 to April 4, 2001. During the past few years, the Society receives about 100 new members annually and to date it has about 1000 members. The Council voted and approved two proposals concerning the membership fees, which are effective from the 1 May 2001:

- to cancel the junior membership category
- to apply a student's membership fee of USD 10 (EUR 10) instead of USD 25 (EUR 25)

The Executive Secretary informed the Council on his other activities involving compilation of the Annual Report for IUGS and extensive correspondence with SGA members.

### Report of the Chairman of the Nomination Committee

H. Papunen presented a list of the candidates for the Officers and Council Members of SGA for the SGA ballot 2001. The Council approved the list and highly appreciated efforts of the Members of the Nomination Committee.

### Report of the Treasurer

P. Herzig presented the financial report covering the period from January 1, 2000 to December 31, 2000. To date, the Society has ca. 700 paying members. About one half of the total expenses associated with publishing the Short Course Series Volume 1 was recovered after 2 years from printing.

### Report of the MD Chief Editors

The report was presented by B. Lehmann (Chief Editor, European MD Office). The Council approved the changes in the Editorial Board (G. Beaudoin from Canada and L. Meinert from USA newly joined the Board).

A proposal for the SGA Award was presented on behalf of the Chief Editors of MD by B. Lehmann. The Council decided to award the following article:

*F. Melcher, W. Grum, T. V. Thalhammer and O. Thalhammer: The giant chromite deposits at Kempirsai, Urals: constraints from trace element (PGE, REE) and isotope data (Mineralium Deposita 34: 250-272).*

The award, which consists of DM 3000 plus travel expenses to the Biennial Meeting where the Prize will be awarded, will be presented by the Chief Editors of MD and the SGA President at the SGA General Assembly in Kraków (August 27, 2001).

### Status of the SGA-SEG collaboration

The report was presented by H. Stein. P. Herzig informed about his participation to the SEG Council Meeting (November 13, 2000 in Reno). The deal for a joint SEG-SGA Meeting (Denver, 2002) includes:

- joint logo display at any conference materials;
- SGA will independently organize a short course or workshop entitled "Diamonds - From Source to Sea" (run by J. Gurney - RSA and H. Herbstaedt - Canada), but will share logos on the publications with SEG.

### 6<sup>th</sup> Biennial SGA-SEG Meeting

The report on the status of the preparation of the meeting was presented by A. Piestrzyński, Chairman of the OC. The meeting unfolds well and the Council appreciated efforts of the OC. 303 abstracts were submitted as of April 2, 2001.

## SGA NEWS MAILBOX

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*We expect your letters with comments, news,  
criticisms, ...*

### Date and place of the next SGA General Assembly

The next SGA General Assembly will take place in Kraków, on Monday, August 27, 2001, between 13.00 and 14.00.

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## 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:**

Peter M. Herzig, SGA Treasurer - Institut für Mineralogie, TU Bergakademie Freiberg, Brennhausgasse 14 - D-09596 Freiberg, Germany; phone: +49 3731 39-2662/2626; fax: +49 3731 39-2610; e-mail: herzig@mineral.tu-freiberg.de

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### Proposal for the 7<sup>th</sup> SGA Biennial Meeting in 2003

D. Eliopoulos confirmed continuous interest of Greek institutions to organize the next SGA Biennial meeting in 2003. The meeting should be held in Athens on August 24-28, 2003, at the Complex of the National Technical University well accessible from the city center and accompanied by several pre- and post-meeting fieldtrips. The Council approved the proposal and asked for the submission of detailed documents at the upcoming SGA Ordinary Council Meeting (Kraków, August 26, 2001).

### Past activities

- Prospectors & Development Association of Canada (March 14-17, 2001 Toronto, Canada).
- Special GEODE/SGA symposium «The timing and location of major ore deposits in an evolving orogen», EUG XI. April 8-12, 2001, Strasbourg, France.
- XVI ECROFI Meeting (May 2-4, 2001, Porto, Portugal).
- 2001 - A Hydrothermal Odyssey, May 17-19, Jupiter's Casino, Townsville, Queensland, Australia, organized by the Economic Geology Research Unit (EGRU), James Cook University School of Earth Sciences.

### Future Activities

- 4<sup>th</sup> International Archaean Symposium (September 24-28, 2001, Perth, Australia)
- Joint SEG-SGA Global Exploration 2002 „Integrated Methods for Discovery” Conference (April 2002, Denver, Colorado, USA)
- 11<sup>th</sup> IAGOD Symposium (July 22-27, 2002, Windhoek, Namibia)
- Uranium Deposits: From Their Origin To Their Environmental Impacts (September 24-26, 2002, Prague, Czech Republic)

### !!! IMPORTANT NOTICE !!!

**Applications to SGA for meeting sponsorship have to be submitted to Jan Pasava, SGA Executive Secretary, on appropriate forms developed and approved by the SGA Council which are available at the SGA home page on Internet:**

<http://www.min.tu-clausthal.de/www/sga/sga.html>

**Other requests will be not considered.**

### Various

- The Council suggested that the 8<sup>th</sup> SGA Biennial Meeting in 2005 could be held out of Europe and encourages regional Vice-Presidents to come up with their proposals at the next SGA Council Meeting (August 26, 2001, Cracow, Poland).
- The Council approved a proposal to begin with „SGA student chapters” at selected leading universities with mineral deposit programmes.

- The Council wishes to attract more corporate members in the future and would welcome any suggestions from membership and ongoing corporate members.

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

**Dr. Jan Pasava**  
SGA Executive Secretary

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## Report of the Executive Secretary about membership

33 Regular Members and 16 Student Members applied for membership from October 11, 2000 to April 4, 2001

**LIST OF NEW SGA MEMBERS**  
(October 11, 2000-April 4, 2001)

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## THE SGA HOMEPAGE ON INTERNET

The SGA homepage has a new address on INTERNET. From this homepage you can get information about biennial scientific meetings in Europe, world-wide field trips and workshops, membership application form for the SGA and authors and titles of this year contributions to Mineralium Deposita as well as the electronic edition of SGA News.

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# SGA

**SOCIETY FOR GEOLOGY APPLIED TO MINERAL DEPOSITS**

[Origin of SGA](#)

Origin of SGA

In 1965 the Society for Geology Applied to Mineral Deposits was established by a group of economic geologists in Heidelberg. In 1971, SGA was legally incorporated in Switzerland with its statutes in English, French and German. Its journal [MINERALIUM DEPOSITA](#) is now recognized as a premier international mineral deposits journal.

[Goals](#)

The promotion of science of mineral deposit geology. Personal contact of members in order to exchange knowledge and experience. Organization of biennial scientific meetings in Europe, world wide field trips and workshops. For these events, SGA members have reduced registration fees.

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1: MINERAL EXPLORATION IN THE MT. READ VOLCANICS, TASMANIA, AUSTRALIA

The MRV can be subdivided into southern (248 km<sup>2</sup>), central (1152 km<sup>2</sup>) and northern (1590 km<sup>2</sup>) segments, of which only the central segment (extending from Macquarie Harbour to North of Mt. Cripps) hosts economically significant mineralisation (see Table 1). The internal stratigraphy of the MRV is complex, but 4 regionally extensive lithostratigraphic units have been described: the eastern Quartz-phyric Sequence, the Central Volcanic Complex (CVC), the Western volcano-sedimentary sequence and the Tyndall Group (Corbett, 1992). These units are easily recognised in the Central MRV, but it has proved difficult to make correlations with the northern and southern MRV. This problem is now being tackled by attempting to find characteristic, regionally extensive units that were the products of single, large eruptive events (e.g., the Lynchford Tuff in the lower Tyndall Group).

Stratigraphic relationships between the four lithostratigraphic groups are still unclear, partly due to poor exposure. However, one view is that all the VHMS mineralisation is predominantly syngenetic (although, significantly affected by Devonian deformation and the intrusion of post-kinematic granitoids) and occurs in a stratigraphic interval at the top of the CVC and below the Tyndall Group.

The top of the CVC marks a peak in andesitic-basaltic volcanism and a change in the chemistry of the volcanics from high-K calc-alkaline (Suite 1 of Crawford et al., 1992) to primitive shoshonitic (suite 2 [transitional] and suite 3) and tholeiitic (dykes of Suite 4). It is interpreted that this transition indicates that maximum extension was reached at this time.

In addition, at the outcrop scale, the top of the CVC marks a major change in the type of volcanics; from feldspar-phyric, lava/intrusive dominated to quartz-feldspar-phyric epiclastics, with minor lavas and intrusives.

### Exploration

Significant deposits and their mode of discovery are listed in Table 2. An early period of success by prospectors locating outcropping deposits, largely by following Au dispersion trains along drainages, was supplanted after a 50 year drought by largely geophysical, in combination with stream or soil geochemistry and/or geology, discoveries of buried or sub-cropping deposits and culminated in the discovery of Hellyer at >100 m below surface.

Modern exploration (1960 – present) has resulted in a large database of open file exploration data, including:

- Extensive airborne EM, ground time- and frequency-domain EM and IP surveys, gravity stations at a density of >1 per km<sup>2</sup>, airborne and ground magnetic surveys covering the belt at a line spacing of 200 m or better, and some CSAMT and seismic surveys (note that it is difficult to quantify the extent of geophysical coverage as much pre-1995 data is not available digitally).
- 29'300 stream sediment samples (with sample density of 9 samples per km<sup>2</sup>) the majority of which are -80#, but with significant numbers of -20#, -200#, panned concentrate and bulk cyanide leach samples.
- 90'000 soil samples (the Pasminco database is currently incomplete, but we estimate this to be approximately 70% of the available data) the majority of which are nominal C horizon samples (often sieved to -80#) with lesser A and B horizon and wacker samples.
- 13'500 rock-chip samples analysed for a range of elements by a range of methods.
- Isotopic data, currently being compiled as part of an Industry-Government project, including, e.g., >600 Pb isotope analyses of mineral separates, rocks and soils.

Table 1: Significant Cambrian 'VHMS' Deposits of the Mt Read Volcanics (data from Large (1992) and Mineral resources Tasmania, July 2000 (from Berry et al., 2000).

Deposit	Million tonnes	Cu %	Zn %	Pb %	Ag ppm	Au ppm	Type	Status
Mt Lyell*	312	1.0				0.3	Cu-Au	Mine
Henty	1.7					11.3	Au	Mine
Hellyer	16.0	0.4	13.0	7.0	160	2.3	Zn-Pb-Cu	Closed
Que River	3.1	0.6	13.5	7.5	200	3.4	Zn-Pb-Cu	Closed
Rosebery	31.7	0.6	14.3	4.4	146	2.3	Zn-Pb-Cu	Mine
Hercules	3.42	0.42	17.3	5.4	169	2.8	Zn-Pb-Cu	Closed

Table 2: Discovery of significant deposits in the MRV.

Deposit	Year	Method	Comments
Mt Lyell	1883-1890's	Prospecting	15 ore bodies in Lyell field
Crown Lyell	1956	IP/EM	
Cape Horn	1957	IP/EM	
Hercules	1891-1894	Prospecting	
South Hercules	1973	Turair/IP	Hg soil geochemistry
Rosebery	1893	Prospecting	
North end	1991-1996	Drilling	Geologically based
Que River	1974	AEM/stream sediments	
Hellyer	1983	UTEM	Considerable geological input
Henty	1973-1989	IP/Soils	Originally a Pb-Zn showing
Mt. Julia	1995	Geology	Structural model from Henty

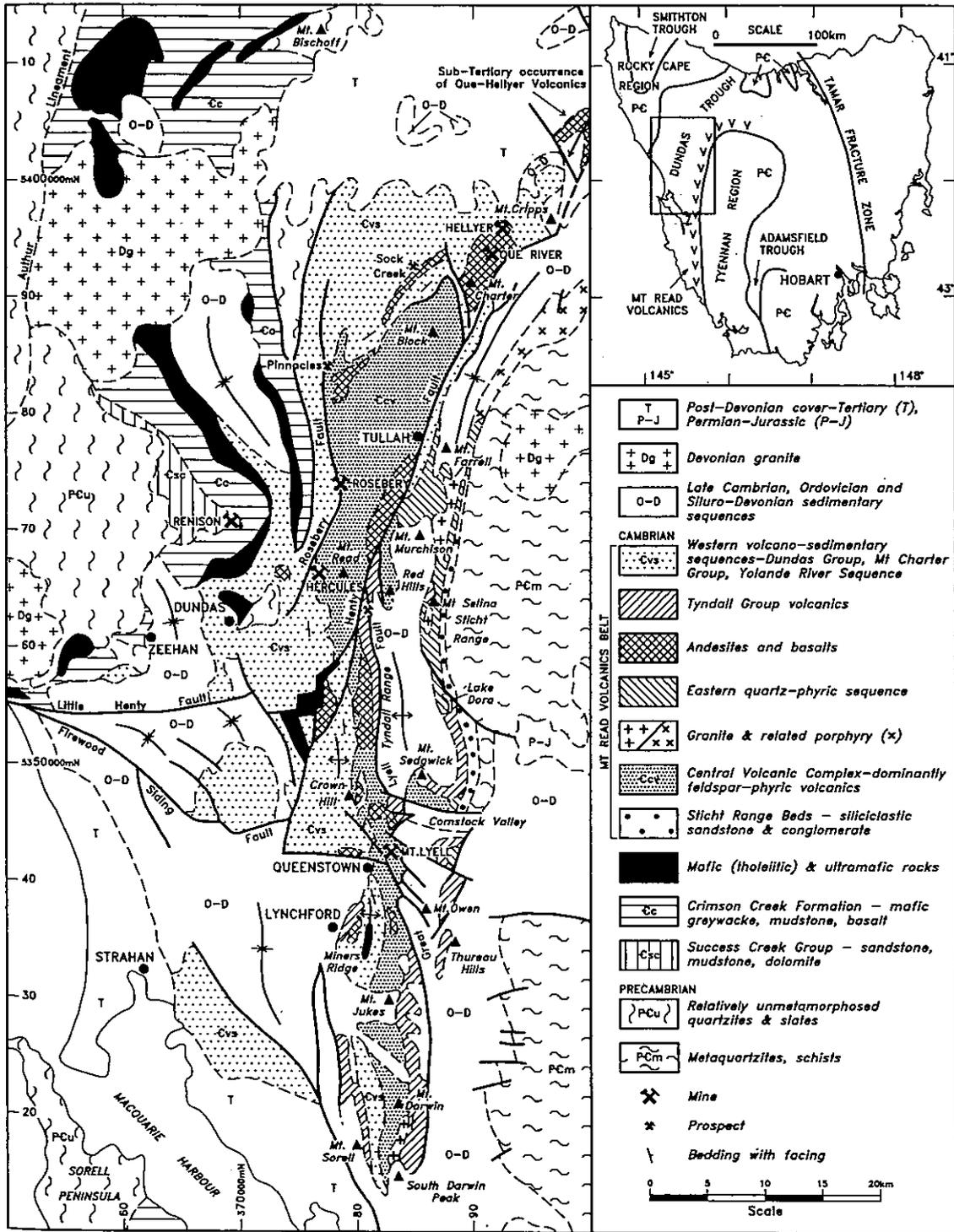


Figure 1: Geologic map of the Central Mount Read Volcanics and associated sequences (from Crawford et al., 1992).

Following the discovery of Que River and the subsequent orientation surveys, exploration programmes were largely based on geological mapping, IP and C Horizon soil geochemistry. Following the discovery of Hellyer in 1983, many exploration programmes were driven by ground EM surveys, with blanket coverage of the Central MRV. The failure of these programmes to locate significant mineralisation led to programmes dominated by drilling of conceptual stratigraphic (top of the CVC)/structural targets (with regional structural models derived from airborne magnetic and gravity data), also, with the exception of the Mt. Julia deposit, without success. The result of this exploration

activity has been, in the view of explorers currently active in the belt, to largely sterilise the top 100-200 m of the belt for economically significant mineralisation and this has provided the impetus for researching techniques that will test deeper than 200 m. In addition to geophysical methods, Pasmafinco have been working on partial leach soil techniques. Partial leach (or mobile metal ion) geochemical techniques have been used for some time. However, it is only since the introduction of routine low-cost ICP-MS analysis at commercial laboratories that the technique has become practical. Partial leach methods rely on the transport of metal ions from a buried ore body, through the overlying cover

rock, and the trapping of these ions in the soil profile where they are loosely bound, whether they be adsorbed, organically bound or in Fe- or Mn-oxides. Given the high organic content of many western Tasmanian soils, a reagent that attacked metal ions bound in humic and fulvic acids was thought appropriate and a digest based on sodium-pyrophosphate was developed. Orientation surveys were conducted over the north end of the Rosebery ore body and the technique was applied at the Beatrice Prospect, near Queenstown, where a zone of disseminated Pb-Zn mineralisation was located through approximately 200 m of barren porphyry. These technical successes have encouraged the continued development of the technique and Pasminco have been routinely using partial leach methods on B horizon soil samples for the past 2 years.

In conclusion, I believe that the combination of an improved understanding of the stratigraphic setting of mineralisation in the MRV, coupled with examination of the extensive open-file geochemical and geophysical data sets currently available to locate zones of interest followed by prospect scale exploration using partial leach soil sampling, geological mapping and, where

appropriate, ground EM will provide the key to the next generation of discoveries in the MRV.

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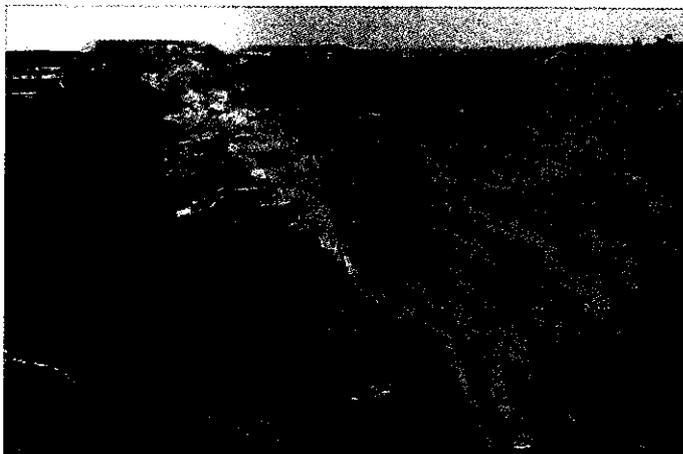
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# THE STATE OF THE MINING INDUSTRY IN 2000: A BRIEF REVIEW

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## 1. General situation : a burst but could fare better

Once more, world economy has been depending on the health of the US economy which was good as a whole, but a clear slowdown in the latter weeks of 2000 pointed to a likely pause, indeed a recession. Asia as a whole recovered somehow, except for Japan still labouring to get out of its crisis. China paused more or less. As for Europe, she followed the US, carrying on with the expansion initiated in 1999, however here too, a slowdown was recorded at the year's end.

In the mineral industry, as in many others, globalisation, so spurned by some, has been the keyword over the past year, witnessed by a new and big wave of international mergers and acquisitions, mainly in iron ore, coal, aluminium and copper. Another important facet was the closer interest in the public (i.e. the stock exchanges) for the way the mining business is run (see below, sections 2 and 8).

## 2. The big game: mergers, acquisitions, restructuring and repositioning of the industry

### 2.1 Main mergers and acquisitions

In the first ten months of the year, mergers and acquisitions totalled US\$ 17.5 billion, which may seem a lot, but is in fact small compared to other industries (see below). Switzerland was in the forefront, as the largest merger was the one between the Swiss Algroup and Alcan of Canada for US\$ 4.7 billion. That mark could have been much higher had Alcan been permitted to buy also Pechiney of France (bigger than Algroup), but the European Commission expressed a negative judgment thereon. Also, the Swiss-based Glencore International bought coal mines in Australia and South Africa. And indeed, a large part of the activity was in Australia:

- Rio Tinto paid US\$ 1.9 billion for North Ltd. and led a successful battle for control of Ashton Mining with non other than De Beers;
- Anglo Coal bade successfully (US\$ 850 million) for Shell's coal assets;
- the joint BHP-Mitsubishi paid US\$ 830 million for Queensland coal producer QCT;
- Billiton acquired the Alcoa's 56% stake in the Worsley (WA) alumina operations for US\$ 1.5 billion (Alcoa had to offer them as a condition of its own previous takeover of Reynolds Metals for US\$ 4.5 billion in 1999);
- Billiton also became owner of the Canadian copper producer Rio Algom at a cost of US\$ 1.2 billion.

- there were rumors of the possible sale of MIM's coal interests and, above all, that of WMC, the big Australian nickel, copper, gold, aluminium producer.

Elsewhere, other significant mergers included:

- the acquisition by CVRD of a 51% stake in five mines of another Brazilian iron ore producer Samitri for US\$ 525 million;
- a proposal for a merger between Gold Fields Ltd and the Canadian gold company Franco-Nevada Mining Corp. was blocked by the South African authorities;
- Newmont announced the takeover of the US-based Battle Mountain Gold Co;
- In Russia, one company, Russian Aluminium, now controls 70% of the country's production of over 3 Mt/y, but controversy surrounds the manner in which the mergers of various companies took place and suit was launched by US metal traders.

One rationale for these concentrations, still modest in fact, is the necessity for the industry to reduce overheads, to introduce greater productivity and to reduce operating and other costs. Moreover there is a belief that size now matters to attract new investments in competition with other industries and that only the largest companies have a chance to attract attention of fund managers. Mining is a very global business, however it is still only a minor player in terms of overall market capitalisation. For example, the world's largest pure mining company, Rio Tinto, has a market capitalisation of around US\$ 24 billion, whereas Microsoft is valued at over US\$ 400 billion! What is more, some countries like South Africa and Australia have weak currencies which make the cost of international takeovers much cheaper for hard currency countries. Currency weakness was also a factor in buoying profits for a number of mining companies. However, on the other side, the steep rise in oil prices in 1999-2000 had an adverse effect on costs and the negative impact of this was observed when US aluminium producers had to close several smelters in the Pacific Northwest.

### 2.2 As a matter of fact, this has been going on for ten years

Since 1990, Australian iron ore producers have been faced with annual average price reductions of some 3% which forced them to ensure cost reductions, to concentrations and consolidation (cf. Rio Tinto's move on North Ltd.). Same move in Brazil (see above). As a whole, for the last ten years, non-ferrous acquisition activities (excluding aluminium) totalled around US\$ 70 billion. When considering the global merger and acquisition

activity from 1995 to 2000, this brings the total expenditure to US\$ 110 billion, of which 30% was for gold, 19% for aluminium, 13% for copper, 16% for diversified metals and 22% for others (see Table 1).

In 2000, there were 11 deals worth over US\$ 1 billion, for a total of US\$ 17.5 billion. In spite of this, the degree of production concentration is still lower in the mining industry than in other industries. There is considerable variation in the concentration levels between various metals (see Table 2).

However, the rhythm of concentration (except for iron ore) decreased as a whole since 1995-1996. Thus, at the end of 1999, the 3 largest companies controlled only 15.2% of the value of the total mining production (without coal and hydrocarbons) against 17.8% at the end of 1997 and, more surprising, 21% at the end of 1984. The 10 largest companies accounted for 27% of total production in 1999 against 34% in 1984. And the share of the mine production by the largest 50 companies fell below 60% in 1999. This could be due to a fall in the relative value of copper and gold which make up a large proportion of the production controlled by the largest companies. Experts, though, think that the trend to more concentration will go on with the consolidation of a few very large groups.

A study on gold and copper property acquisitions by North American companies during the 1990s showed some interesting points (cf. Mining Journal, Dec 15, 2000):

- number of acquisitions: 429 (of which 314 for gold, 45 for copper and 34 for gold and copper);
- because of the increasing difficulties met in North America (legislation, claim fees, bad environmental climate, etc.), 53% of the deals were made outside North America, half of them (27%) in South America;

- the acquisition costs (AC) for gold-exploration properties declined from around US\$ 20/oz in 1990, to values under US\$ 10/oz in 1999, ca US\$ 7/oz as an average, i.e. 2-3% of the gold price over the ten-year period;
- the mean AC for gold development-properties over the ten year-period are US\$ 30/oz (with a median at US\$ 22/oz), corresponding respectively to 8.5% and 6.4% of the average gold price. There was a sharp increase to US\$ 33/oz in 1998 and 1999, which is probably related to the current reduced and low exploration expenses and staffing;
- the mean AC for gold production-properties amount over the ten-year period to US\$ 60/oz, corresponding to 17% of the average gold price.

### 2.3 A few crude truths about mining

Mining is with agriculture the most fundamental industry to world economic development and yet our industry has little influence (with the notable exception of the oil sector), even in countries where it counts. It comes with a huge historical baggage and most of it has an adverse influence on the public, politicians and... investors. Its image is as a whole a bad one in the public sentiment and worse, with the increasing awareness of the environment, mining has become quite unpopular, at least in affluent countries. The industry should normally have an important role in the ongoing debate about sustainable development, but fails to do so. The sad story is that the industry's chief executives have relatively little political influence. If trucks and shovels are large, however the leading companies are not. According to Standard & Poor's 500 index, metals mining weighs under 0.6%, which is less than the Walt Disney group alone (see Table 3)!

Table 1: Top ten mining deals since 1995.

Buyer	Target	Amount (year) (US\$ billion)
Alcan	algroup	4.7 (2000)
Alcoa	Reynolds	4.5 (1999)
RTZ	CRA	4.0 (1995)
Alcoa	Alumax	3.8 (1998)
Anglo American	Minorco	3.7 (1998)
Inco	Voisey's Bay	3.3 (1995)
Consortium	CVRD	3.2 (1997)
Anglo American	AngloGold	3.1 (1997)
Newmont	Santa Fe	2.5 (1997)
BHP	Magma	2.4 (1995)

From Mining Journal, London, Dec. 15, 2000

Table 2: Concentration of metal production in the western world.

Metal	Nb. of controlling companies	Degree of control in %
Iron ore	3 (?)	80 %
Tin	4	78
	<b>10 first companies</b>	
Nickel	10	81
Chromite	10	80
Bauxite	10	72
Copper	10	70
Lead	10	61
Zinc	10	51
Gold	10	50

**Table 3: The top ten mining companies (from Sweden's Raw Material Group-RMG).**

Anglo-American (S.A. & UK)	Codelco (Chile)
Rio Tinto (UK)	Freeport Mc Moran (USA)
CVRD (Brazil)	Phelps Dodge (USA)
BHP (Australia)	Noranda (Canada)
Norilsk (Russia)	Grupo Mexico (Mexico)

The combined market capitalisation of the top ten mining companies is currently around US\$ 80 billion (Table 3). Even if one includes companies which derive much of their income from processed metal and fabrication, such as the aluminium producers, the total market capitalisation of the 20 largest mining companies is about US\$ 166 billion. By comparison BPAmoco and Exxon Mobil have a combined capitalisation of US\$ 520 billion.

As a result, mergers and acquisitions in the mining industry, as big as they might seem, find their true dimension and are dwarfed by deals in other sectors. The largest deals in the mining industry during the past five years were respectively Alcan's (US\$ 4.7 billion) and Alcoa's (\$ 4.6 billion) (see Table 1). In contrast, in 2000, America Online's merger with Time Warner was valued at US\$ 182 billion and that of Glaxo Wellcome with SmithKline Beecham at US\$ 78 billion! And in January 2001 Nestle bought Purina, a pet food producer, for \$ 10.5 billion! According to RMG, the total amount of the world's mergers and acquisitions was US\$ 3,400 billion, with the mining industry reaching barely \$ 19 billion (0.6%).

In terms of metal sales, the two largest companies in North America are Alcoa and Alcan with revenue in 1999 of US\$ 12.6 billion and \$ 6.7 billion, respectively, and a leading one like Inco of \$ 2.1 billion. In contrast, BPAmoco alone reached a revenue of US\$ 100 billion in 1999. In terms of commodities, coal dominates (average value of \$ 110 billion) followed by gold, bauxite and copper (around \$ 20 billion each for run-of-mine output) and iron ore (\$ 15 billion), then by zinc and diamonds (\$ 6 billion each). The total value of annual mine output is probably around US\$ 300 billion (with \$ 3-5 billion devoted to annual exploration). But the annual value of oil production is currently \$ 800 billion (at \$ 30/bbl) and BPAmoco alone has an exploration budget of \$ 8 billion. As a matter of fact, in a global perspective, mining is rather small and has relatively little political influence, particularly in developed countries, in spite of its strategic importance. Indeed, without metals and other mineral commodities, the world would quickly move to a halt.

### 3. Regional developments

#### 3.1 Canada : business as usual

A few projects went ahead in 2000 :

- partners in the Diavik diamond project in NWT decided to proceed with mine development;
- Inco decided to proceed with the next phase of the Goro nickel-cobalt laterite project in New Caledonia after successful trials of its hydrometallurgical process, which

could repel to a later date the development of its Voisey's Bay nickel-cobalt sulphide deposit in Newfoundland.

#### 3.2 Latin America booms

- Billiton bought from the Canadian Cambior its interests in La Granja, Peru, one of the major world's undeveloped copper deposit with reserves of 2,560 Mt at 0.61% Cu (cut off : 0.41% Cu) based on 108 km of drilling. Billiton will undertake a feasibility study within five years and test-work to evaluate heap and dump leaching potential and the possible application of its bio-leaching process, BioCop.
- Also in Peru, construction of the Antamina copper-zinc deposit was near completion.
- In Chile, the enormous Escondida porphyry-copper deposit is to enter a fourth-phase expansion at a cost of US\$ 1.045 billion which will raise annual production by 50% from 0.8 to 1.2 Mt/y (see Table 4). This expansion will make Escondida the world's largest copper mine with ca 12% of the western world production.

#### 3.3 Africa: a rather dull picture

At the end of the year came the publication in South Africa of a draft new minerals law which would vest all ownership of mineral rights to the State, thus abolishing the current private/public ownership.

- In Zambia, the privatisation process was completed and should allow and bring the important and badly needed investments.
- In Tanzania opening of the new Geita gold mine, sold by Ashanti to AngloGold.

Unfortunately these positive developments were largely offset by negative ones :

- In Zimbabwe the mounting economic crisis following President Mugabe's policies could threaten new platinum projects in the Great Dyke.
- In Sierra Leone, Congo (DRC), Angola, civil wars and strives went on, mainly fed by illegal production and trade of uncut gem diamonds. This led to international pressure to try to halt such trade: one proposed measure was notably to create certificates of origin for all diamonds, which seems quite difficult. Moreover, some African countries like Botswana, where the diamond industry is well regulated and an important source of national revenues, feared that such an issue could lead to a general boycott of all African diamonds.

In Congo (DRC), in addition to revenues from gold and diamond to help their war effort, the rebels opposed to Kabila's regime also derived substantial revenues from the illegal mining of columbite/tantalite : indeed niobium and tantalum are currently in high demand from the high technology. Tantalum is notably used in capacitors in products such as mobile phones and niobium in high-strength low-alloy steels. The concentrate, where the Nb/Ta ratio exceeds 3:1, is known as «coltan» and is produced by artisanal groups extracting the mineral from weathered pegmatites and alluvial deposits widely distributed through the Kivu provinces.

Table 4: The Escondida copper deposit expansion: a few data.

Location:	160 km to the SE of Antofagasta (northern Chile), a few tens km from the port of Coloso, south of Antofagasta.
Owners:	BHP 57.5%, Rio Tinto 30%, Mitsubishi 10%, International Finance Corp. 2.5%. BHP is the operator.
Type of deposit:	porphyry copper (Cu-Mo-Au). Age: Oligocene.
Production:	it is the world's largest copper mine in activity. From July 1999 to June 2000, production was 920,000 t of copper, i.e. 9% of the world copper market. 780,000 t were extracted from 127,500t/d of sulphide ore (ca. 40 Mt/y at 2% Cu) and 140,000t from oxide ore leaching. Gold: 10 t/y? With the completion of the 4 <sup>th</sup> expansion (see below), Escondida will be responsible for around 30% of the international custom concentrate market. The associated gold output may conservatively be estimated at 20 t/y.
Grade:	since start-up (in 1990) to 1997, 2.7% Cu average, then decline to ca 2% Cu in 2000 and a planned 1.5% Cu by 2003. In 2000 the output of concentrates decreased and without the current expansion and the leach oxide plant, copper production would also have decreased with an increase of the operating costs.
Concentrate:	produced in situ and transported via a slurry pipeline to a plant in Coloso.
Reserves:	at the beginning ca 2200 Mt. As at June 2000 proven and probable reserves of sulphide ore amounted to 1900 Mt averaging 1.2% Cu, of which 1050 Mt at 1.32% Cu in the proven category. Within the Escondida mining lease area other possibilities are considered, notably at Escondida Norte, 5 km to the north. There, indicated resources amount to 676 Mt of sulphides averaging 1.03% Cu and inferred resources to 800 Mt of sulphides at 0.76% Cu and 131 Mt of oxides at 0.73% Cu. Other prospects are currently being explored.
Planned expansion:	increase annual copper output by 400,000t to 1.2 Mt/y with full production anticipated in April 2003. A new 110,000t/d concentrator is in construction to raise total milling capacity to 237,500 t/d (80 Mt/y). Concentrate production is expected to peak in 2004 to 2006 with 1.2 Mt/y of contained copper and bio-leaching is envisaged for lower-grade ores. Numerous modifications in the extraction, transport and milling systems are planned, among which a conveyor system to the new plant, a new pipeline and a refurbishment of the present one, a new tailings disposal and water reclaim facility which is a major problem there, an increase in the mining truck fleet, bigger port facilities at Coloso, etc.
Cost:	US\$ 1045 million. A significant portion of the project financing will be debt-funded by the JV partners. BHP's share of the investment will be US\$ 600 million. The new concentrator is forecast to process ore at a cost of US\$ 3.18/t by 2004, significantly lower than the present US\$ 3.37/t for the existing plant. And despite the lower ore grade, cash production costs are expected to remain at the current level of ca US\$ 0.43/lb (or \$ 949/t) for several years.
Clients:	most of the sales go to Japan (31%), Europe (Germany, Finland, Spain...)(15%), Chile (9%) then Corea, Canada, China, Brazil, etc. Contracts have already been finalised for more than 70% of the additional production.

Coltan sells locally for between US\$ 30 and US\$ 100/kg by fractions of 500 kg. The dealers pay the rebels to get export licenses plus royalties. Coltan is generally transported by air to Bukavu from small bush airstrips, then by road to the capitals of Uganda and Rwanda and finally flown to industrial buyers in Europe and North America. As with gold and diamond, local civilians derive almost nothing from the coltan business and, helplessly, see their country being looted of its natural resources.

#### 3.4 Australia: not so nickeliferous any more?

- As could be expected, the new lateritic nickel projects experienced further problems related to the pressure-acid leaching hydrometallurgic treatment process which is not yet fully operational. Notably the costs, especially at Murrin-Murrin, the biggest such deposit, will be considerably higher than anticipated.
- WMC, Australia's first nickel producer, rather sceptical from the beginning about these projected low costs, preferred to expand its own nickel sulphide production. It also expanded capacity at their Olympic Dam copper-gold-uranium mine in S.A. which almost doubled.
- A new vanadium operation started at Windimurra.
- Green light has been given to a magnesium project at Stanwell near Rockhampton (Qld) where AMC is planning to produce 96,000t/y of metal based on magnesite deposits at Kunwarara.
- BHP closed its Beenup mineral sands operation, thus abandoning its entry in this sector.
- On the other hand, interest continued in the mineral sands of the Murray Basin (S.A.)

#### 3.5 South East Asia: highs and lows

Here also political instability in countries like Indonesia and the Philippines undermined somehow investor confidence.

- A spillage occurred at the world's second largest copper mine, Grasberg, in Irian Jaya.
- A report by the World Bank recommended closure of the Ok Tedi copper mine operated by BHP in Papua New Guinea because of repeated pollutions of the Fly River: indeed tailings are dumped directly in the river because the topography did not allow construction of a safe tailings dam.
- 2000 was the first full year of production at Batu Hijau copper mine on Sumbawa Island, Indonesia, one of the most expensive mining projects ever (US\$ 1.83 billion), owned at 80% by Newmont and Sumitomo and completed ahead of schedule and within budget!

#### 4. Exploration: still in the doldrums in spite of a few bright successes

Exploration spending continued at low levels during 2000 due, among others, to the low gold price. As a matter of fact, total expenses were 4% lower than those of 1999, already at an alarming level. Related to the record year 1997, they dipped 50%. Total spending is estimated at US\$ 2600 million. The analysis of total exploration expenses from 1994 to 2000 for more than 600 companies representing over 90% of these expenses shows the distribution of Table 5.

Regarding the distribution of mining investments by country or province, Nevada would be first, followed by Chile, Ontario and Peru. All that resulted in a lack of funding for junior companies and a reluctance to invest by gold-oriented companies.

Table 5: Exploration expenses 1994-2000.

	1994	1995	1996	1997	1998	1999	2000
<b>Total expenses (in '000 US\$)</b>	2100	2940	4600	5050	3500	2700	2600
<b>Geographic distribution of exp. in % :</b>							
USA	16%		10%	9%	8.6%	10%	10%
Australia	21		19	17	17.5	19	17.3
Latin America	26		27	29	29	29	28.2
Canada	14		13	11	11	11	15
SE Asia-Pacific region	8		12	11	9.4	8	8.5
Rest of the world (incl. Africa →1995)	15		7	7	7.4	8	8.4
Africa (from 1996 on)			12	17	17.5	15	12.6
<b>Yearly progression in %</b>	+24	+40	+56	+10	-31	-23	-4

Latin America remained geographically the top destination, down by \$ 57 million, Australia was sharply down by \$ 90 million (-18%), Africa down by 25%. Canada was the only one to reverse the trend with \$ 38 million more than in 1999 (+12%). However, some discoveries were made or advertised in 2000 :

- The Cu-Mo Magistral deposit in Peru;
- Boyangan porphyry copper (Cu-Au) in the Philippines;
- Several zinc finds in Ireland;
- Gold at Meadowbank and Hope Bay in Arctic Canada;
- Barrick Gold almost trebled its reserves at its Bulyanhulu gold mine in Tanzania, but announced it was deferring development of its Pascua-Lama project on the Chilean-Argentinian border, because of the low gold price;
- Mention should also be made of the continuous search for diamonds in Canada and Mauritania and of the interest for platinum group metals in Ontario.

As a matter of fact, the low prices for gold and silver did not help much exploration and discouraged several projects while hitting those countries heavily dependent on the metals. By contrast, PGMs enjoyed a strong demand and spiralling prices (Pt at US\$ 630/oz), especially for palladium whose price has tripled over the last two years, reaching over US\$ 1000/oz.

The tungsten market was also buoyant because of reduced output in China (who enjoys almost a monopoly) where wolframite reserves are depleted faster than new discoveries are made. Indeed a Chinese official said that wolframite now represents only 27% of the Chinese tungsten reserves, with only 600,000 t of wolframite left, which is hardly 10-12 years of supply left. Output in 2000 was only 39,000 t against 53,000 t in 1999. The alternative Chinese source for tungsten is scheelite, but Chinese deposits have grades which make them uneconomic at current prices and furthermore that scheelite is associated with other metals, thus requiring more processing. The situation for tantalum was already exposed here above.

##### 5. Metal prices in 2000 : from hope to disillusion, only platinum glitters

Back in January 2000, optimism was considerable because most metal prices were recovering from their cyclical lows. Nickel had doubled at US\$ 8500/t, zinc closed 32% up at US\$ 1235/t, copper and aluminium rose by 27% and 25%, tin by 18%, only lead was disappointing with 5% up. Unfortunately it did not last and mounting concerns about the slowing down

of the US economy and its ability to fuel metal demand pushed the prices of base metals lower, in spite of the strong fundamentals for many of them. At the end of the year, nickel had lost 20% at US\$ 6800/t, zinc and tin 15% (resp. US\$ 1043/t and \$ 5200/t). Aluminium, copper and lead fared better, falling respectively 4.1% (US\$ 1580/t), 3.2% (US\$ 1870/t) and 2.6% (US\$ 582/t). Curiously, the falls in prices were not matched by rising stocks as is usual. In fact, they fell significantly on the LME, copper stocks even decreasing from 790,000 t at the end of 1999 to 357,000 t at the end of 2000 (-120%). Nickel stocks declined 79%, aluminium 58%, zinc 30% and lead 26%.

Platinum group metals were already mentioned. One reason for the very strong increase of the palladium price is that the Russian deliveries from Norilsk, by far the main world producer, remained quite erratic and unreliable.

##### 6. Research and development

The main efforts here were directed towards the development of technologies favourable to environment and to improvements in productivity. For the former, much work was devoted to hydrometallurgical processing of base metals (which suppresses the need for smelting), particularly with nickel producers. Biotechnology attracted much attention and one company, Billiton, is hoping to use in a near future its proprietary biotechnology to process not only copper, but also nickel and zinc ores.

In open-pit operations, the quest for greater productivity ended in building larger and more reliable machinery, like haulage trucks with capacities in excess of 360 t. Underground, Inco achieved in November at Sudbury, one of the world's first computer network-controlled blast from surface. Remote mining permits much better equipment use and improvements up to 50% have been achieved in tunnelling and drifting while employing less people underground.

Regarding safety underground, there is still a major concern in the coal industries in China and Ukraine. In China more than 5,300 coal miners lost their lives in 2000 (some say 10,000) and the government took several measures during the year aiming at tighter regulations and better safety.

Among them, the closing of 19,000 of the remaining 40,000 coal mines (31,000 were already closed in 1999). Most of the small operations are devoid of any safety system or equipment. And coal mining in China is dominated by underground operations (93% of the output).

Table 6: Percent of coal in the primary energy consumption and production of coal in 1999.

Country : rank in % consump.	% of prim. energ. consump. in coal	Prod. of coal in Mt oil equiv. (oe)	Rank production
1. South Africa	76	117	5th
2. China	70	512	2nd
3. Poland	66.7	73	7th
4. India	54	144	4th
5. Czech Rep.	45.5	21	17th
6. Australia	44.2	150	3rd
7. Kazakhstan	44	30	13th
8. Turkey	44	24	14th
9. Ukraine	28	42	9th
10. USA	24.6	581	1st
Germany	24.3	60	8th
Russia	18	113	6th
Japan	18	2.6	-
UK	16	23	16th
France	5.5 (nucl. 40.4%)	3.3	-
Switzerland	0.4	-	-
European Union	14.5	106	
OECD	21.3	1010	
World	25	2103	

In 1988 USSR produced 365 Mtoe (775 Mt coal) and was the 3<sup>rd</sup> world producer.

There are around 600 state-owned large mines with an average output of 785,000 t/y and 1800 medium-sized provincial mines (average output 109,000 t/y) and 30,000 (?) village mines (output of 6-7000 t/y). But the small mines still account for 25-30% of the production. Productivity is very low, at best 1.8 t/manshift (0.8t/manshift in provincial mines) against 19t/manshift in Australia and even more in the US. The main problem is that China depends on coal for more than 70% of its primary energy (see Table 6), which in such an under-developed system entails an enormous pollution. It was planned to cut production by 120 Mt in 2000, after already a drop of over 200 Mt (or 18%) in 1999 (down to 1050 Mt), but the blaze of oil prices could question that policy. Chinese coal production culminated in 1996 with 1400 Mt. Reserves are estimated at 1000 billion tonnes.

#### 7. Environmental blues: bad climate and bad mood

It is unfortunate, but true, to say that the attention of the international news media is only attracted in mining when safety or environmental problems do occur. In January 2000 a tailings spill occurred at Baia Mare in NW Romania, when 50-100 t of cyanide from a gold tailings retreatment project leaked in the drainage system and led to the contamination of a river flowing through Hungary as far as the Danube in Serbia. There was naturally an international outcry in the media and the Hungarian government launched a legal suite for compensation against the project operator, the Australian junior company Esmeralda. An EU-led task force is to prepare a new legislation in the EU to prevent such accidents in the future. An UN report into Baia Mare also drew attention to existing pollution by heavy metals in the region, as a result of past ill-considered mining activities.

The global warming debate is still hot and, among others, coal miners are in the line of sight. The Hague conference in November 2000 failed to reach agreement on how to take

measures to combat global warming. This happened largely because of disagreements between the UE and the US (strongly supported by Australia, Canada, Japan and, behind the scenes, by China) on the extent to which industrialised nations should tackle the problem of cutting greenhouse gas emissions. The Kyoto Protocol (1997) calls for developed countries to cut by 2010 their greenhouse gas emissions (mainly CO<sub>2</sub>) by an average of 5% from 1990. To come into force, the Protocol must be ratified by 55 countries which account collectively for 55% of the emissions. Now, we are far from it at present, particularly as the new American president has decided not to present it to ratification. But many other countries have not done so as yet. The main problem is that the US, with around 4% of the world's population, consumes 26% of the world energy and contributes 25% of CO<sub>2</sub> emissions and that in Kyoto it pledged to cut its emissions by 7% (see table 7). With its burgeoning economy in the '90s, the US seem far away from the target, hence the actual reluctance to comply with it and the fact that it is not popular in the US with the industry, population and non-nuclear (mostly coal-burning) utilities.

It should also be recalled that Canada and particularly Australia are major coal exporters and these were not too concerned by the failure of the Hague conference: Australia is the world's leading exporter of coal with annual shipments of some 170-175 Mt worth about US\$ 4.6 billion and its aluminium sector, which relies heavily on coal-fired power, accounts for 10% of world aluminium production. And Australia was permitted to increase its emissions by 8% above the 1990 level. On the other hand, among those disappointed by the lack of agreement: the European Union, the world's leading uranium producers (Canada and Australia) and the nuclear industry in general because the debate has so far provided no positive answer for nuclear power as a source of clean energy.

Table 7: A few data about CO<sub>2</sub> emissions: some of the principal CO<sub>2</sub> polluters.

Country	Emissions in 1997(in Mt)	1990-'97 variation in %	Planned cut between 1990 and 2010 (in %)	Per capita prod. of CO <sub>2</sub> in t CO <sub>2</sub> /cap./year
USA	5470	+ 12.2	-7	20 t
China	3162	+ 32	-no pledge	2.6 t
Eur. Union	3209	0	-8	8.6 t
Russia	1456	-37	0	10 t
Japan	1172	+10.4	-6	9.3 t
Germany	884	-9.9	-21	11 t
France	363	-4	0	6 t
Spain	254	-18.1	+15	6.5 t
Italy	408	+ 5		7.1 t
UK	517	+ 5		8.8 t
Switzerland	40	+ 5	-8?	5.6 t
India	~700	+43	-no pledge	~ 0.8 t

So were also US or other industries involved in the international fight against global warming by building new clean power stations, especially in Asia and Latin America. Without a clarification of the guidelines of the Kyoto Protocol, there might be no such investment commitments.

#### 8. Let us all dialogue, maybe something will come out of it

The mining industry seems to have at last understood that it had a bad image in the public and that there was a urgent need to talk with its detractors. There was also a growing understanding that shareholders are not the only group that a company must take account of, notably in environmental and social issues. Moreover, the fantastic revolution in communications and information has ensured that companies can no longer be so secretive about their activities, because, among others, they came to realise that investors (banks, pension funds, insurances...) are more and more interested in their past record of social and environmental responsibility, and not only in the size, value and return of their properties.

A «Global Mining Initiative» was launched two years ago by 27 of the world's leading mining companies which sponsored a major study called «Mining, Minerals and Sustainable Development». The results of the study will be presented in early 2002, to coincide with the 10<sup>th</sup> anniversary of the Rio de Janeiro Earth Summit.

#### 9. The year ahead (2001): we still need our umbrellas, the sky is covering.

For much of 2000, the main focus of metal markets concerned the signs of a slowdown in the US economy. There is no doubt that US economic growth has considerably slowed and the conjecture has been whether landing, after the dynamic Clinton years, will be soft or hard, provided there is no crash! As metals and minerals producers are among the first to feel the impact, optimism is rather out of place. However, on the other hand, the aftermath of the Asian economic crisis and mergers, acquisitions and restructurations have made the industry leaner and fitter and it could probably weather, at least for the large companies, a strong slowdown or even a mild recession. Moreover, because of the industry's fundamentally cyclical character, economic cyclicality is normally factored into its decisions and plans, more than in other industries. But there will obviously be

some casualties among the marginal or too small producers. Unfortunately, if victims there must be, it will at first be on grass-root exploration, even if work on the most promising projects will certainly continue.

As for mining investments, political, physical and environmental, as well as economic, risks have to be considered. Thus, in Congo and Angola physical insecurity, in Zimbabwe the challenge to judiciary, probably are far greater deterrents to investments than the price of copper, gold or platinum. In the Asia-Pacific region and in ex-Soviet Asian republics, political risks can be a crucial factor, whereas in North America this can proceed from harsh environmental regulations and the social impact of mining. On the other hand, in those countries without any unfavourable prejudice and where rules and regulations are clearly spelled out, the investment will continue to flow regularly: Ireland, Spain, Finland, Sweden in the EU and several developing countries like, possibly, Iran. South America offers some of the best enabling environments and Brazil, Chile, Argentina and Peru are likely to attract opportunities for major mining investment.

For exploration, where the investment commitment is much smaller, Indonesia and the Philippines, despite their political unrest, remain good targets simply because of their high geological potential, as demonstrated by recent discoveries.

So far no mention was made of two giants, and what is more the world's two most populous countries, China and India, who, together, account for 35% of the world's population. If both remain rather locked, they enjoyed a rapid economic growth and are net importers of several key commodities. And both need imperatively to attract foreign investment and know-how to their mining sectors. However, their time will probably not yet come in 2001.

#### References

- Most informations are drawn from various issues of Mining Journal in 2000, notably those of the end of the year.
- A large part of the information on China is extracted from an anonymous paper - Chinese progress, Mining Magazine, Dec. 2000, p. 246-254.
- A part of chapter 2 (§ 2.3) is inspired by a paper by C. Hinde - Mining whispers, Mining Magazine, Dec. 2000, p. 242.
- Data on coal largely come from BPA moco's 2000 statistical review of world energy.

## →→→FORTHCOMING EVENTS→→→

★ marks a new entry

2001

May 17-19

NEW DEVELOPMENTS IN METALLIFEROUS HYDROTHERMAL SYSTEMS, Jupiter Hotel, Townsville, Queensland, Australia – Contact address: Lucy Chapman, Manager, Economy Geology Research Unit, School of Earth Sciences, James Cook University, Townsville, Queensland, 4811, Australia; phone: + 61 7 4781 4726; fax: +61 7 4725 1501; e-mail: lucy.chapman@jcu.edu.au; web-site: <http://www.es.jcu.edu.au/soseg>

May 23-25

37TH FORUM ON THE GEOLOGY OF INDUSTRIAL MINERALS 2001, Victoria, B.C., Canada - Contact address: for technical program George Simandl, B.C. Geological Survey; phone:+1 250 952 0413; fax: +1 250 952 0381; e-mail: [George.Simandl@gems2.gov.bc.ca](mailto:George.Simandl@gems2.gov.bc.ca); for registration Susan Dunlop, CEOR, University of Victoria; phone:+1 250 472 4347; fax: 1 250 472 4100; e-mail: [sdunlop@uvic.ca](mailto:sdunlop@uvic.ca)

May 27-30

GEOLOGICAL ASSOCIATION OF CANADA - MINERALOGICAL ASSOCIATION OF CANADA, JOINT ANNUAL MEETING, St John's, Newfoundland, Canada – Contact address: phone: +1 709 729 4014; e-mail: [dgl@zeppo.geosurv.gov.nf.ca](mailto:dgl@zeppo.geosurv.gov.nf.ca); web-site: [www.geosurv.gov.nf.ca](http://www.geosurv.gov.nf.ca/listserv@morgan.ucs.mun.ca)

May 28-31

6TH INTERNATIONAL SYMPOSIUM ON MINING IN THE ARCTIC, "MINING AND MAN", Nuuk, Greenland - Contact address: 6th International Symposium on Mining in the Arctic, Bureau of Minerals and Petroleum, Government of Greenland, P.O. Box 930, DK-3900 Nuuk, Greenland; phone: +299 34 68 00; fax: +299 32 43 02; e-mail: [bmp@gh.gl](mailto:bmp@gh.gl); website: [www.bmp.gl](http://www.bmp.gl) (see page 16)

June 10-15

10TH INTERNATIONAL SYMPOSIUM ON WATER-ROCK INTERACTION, Sardinia, Italy - Contact address: Rosa Cidu, Dipartimento di Scienze della Terra, via Trentino 51, 1-09127 Cagliari, Italy; e-mail: [cidur@unica.it](mailto:cidur@unica.it)

June 19-20

XX CURSO INTERNACIONAL DE POSTGRADO EN METALOGENIA, Quito, Ecuador – Contact address: Ing. Pedro Espín M., Director Curso Internacional de Metalogenia; phone: +593 2 557 814; fax: +593 2 566 738; e-mail: [isfigempa@andinanet.net](mailto:isfigempa@andinanet.net); website: [http://www.unige.ch/sciences/terre/mineral/min\\_ore.html](http://www.unige.ch/sciences/terre/mineral/min_ore.html)

★ June 19-22

17TH INTERNATIONAL MINING CONGRESS AND EXHIBITION OF TURKEY, Ankara, Turkey – Contact address: Bahtiyar Unver, Co-Chairman, Organizing Committee, Department of Mining Engineering, Hacettepe University, Beytepe Ankara, 06532 Turkey; phone: +90 312 297 7696; fax: +90 312 299 2155; e-mail: [unver@hacettepe.edu.tr](mailto:unver@hacettepe.edu.tr); website: [www.mining-eng.org.tr](http://www.mining-eng.org.tr)

★ June 20-22

6TH INTERNATIONAL SYMPOSIUM CONTINUOUS SURFACE MINING (ISCSM 2001), Freiberg, Germany – Contact address: Freiberg University of Mining & Technology, Institute of Mining Engineering, Gustav-Zeuner-Strasse 1, D-09596 Freiberg; phone: +49 3731 392 893 or 3482; fax +49 3731 392 524; e-mail: [bergbau@mabb.tu-freiberg.de](mailto:bergbau@mabb.tu-freiberg.de); website: [www1.tu-freiberg.de/~wwwgeoli/bergbau.html](http://www1.tu-freiberg.de/~wwwgeoli/bergbau.html)

June 25-July 1

THE SWEDISH MINING ASSOCIATION, INTERNATIONAL CONFERENCE "SECURING THE FUTURE", Skellefteå, Sweden – Contact address: Expolaris Kongresscentret, SE-931 78 Skellefteå, Sweden; phone: +46 910 736 000; fax: +46 910 736 010; e-mail [kongresscenter@skelleftea.se](mailto:kongresscenter@skelleftea.se)

★ July 7-12

NEW PARADIGMS FOR THE PREDICTION OF SUBSURFACE CONDITIONS: Euroconference on the characterisation of the shallow subsurface: implications for urban infrastructure and environmental assessment, Spa, Belgium - Contact address: Dr. J. Hendekovic, European Science Foundation, 1 quai Lezay-Marnésia, 67080 Strasbourg Cedex, France; phone: +33 388 76 71 35; fax: +33 388 36 69 87; e-mail: [euresco@esf.org](mailto:euresco@esf.org); website: <http://www.esf.org/euresco>

★ July 8-12

FIELD WORKSHOP ON ILMENITE DEPOSITS in the Rogaland Amorthosite Province, S. Norway – Contact address: B. Robins, Department of Geology, Allégt. 41, 5007 Bergen-University, Norway; e-mail [brian.robins@geol.uib.no](mailto:brian.robins@geol.uib.no); website: [www.ngu.no/prosjekter/Geode/index.htm](http://www.ngu.no/prosjekter/Geode/index.htm)

★ July 10-13

CHALLENGES OF A CHANGING EARTH: Global Change Open Science Conference, Amsterdam, The Netherlands – Contact address: Conference Secretariat, Congrex Holland BV, P.O. Box 302, 1000 AH Amsterdam, The Netherlands; phone: +31 20 5040 208; fax: +31 20 5040 225; e-mail: [igbp@congreg.nl](mailto:igbp@congreg.nl); website: <http://www.scicong.igbp.kva.se>

★ July 14-18

ENVIROMIN 2001: ENVIRONMENTAL AND HEALTH ASPECTS OF MINING, REFINING AND RELATED INDUSTRIES, Kruger National Park, South Africa - Contact address: website: <http://www.niwl.se/kemi/enviromin>

★ July 22-28

12TH INTERNATIONAL CLAY CONFERENCE. Bahía Blanca, Argentina – Contact address: Fernanda Cravero, Secretary-General 12 ICC, Departamento de Geología, Universidad Nacional del Sur, 8000 Bahía Blanca, Argentina; phone: +54 291 459 51 01 ext. 30 41; fax: +54 291 459 51 48; e-mail: [12icc@criba.edu.ar](mailto:12icc@criba.edu.ar); website: <http://www.12ICC.criba.edu.ar>

★ July 29-August 2

BIOGEOCHEMISTRY OF TRACE ELEMENTS, 6th International Conference, University of Guelph, Guelph, Ontario, Canada – Contact address: ICOTTE Secretariat, Department of Land Resource Science, University of Guelph, Guelph, Ontario, Canada N1G 2W1; phone: +1 519 824 4120 ext. 2531; fax: +1 519 823 1587; e-mail: [icobte@lrs.uoguelph.ca](mailto:icobte@lrs.uoguelph.ca); website: <http://www.icobte.crie.uoguelph.ca>

August 18-25

*SGA-Cosponsored*

PALEOZOIC GEODYNAMICS AND INTRUSION-RELATED AU DEPOSITS IN THE ALTAIDS (KYRGYZSTAN), IGCP-373 field conference and excursion, Bishkek, Kyrgyzstan - Contact address: Reimar Seltmann, Natural History Museum, Dept. Mineralogy, Cromwell Road, London SW7 5BD, UK; phone: +44 207 942 5042; fax: +44 207 942 5537; e-mail: [rs@nhm.ac.uk](mailto:rs@nhm.ac.uk); web-site: <http://www.nhm.ac.uk/mineralogy/seltmann/IGCP/index.html>

August 19-24

GORDON CONFERENCE, Gordon Research Conference "Formation, Modification and Preservation of Ore Deposits", focusing on geochemical aspects of tectonic, climatic and surficial processes, Proctor Academy, New Hampshire - Contact address: website: [www.grc.uri.edu](http://www.grc.uri.edu) click on 2001 Meetings, "Inorganic Geochemistry" for session and speaker updates; Jeff Hedenquist e-mail: [Gordongeochem@aol.com](mailto:Gordongeochem@aol.com) (see page 21)

August 26-29

*SGA-Cosponsored*

6TH SGA BIENNIAL MEETING JOINTLY ORGANIZED WITH SEG, Kraków, Poland - Contact address: Secretary - Dr. Adam Piestrzynski, University of Mining and Metallurgy, av. Mickiewicza 30; 30-059 Kraków, Poland; phone: +48-12-6172433; fax: +48 12 6332 936; e-mail: [piestrz@geol.agh.edu.pl](mailto:piestrz@geol.agh.edu.pl); web-site: <http://galaxy.uci.agh.edu.pl/~sga> (see page 24)

August 31- September 12

FIELD EXCURSION TO THE SKAERGAARD INTRUSION, East Greenland. Sponsored by the Camborne School of Mines, IGCP Project 427, and affiliated with the 6th Biennial SGA Meeting - Contact address: Dr. Jens C. Andersen, Camborne School of Mines, University of Exeter, Redruth, Cornwall, UK; phone: +44 1209 714866; fax: +44 1209 716977; e-mail: [andersen@csm.ex.ac.uk](mailto:andersen@csm.ex.ac.uk); web-site: <http://www.ex.ac.uk/CSM/news/conf.htm>

★ September 3-5

ICAMC 2001, 14TH INTERNATIONAL CONFERENCE ON AUTOMATION IN MINING, Tampere, Finland - Contact address: ICAMC 2001, Tampere Conference Service Ltd., P.O. Box 630 (Koskikatu 9 B), Fin-33101 Tampere, Finland; phone +358 3 366 44 00; fax: +358 3 222 64 40; e-mail: [registration@conference.fi](mailto:registration@conference.fi) (ref. ICAMC); website:

<http://www.hut.fi/events/icamc2001/>

#### September 6-8

CL 2001 CATHODOLUMINESCENCE IN GEOSCIENCES: new insights from CL in combination with other techniques, Freiberg, Germany - Contact address: CL 2001 Secretariat Freiberg University of Mining and Technology, Department of Mineralogy, Brennhausgasse 14, D-09596 Freiberg, Germany; phone: +49 3731 392 628; fax: +49 3731 393 129; Jens G'tze e-mail: goetze@mineral.tu-freiberg.de or Ulf Kempe e-mail: kempe@mineral.tu-freiberg.de; website: <http://www.mineral.tu-freiberg.de/info/local/wissterm.html> (see page 20)

#### September 10-14

IIMP, MINING: SOCIETY AND DEVELOPMENT, Arequipa, Peru - Contact address: IIMP, Los Canarios 154, Lima 12, Peru; phone: +51 1 349 42 62; fax: +51 1 349 37 21; e-mail: conmin@amauta.rcp.net.pe

#### ★ September 5-7

7TH INTERNATIONAL KAZAKHSTAN MINING & METALLURGY EXHIBITION AND CONFERENCE (KazMin-KazMet 2001), Atakent Exhibition Centre, Almaty, Kazakhstan - Contact address: ITE Group Plc., Industrial Division, Mr. Oleg Netchaev, Project Manager; phone: +44 20 7596 5213; fax: +44 20 7596 5128; e-mail: oleg.netchaev@ite-exhibitions.com; website: <http://www.ite-exhibitions.com>

#### September 9-14

SOCIETY OF EXPLORATION GEOPHYSICISTS (SEG), INTERNATIONAL EXPOSITION AND 71ST ANNUAL MEETING, San Antonio, TX, USA - Contact address: SEG Business Office; phone: +1 918 497 5500; fax: +1 918 497 5557; website: <http://seg.org>

#### ★ September 10-16

3RD ANNUAL GEODE-FENNOSCANDIAN SHIELD FIELD WORKSHOP ON PALAEOPROTEROZOIC AND ARCHAEOAN GREENSTONE BELTS AND VMS DISTRICTS IN THE FENNOSCANDIAN SHIELD, Russian Karelia - Contact address: State Company "Mineral", Veselnaya Street 6, 199106 St. Petersburg, Russia or Institute of Geology of Karelian Research Centre Russian Academy of Science, Pushkinskaya Street, 11, 185610 Petrozavodsk, Karelia, Russia; e-mail: frank@DF3136.spb.edu; website: <http://www.gl.rhbnc.ac.uk/geode/>

#### September 17-19

MINEFILL 2001, THE 7TH INTERNATIONAL SYMPOSIUM ON MINING WITH BACKFILL, Seattle, WA, USA - Contact address: SME, Meetings Department, P.O. Box 625002, Littleton, CO 80162-5002, USA; phone: +1 303 973 9550; fax: +1 303 979 3461; e-mail: meetings@smenet.org; website: <http://www.smenet.org>

#### ★ September 20-22

XXI REUNION ANUAL DE LA SOCIEDAD ESPAÑOLA DE MINERALOGÍA, Sessions and field trips on ore deposits, Malaga, Spain - Contact address: Dr. Emilio Galan Huertos, Dpto. Cristalografía, Mineralogía y Q. Agrícola, Facultad de Química, Universidad de Sevilla, Campus de Reina Mercedes, Aptdo. 553, 41071-Sevilla; phone: +34 954 625 060; fax: +34 954 557141; e-mail: egalan@cica.es

#### ★ September 23-26

II INTERNATIONAL CONFERENCE, METALS IN THE ENVIRONMENT, Vilnius, Lithuania - Contact address: II international Conference, Lithuania, "Metals in the Environment", Institute of Geology, Sevcenkos 13, 2600 Vilnius, Lithuania, Kestutis Jokas phone: +370 2 729 291; fax: +370 2 729 245; e-mail: kestutis.jokas@geo.lt or Rimantė Zinkutė phone: +370 2 235 409; fax: +370 2 236 710; e-mail: zinkute@geologin.lt

#### September 24-26

MINPET 2001, Vienna, Austria - Contact address: Sekretariat: Christine Strobl, Institut für Petrologie, Universitaet Wien - Geozentrum, Althanstrasse 14, A-1090 Vienna, Austria; phone: +43 1 4277 533 01; fax: +43 1 4277 95 33; e-Mail: oemg.mineralogie@univie.ac.at

#### ★ September 24-28

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4TH INTERNATIONAL ARCHAEOAN SYMPOSIUM, Perth, Australia - Contact address: Dr. Susan Ho, Secretary 4th International Archaeoan Symposium, PO Box 80, Bullcreek WA 6149, Australia; phone: +61 8 9332 7350; fax: +61 8 9310 6694; e-mail: susanho@geol.uwa.edu.au; web-site: <http://redback.geol.uwa.edu.au/~ias/general.html>

#### October 1-5

7TH ANNUAL EUROPEAN METALLOGENY SHORT COURSE, Brest, France - Contact address: Yves Fouquet, DRO/GM, Centre Ifremer de Brest, BP 70, 29280 Plouzané Cedex, France; phone: +33 2 982 242 54; fax: +33 2 982 245 49; e-mail: fouquet@ifremer.fr (see page 20)

#### ★ October 21-24

3RD SOUTH AMERICAN SYMPOSIUM ON ISOTOPE GEOLOGY, Pucon, Chile - Contact address: The organizing committee, III SSAGI, Laboratorio SERNAGEOMIN, Til-Til 1993 Nuñoa, Santiago, Chile; phone: +56 2 238 5292; fax: +56 2 238 5332; e-mail: ssagi@sernageomin.cl; web-site: <http://www.sernageomin.cl/ssagi>

#### October 28-November 3

EPITHERMAL GOLD MINERALIZATION AND MODERN ANALOGUES FIELD TRIP, Kyushu, Japan - Contact address: The Society of Economic Geologists, Inc., 7811 Shaffer Parkway, Littleton, CO 80127; phone: +720 981 7882; fax: +720 981 7874; e-mail: seg@segweb.org

#### ★ November 1-10

GEOLOGICAL SOCIETY OF AMERICA (GSA)/SOCIETY OF ECONOMIC GEOLOGISTS (SEG) ANNUAL MEETING, Boston, MA, USA - Contact address: GSA Meetings, Box 9140, Boulder, CO 80301-9140, USA; phone: +1 303 4472 020; fax: +1 303 4470 646; e-mail: meetings@geosociety.org; web-site: <http://www.geosociety.org/meetings/index.htm>

#### ★ December 3-4

3RD FENNOSCANDIAN EXPLORATION AND MINING, Rovaniemi, Arktikum, Finland - Contact address: Rovaniemi-Lapland Congresses, University of Lapland, P.O. Box 122, Fin-96101 Rovaniemi, Finland; phone: +358 16 341 2960; fax: +358 16 341 2951; e-mail: congres@urova.fi

### 2002

#### ★ January 27-30

TAILINGS AND MINE WASTE '02, Fort Collins, CO USA - Contact address: Linda L. Hinshaw, Dept. of Civil Engineering, Colorado State University, Fort Collins CO 80523-1372 USA; phone: +1 970 491 60 81; fax: +1 970 491 35 84/77 27; e-mail: lhinshaw@engr.colostate.edu; website: <http://www.tailings.org>

#### ★ February 25-27

SOCIETY FOR MINING, METALLURGY AND EXPLORATION (SME), ANNUAL MEETING, Phoenix, AZ, USA - Contact address: William Wilkinson Jr., Phelps Dodge Mining Co., 2600 N., Central Ave., Phoenix, AZ 85004, USA; phone: +1 602 234 60 80; fax: +1 602 234 48 47; e-mail: wwilkinson@phelpsd.com

#### ★ March 10-13

PROSPECTORS & DEVELOPERS ASSOCIATION OF CANADA, Annual Convention, Toronto, Canada - Contact address: PDAC, 34 King Street East, 9th Floor, Toronto, Ontario, Canada M5C 2X8; phone: +1 416 362 19 69; fax: +1 416 362 01 01; e-mail: info@pdac.ca; website: <http://www.pdac.ca>

#### April 14-17

5TH INTERNATIONAL GOLD SYMPOSIUM, Lima, Peru - Contact address: National Mining Oil and Energy Society (SNMPE); fax: +51 14 60 1616; e-mail: cmendoza@snmpe.org.pe

#### ★ April 21-24

15TH INDUSTRIAL MINERALS: INTERNATIONAL CONGRESS, Meridien Etoile, Paris, France - Contact address: Industrial Minerals Conference Department, Park House, Park Terrace, Worcester Park, Surrey, KT4 7HY, UK; phone: +44 207 827 99 77; fax: +44 208 335 39 94 or 337 89 43; e-mail: conferences@metalbulletin.plc.uk; website: <http://www.mineralnet.co.uk>

#### ★ July 22-27

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11TH IAGOD QUADRENNIAL SYMPOSIUM/ GEOCONGRESS 2002, Windhoek, Namibia - Contact address: The Secretary IAGOD/GEOCONGRESS 2002, P.O. Box 44283, LINDEN 2104, SOUTH AFRICA; web-site: <http://www.wits.ac.za/gssa> (see page 22)

#### ★ August 17-23

12TH V.M. GOLDSCHMIDT CONFERENCE, Davos, Switzerland - Contact address: Prof. A. Halliday, Institut für Min. und Petrographie, ETH-Zentrum, CH-8092, Zürich Switzerland; e-mail: halliday@erdw.ethz.ch; website: <http://gs.wustl.edu/conferences/>

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# ANNOUNCEMENT

## Global Exploration 2002 Integrated Methods for Discovery



**T**he Society of Economic Geologists, in collaboration with the Society for Geology Applied to Mineral Deposits (SGA), the Association of Exploration Geochemists (AEG), and the Society of Exploration Geophysicists, will convene **Global Exploration 2002 — Integrated Methods for Discovery** in April 2002. The meeting is a sequel to the highly successful 1993 **Integrated Methods in Exploration and Discovery** conference. The 2002 meeting, like its predecessor, will emphasize the effective integrated use of a variety of exploration tools and techniques for discovery. The venue will be Denver, Colorado, USA.

### TECHNICAL SESSIONS

The 2002 meeting promises an exceptional technical program with select speakers discussing some of the great mineral deposits and districts of the world. All technical papers will be invited. There will be a single-track program, with fewer papers of better quality and greater length than at most meetings. Emphasis for all presentations will be the integration of geology, geochemistry, and geophysics. Four keynote addresses will highlight some of the best new thinking in mineral exploration. Technical sessions have been organized around six half-day theme sessions entitled:

- **Four-Dimensional Portraits of Giants**
- **Case Studies – Regional Exploration**
- **Case Studies – District Exploration**
- **In the Shadow of Headframes – Exploration in Old Districts**
- **Under the Covers – Exploration for Hidden Deposits**
- **The Dollars and Sense of Exploration**

### POSTER AND CORE PRESENTATIONS

These will be integral to the technical program. Presentations will be given during dedicated time periods to maximize the exchange between presenters and meeting participants. Poster presentations will be selected with an emphasis upon attracting contributions from students. Core displays will complement many of the technical and poster presentations.

### FIELD TRIPS

Field trips will be conducted in connection with the conference and include:

- **Zacatecas, Mexico**
- **Carlin Trend Gold Deposits, Nevada**
- **Porphyry Copper Deposits, Arizona-Sonora**
- **Sudbury, Ontario**
- **Cripple Creek, Colorado**
- **Kelsey Lake, Colorado**

The Carlin Trend and Arizona-Sonora porphyry copper field trips will highlight the use of integrated data sets in the field.

### WORKSHOPS

Workshops will be offered on Giant Ore Deposits, Exploration Technology, GIS, and Diamonds.

### PUBLICATION

A high-quality volume of technical papers will be distributed to participants at the conference. Authors will be required to submit an extended abstract for the meeting program and a complete manuscript for the conference volume.

For further information, go to our website at [www.seg2002.org](http://www.seg2002.org), or contact us at [seg2002@segweb.org](mailto:seg2002@segweb.org)



### — THE SEG ORGANIZING COMMITTEE —

- GENERAL CHAIRMAN - *Bruce Bouley*  
 ASSISTANT GENERAL CHAIRMAN - *Jim Lincoln*  
 TECHNICAL PROGRAM - *William Gee*  
 PUBLICATIONS - *Richard Goldfarb*  
 POSTER SESSION - *Murray Hitzman* • FIELD TRIPS - *Jim Cappa*  
 WORKSHOPS - *Craig Beasley* • FACILITIES - *Geoff Snow*  
 EXHIBITS - *Bob Wilson* • PUBLICITY - *Chuck Thorman*  
 FUND RAISING - *Roger Newell* • REGISTRATION - *Warren Day*

# ANNOUNCEMENTS

## MEETINGS, CONFERENCES, FIELD TRIPS AND SHORT-COURSES

### SVECOFENNIAN FIELD TRIP

18-25 August, 2001

8 day pre-conference SGA-SEG field trip

**Itinerary:** an 8 day trip to 3 of the most important zinc, lead, copper, gold and iron mineral provinces in Sweden and Europe. 3 days in the Early Proterozoic Skellefte mining district visiting volcanic-hosted massive sulfide deposits and regional outcrops. 1 day tour to the Paleozoic Laisvall sandstone hosted lead-zinc deposit in the Swedish Caledonides. 3 days in the Early Proterozoic Norrbotten mineral province, including Visits to the giant Kiruna and Malmberget magnetite-apatite iron deposits and the giant Aitik copper-gold deposit.

**Field trip leaders:** Rodney Allen (Volcanic Resources Limited and Lulea University) and Olof Martinsson (Lulea University).

Cost estimate has not yet been determined.

#### Contacts:

Rodney Allen  
Volcanic Resources Limited  
Guldgatan 11  
S-936 32 Boliden  
Sweden  
Tel+Fax: +46 910 581 122

Boliden Mineral AB  
Exploration Department  
936 81 Boliden  
Sweden  
Tel: +46 910 774000  
(switchboard)  
+46 (0)910 774339 (direct)  
Fax: +46 (0)910 774285

### CL 2001 CATHODOLUMINESCENCE IN GEOSCIENCES: NEW INSIGHTS FROM CL IN COMBINATION WITH OTHER TECHNIQUES

Freiberg, Germany

6-8 September, 2001

SGA-COSPONSORED

Organized by the Freiberg University of Mining and Technology in collaboration with Ruhr-University Bochum, Germany, Saxon Academy of Sciences

#### SCOPE OF THE CONFERENCE

To assess the state of the art and reliability of cathodoluminescence and related techniques in geosciences.

#### SCIENTIFIC PROGRAMME

Both oral presentations and posters will be presented on the following conference topics:

- New developments in luminescence techniques
- CL applied to Sedimentary Petrology
- CL applied to igneous and metamorphic rocks
- CL studies on extraterrestrial materials
- Luminescence properties of minerals
- Characterization of gemstones by CL
- Advantages of CL in tracing ore and mineral deposits Application of luminescence techniques in archeometry and geochronometry
- Application of CL in Technical and Environmental Mineralogy
- Combination of CL with other advanced analytical techniques

#### PLENARY LECTURES

Keynote speakers have been invited to cover special sessions:

- Recent developments in CL: theory, equipments, and combination with other techniques by M. R. Phillips (Australia)

- CL properties of REE and Mn activated synthetic and natural mineral phases by P. Blanc and D. Ohnenstetter (France)
- CL petrography of magmatic and metamorphic rocks by A. A. Finch (Great Britain)
- Progress in application of CL to sedimentary geology and paleontology by D. K. Richter (Germany)
- Cathodoluminescence microscopy as an effective tool for natural stones characterization: applications to archaeometric studies by V. Barbin (France)

#### Deadlines

- Submission of camera ready abstracts 31 March 2001
- Acceptance of abstracts and final program 01 June 2001
- Registration 15 June 2001
- Hotel reservation 15 June 2001
- Latest poster registration (without abstract publication) 31 July 2001

#### Registration fees

Congress registration before 15 June 2001 after 15 June 2001

Full member 300 DM 350 DM

Student member 100 DM 150 DM

(documentation required)

Conference Dinner 50 DM

Lunch (6-7-8 September) 25 DM per day

Some financial support will be provided for DMG student members.

#### Accommodation

The town of Freiberg provides various facilities for accommodation in different categories.

#### Conference venue

The conference will be held in the Freiberg University of Mining and Technology in the immediate vicinity of city of Freiberg.

#### Travel

There are flights to Dresden from major European cities. There is an hourly bus shuttle to the main railway station in Dresden, where trains to Freiberg are leaving half-hourly. The travel from the airport to Freiberg takes about 2-3 hours.

#### Contact

CL 2001 Secretariat, Freiberg University of Mining and Technology, Department of Mineralogy, Brennhausgasse 14, D-09596 Freiberg, Germany; phone: +49 3731 392628; fax: +49 3731 393129, Jens Götze e-mail: goetze@mineral.tu-freiberg.de or Ulf Kempe e-mail: kempe@mineral.tu-freiberg.de; homepage <http://www.mineral.tu-freiberg.de/>

### 7TH ANNUAL EUROPEAN METALLOGENY SHORT COURSE

Brest, France

1-5 October, 2001

UNIVERSITE' DE BRETAGNE OCCIDENTALE - BREST, FRANCE, ECOLE DOCTORALE DES SCIENCES DE LA MER, Institut Universitaire Européen de la Mer, Place Nicolas Copernic, 29280 Plouzané (Brest), France

An in-depth examination with lectures and labs on a spectrum of ore deposits presented by experts from Canada, Germany, Portugal and France. The focus is on up-to-date research on seafloor hydrothermal deposits.

#### PROGRAM:

Days 1 & 2: seafloor hydrothermal systems and their ore deposits.

Day 3: field excursion to Crozon Peninsula: pillow lavas and hyaloclastites.

Days 4 & 5: ancient magmatic and hydrothermal ore deposits.

#### Presented and organized by:

**Steven Scott**,  
Department of Geology  
University of Toronto, Canada  
et IUEM, UBO, France

**Yves Fouquet**  
Centre IFREMER de Brest,  
France, Ecole Doctorale de  
Sciences de la Mer, UBO,  
Brest, France

**Nicholas Arndt**  
Université de Grenoble, France

**Thierry Juteau**  
IUEM, UBO (Brest), France

#### Other invited instructors

Fernando Barriga, University of Lisbon, Portugal  
Harold Gibson, Laurentian University, Sudbury, Canada  
Roger Hekinian, Geomar, Kiel, Germany  
Peter Herzig, Freiberg University, Freiberg, Germany  
Kim Juniper, University of Québec, Montréal, Canada  
Eric Marcoux, University of Orléans, France  
M. Mustin, Centre de Pédologie, Nancy, France  
Maryse Ohnenstetter, CRPG, Nancy, France

#### Sponsors

CNRS, UBO, ESF/GEODE, Ifremer, Région Bretagne, Communauté Urbaine de Brest

Language: English

Students and young researchers are welcome

**Contacts:** *Yves Fouquet*, DRO/GM, Centre Ifremer de Brest, BP 70, 29280 Plouzané Cedex, France; ph.: (33) 2 98 22 42 54; fax: +33 2 98 22 45 49; e-mail: fouquet@ifremer.fr

*Thierry Juteau*, IUEM, Place Nicolas Copernic, 29280 Plouzané, France; ph.: +33 2 98 49 87 11; fax: +33 2 98 49 87 60; e-mail: juteau@univ-brest.fr

## GORDON CONFERENCE ON "INORGANIC GEOCHEMISTRY"

Proctor Academy, New Hampshire, USA

19-24 August, 2001

Gordon Research Conference: Inorganic Geochemistry Formation, modification, and preservation of ore deposits: Tectonic, climatic and surficial factors

Gordon Research Conferences (GRC) are held on a wide variety of subjects, with the goal of generating dialogue among researchers and members of industry through the presentation of cutting-edge advances in an "off-the-record" informal environment. The mineral-deposit community organizes Gordon conferences every four years under the broad title of "Inorganic Geochemistry". This year's conference will highlight research on the generation of some of the world's largest Cu, Au, Ni, Fe, and Mn deposits, particularly processes that influence the modification and preservation of ores and hence their economic viability. This important topic has seen minimal discussion in recent conferences, and we hope that the GRC will provide a venue to review critical applied and fundamental questions related to tectonics, fluid circulation, climate and weathering, bacterial activity, and metal enrichment. Four speakers from the minerals industry will open the conference by highlighting questions related to exploration and development. This will be followed by seven technical sessions (titles of talks listed at [www.grc.uri.edu](http://www.grc.uri.edu) under Inorganic Geochemistry), plus an informal open session on experimental and analytical advances relevant to ore deposits. A final wrap-up discussion will focus on the frontiers and opportunities for research on the broad theme of the conference.

Limited financial assistance will be available for graduate students and young professionals (assistant professors) engaged in research relevant to the theme of the conference. Apply to Jeff Hedenquist ([Gordongeochem@aol.com](mailto:Gordongeochem@aol.com)). Preference will be given

to those presenting posters. To submit a poster for consideration, send a one-page abstract to Jean Cline ([jcline@nevada.edu](mailto:jcline@nevada.edu)). Decisions on acceptance of posters and financial assistance will be made in May.

REGISTRATION FEE (inclusive of room and board): \$595 (double), \$650 (single).

Attendance at Gordon Research Conferences is limited. For further information and to apply to attend, visit the GRC web site, [www.grc.uri.edu](http://www.grc.uri.edu) or contact GRC, University of Rhode Island, PO Box 984, West Kingston, RI, 02982-0984, USA. Fax 1-401-783-7644.

John Thompson, Teck Corporation, Vancouver, and Jeff Hedenquist, Ottawa, co-chairs  
Jean Cline, University of Nevada - Las Vegas, vice-chair

#### SESSION TITLES, CHAIRS, AND SPEAKERS

**Industry Perspective:** Eric Sedorff, Speciality Product Systems  
James Macdonald, Billiton  
Cam Allen, Cominco  
Richard Moore, Falconbridge  
Neil Phillips, Melbourne

**Metal mobility in the natural environment:** Gordon Southam, N Arizona University  
Jill Banfield, Univ Wisconsin  
Charlie Alpers, USGS  
Derek Lovley, Univ Massachusetts

**Climate, tectonics and metal mobility:** Dick Holland, Harvard University  
Jerry Dickens, James Cook University  
Dave Leach, Dwight Bradley, USGS

**Metal enrichment - Cu and Au:** Dick Sillitoe, London  
Paulo Vasconcelos, University of Queensland  
George Brimhall, UC Berkeley  
Phillipe Freysinnet, BRGM

**Tectonics and ore deposits:** Dick Tosdal, University of British Columbia  
Rich Goldfarb, USGS  
Suzanne Kay, Cornell University

**Metal enrichment - Ni, Fe and Mn:** Hiroshi Ohmoto, Penn State University  
Mark Barley, Univ W Australia  
Charles Butt, CSIRO; Nigel Brand, Anglo American;  
Mick Elias, WMC  
Nic Beukes, Rand University

**Paleosurface: Preservation and destruction:** Steve Kesler, University Michigan  
Bruce Taylor, GSC  
Mark Hannington, GCS

**Crustal fluid circulation:** Rick Sibson, University of Otago  
Nick Oliver, James Cook University  
Alison Ord, CSIRO  
Martin Appold, University of Iowa

**Experimental and analytical advances: An informal session:** Bob Bodnar, VPI

**Research Frontiers:** Ross Large, University of Tasmania  
Murray Hitzman, Colorado School of Mines  
Bob Bodnar, Virginia Polytechnic  
Larry Cathles, Cornell University  
Noel White, Brisbane

#### CONTACT ADDRESS

Gordon Research Conferences, University of Rhode Island, PO Box 984, West Kingston, RI, 02982-0984, USA; fax: +1 401 783 7644.

**11<sup>TH</sup> IAGOD QUADRENNIAL SYMPOSIUM/  
GEOCONGRESS 2002**

Windhoek, Namibia

22-27 July, 2002

**SGA-COSPONSORED**

Earth Systems and metallogensis  
COMPRESSIONAL AND EXTENSIONAL TECTONIC  
ENVIRONMENTS AND THEIR ASSOCIATED ORE-  
FORMING PROCESSES, with a focus on Africa

**HOSTS:** The Geological Societies of Namibia, South Africa and  
Zambia

**CONFERENCE VENUE:** Safari Hotel, Windhoek

**SCHEDULE:**

16 - 21 JULY, Pre-Conference Excursions

22 - 27 JULY, Conference in Windhoek, Namibia

27 JULY - 2 AUGUST, Post-Conference Excursions

**CONFERENCE SESSIONS** will endorse the **Conference Theme**, together with additional Open Sessions under the following tentative topics (yet to be finalised): • Tectono-Magmatic Activation and Metallogeny • Global Tectonics and Metallogeny • Anorogenic processes and mineral deposits • Structural control of mineral deposits and provinces • Remote Sensing for exploration, • Industrial minerals and rocks • Tin & Tungsten Deposits • Ores & Metamorphism • The role of carbon and hydrocarbons in the formation of mineral deposits • Experimental Geochemistry & Modelling of Ore Genesis • The assembly of the Rodinia Supercontinent and Mesoproterozoic

ore deposits (IGCP 418 & 440) • Sediment-hosted base metal deposits (including IGCP 450) • Recent developments in SADC • Environmental impacts of mining (including IGCP 454) • Conservation & Geotourism and others. Sessions presented under the auspices of IAGOD Commissions or Working Groups, or IGCP, will be integrated into the Conference Theme as far as possible and will be duly acknowledged.

**FIELD EXCURSIONS** are being planned in various countries of southern and central Africa, the following being typical examples pending sufficient interest being expressed and logistic feasibility: • Diamond special (Namibia - Botswana - South Africa) • New developments in the Witwatersrand • Giant BIF and related deposits (Northern Cape, Sishen, Kalahari Mn field, Kalahari Park) • New developments in the Zambian Copperbelt, including metallogeny of southern Zambia & Victoria Falls • Massive base metal sulphide deposits (Northern Cape, Namibia, Kalahari Park) • New developments in the Bushveld Complex • Classic Damara Orogen • Geological & Metallogenic highlights of Botswana • Metallogenic highlights of Zimbabwe (Greenstone gold/nickel, Great Dyke PGE/chrome, Victoria Falls/ Great Zimbabwe) • Metallogenic highlights of Tanzania (Greenstone belts, diamonds, gemstones, rickel, Serengeti/ Ngorongoro) • Damaraland Alkaline Province, Namibia & Victoria Falls to Okorusu, Waterberg/ Etosha Park) • The Big 5 (Richards Bay HM, Karoo coal, Palabora Cu/P, Bushveld Complex PGE/Cr, Wits gold, Kruger Park) • and/ or others, yet to be finalised.

**FIRST CIRCULAR** - Please ensure you receive it by e-mailing your postal address details to Ger Kegge at kegge@iafrica.com.na, or to Erik Hammerbeck at ehammerb@geoscience.org.za, or write to Ger Kegge, P.O. Box 90469, Klein Windhoek, Namibia, Fax +00264 61 246 128.

**from page 18: FORTHCOMING EVENTS****★ September 24-28***SGA-Cosponsored*

URANIUM DEPOSITS: FROM THEIR GENESIS TO THEIR ENVIRONMENTAL IMPACTS, Prague, Czech Republic - Contact address: Bohdan Kribek, Czech Geological Survey, Geologická 6, 152 00 Prague 5, Czech Republic; phone: +422 51085 518, +422 5817390, fax: +422 5817 390; e-mail: kribek@cgu.cz

**★ October 20-24**

SEG, MINERAL PROCESSING PLANT DESIGN, OPERATING PRACTICE AND CONTROL CONFERENCE, Vancouver, BC, Canada - Contact address: SME, Meetings Department, P.O. Box 625002, Littleton, CO80162-5002, USA; phone: +1 303 973 9550; fax: +1 303 979 3461; e-mail: sme@smenet.org

**★ October 28-31**

GEOLOGICAL SOCIETY OF AMERICA (GSA) ANNUAL MEETING, Denver, CO, USA - Contact address: GSA, P.O. Box 9140, Boulder, CO 80301-9140, USA; phone: +1 303 447 2020; fax: +1 303 447 0648; e-mail: meetings@geosociety.org; website: <http://www.geosociety.org/meetings/index.htm>

**2003****★ March 9-12**

PROSPECTORS & DEVELOPERS ASSOCIATION OF CANADA, Annual Convention, Toronto, Canada - Contact address: PDAC, 34 King Street East, 9th Floor, Toronto, Ontario, Canada M5C 2X8; phone: +1 416362 1969; fax: +1 416 362 0101; e-mail [info@pdac.ca](mailto:info@pdac.ca); website: [www.pdac.ca](http://www.pdac.ca)

**★ November 1-5**

19TH WORLD MINING CONGRESS & EXPO - 2003, New Delhi, India - Contact address: The Institution of Engineers (India), Indian National Committee of World Mining Congress, 8, Gokhale Road, Calcutta 700020; phone: +91 33 223 83 11 or 223 83 14 or 223 83 16; fax: +91 33 223 83 45; e-mail: [ieihqrs@vsnl.com](mailto:ieihqrs@vsnl.com) or Tafcon Group, C-60, Nizamuddin East, NewDelhi 110013, India; phone: +91 11 469 21 41 or 44 or 82 or 84; fax: +91 11 463 52 15 or 464 40 77; e-mail: [tafcon@del2.vsnl.net.in](mailto:tafcon@del2.vsnl.net.in); website: <http://www.tafcon.com> or <http://www.19wmce2003.com>

**Proceedings of the Biennial SGA Meetings**

Pagel, M. & Leroy, J. L. (eds.) (1991) **Source, transport and deposition of metals**. Proceedings of the 25 years SGA anniversary meeting, Nancy, 30 August - 3 September 1991, Balkema, Rotterdam. 841 p. (ISBN 90-5410 0206). Orders to: Balkema, P.O. Box 1675, NL 3000 BR Rotterdam, The Netherlands; Fax +31 10 4135947

Fenoll Hach-Ali, P., Torres-Ruiz, J. & Gervilla, F. (eds.) (1993) **Current research in geology applied to ore deposits**. Proceedings of the second Biennial SGA Meeting, Granada, 9-11 September 1993, University of Granada, 785 p. (ISBN 84-338-1772-8). Orders to: Prof. Puri Fenoll Hach Ali, Dep. Mineralogía y Petrología, Fac. Ciencias, Av. Severo Ochoa, E-18071 GRANADA, Spain; Fax +34 58 243368, (7.000 pts, ~ 70 US\$)

Pasava, J., Kribek, B., & Zák, K. (eds.) (1995) **Mineral Deposits: From their origins to their environmental impact**. Proceedings of the third Biennial SGA Meeting, Prague, Czech Republic, 28-31 August 1995, Balkema, Rotterdam, 1018 p. (ISBN 90 5410550 X). Orders to: Balkema, P.O. Box 1675, NL 3000 BR Rotterdam, The Netherlands; Fax +31 10 4135947, (105 US\$)

Papunen, H. (ed.) (1997) **Research and Exploration: where do they meet?** Proceedings of the fourth Biennial SGA Meeting, Turku, Finland, 11-13 August 1997, Balkema, Rotterdam, 980 p. (ISBN 90 5410 889 4). Orders to: Balkema, P.O. Box 1675, NL 3000 BR Rotterdam, The Netherlands; Fax +31 10 4135947, (115 US\$)

Stanley, C. J. et al. (eds.) (1999) **"Mineral Deposits: Processes to Processing"**. Proceedings of the fifth Biennial SGA Meeting and the tenth Quadrennial IAGOD Symposium, London, U.K., 22-25 August 1999, Balkema, Rotterdam, 2 volumes (1468 p.) (ISBN 90 5809 121 2). Orders to: Balkema, P.O. Box 1675, NL 3000 BR Rotterdam, The Netherlands; Fax +31 10 4135947, (115 US\$)

# SOCIETY FOR GEOLOGY APPLIED TO MINERAL DEPOSITS

## SGA Membership Application Form

I would like to become a member of the Society for Geology Applied to Mineral Deposits (SGA) and to receive my personal copy of *Mineralium Deposita*.

**Join the SGA now...**

Surname/Corporation .....

First name .....

Title .....

Mailing address .....

.....

Phone ..... Fax .....

E-mail .....

Date of birth..... Nationality.....

Degrees obtained from Universities or Colleges .....

.....

Present position .....

.....

Membership in other scientific societies .....

.....

Are you a member of the Society of Economic Geologists? (If yes, no sponsors are necessary)  Yes  No



The Society of Geology Applied to Mineral Deposits was established in 1965 by an international group of economic geologists. Its Journal *Mineralium Deposita* is now recognized as a premier international mineral deposits journal.

**GOALS**

- The promotion of science of mineral deposit geology
- Personal contact of its members in order to exchange knowledge and experience
- Organization of scientific meetings, field trips, workshops. For these events, SGA members have reduced registration fees and in certain cases may apply for travel grants
- Cooperation with other scientific societies, especially with SEG and IAGOD
- Publication of *Mineralium Deposita* and scientific volumes

- 65 EUROS (~65 US\$) Regular
- 10 EUROS (~10 US\$) Student (up to Ph. D., max. 4 years)\*
- 45 EUROS (~45 US\$) Senior (after retirement)\*
- 200 EUROS (~200 US\$) Corporate (includes 3 copies of *Mineralium Deposita*)

\*Certificate required

**MEMBERSHIP**

Membership in SGA is open to all persons interested in economic geology, mineral resources, industrial minerals and environmental aspects related to mineral deposits. SGA is an international society with global membership in over 50 countries. Members have reduced registration fees in SGA-sponsored events and in certain cases are eligible for travel grants. Subsidies for publication of color plates in *Mineralium Deposita* also may be applied. Current membership fees are listed on the left-side column of this page.

**MINERALIUM DEPOSITA**

Editors: Richard Goldfarb (Denver, CO, USA) and Bernd Lehman (Clausthal, Germany). *Mineralium Deposita* publishes papers on all aspects of the geology of mineral deposits. It includes new observations on metallic and non metallic minerals and mineral deposits, mineral deposit descriptions, experimental and applied inorganic, organic and isotope geochemistry as well as genetic and environmental aspects of mineral deposits. *Mineralium Deposita* is published bimonthly. Fast publication: *Mineralium Deposita* publishes *Mineral Deposita Letters* within 3 months and regular papers normally within 4 months after manuscript acceptance and usually 6-9 months after manuscript submission.

If the 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  Visa  Mastercard/Eurocard  American Express

Card No.

Expiry date

Signature .....

Place and date .....

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

Two SGA Sponsors (If you have difficulty in finding sponsors, please send this form to the Executive Secretary who will recommend sponsors)

Name, place, date, signature

SPONSOR 1 \_\_\_\_\_

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SPONSOR 2 \_\_\_\_\_

\_\_\_\_\_

Send the Membership Application Form to:  
 Dr. Jan Pasava  
 SGA Executive Secretary  
 Czech Geological Survey  
 Klárov  
 CZ-11800 Prague 1  
 CZECH REPUBLIC

Tel.: +420 2 58 17 390  
 Fax: +420 2 58 18 748  
 e-mail: pasava@cgu.cz

**..and receive**  
**MINERALIUM DEPOSITA & SGA NEWS!!!**

Additional information in the  
 SGA homepage on Internet:  
<http://www.min.tu-clausthal.de/www/sga/sga.html>



**SOCIETY FOR GEOLOGY APPLIED TO  
MINERAL DEPOSITS  
(SGA)**  
in collaboration with  
**SOCIETY OF ECONOMIC GEOLOGISTS  
(SEG)**



*in cooperation with*  
**UNIVERSITY OF MINING AND METALLURGY  
STATE GEOLOGICAL INSTITUTE  
KGHM POLISH COPPER Ltd.**

**August 26-29, 2001  
Kraków (Poland)**

## *Sixth Biennial SGA Meeting*

**Mineral Deposits at the beginning of the 21<sup>st</sup> century**

#### ORGANISATION COMITEE

Adam Piestrzyski (UMM, Chairman), Maciej Podemski (PGI, Vice-Chairman), Wojciech Mayer (UMM, Secretary), Jadwiga Pieczonka (UMM, Treasurer), Janusz Magiera (UMM, Exhibitions), Zbigniew Sawłowicz (JU, Excursions), Cezary Bachowski (KGHM PC SA), Marian Banao (UMM), Marta Basta-Grzywacz, (UMM), Pavel Boultruchuk (Ukraine), Peter Herzig (Treasurer, SGA), Henryk Kucha (UMM), David Leach (SGA), Heikki Papunen (President, SGA), Jan Pasava (Executive Secretary, SGA), Tadeusz Peryt (PGI), Sławomir Porzucek (UMM, Internet), Holly Stein (SEG), Chris Stanley (SGA).

#### SPONSORS

Ministry of Education, Ministry of Environment, University of Mining and Metallurgy, KGHM Polish Copper S.A., International Geological Correlation Programs 373, 429, 443, GEODE, Polish Geological Institute

#### INVITATION BY THE ORGANISING COMMITTEE

The Organising Committee of the Joint 6th biennial SGA-SEG Meeting invites geologists from universities, research institutions and industry to the discussion on the role of economic geology in the new century - a period of global economy - with special attention paid to central and eastern Europe where ore deposits are still exploited. We would like to summarize what has already been achieved in studies on mineral deposits and what should be done in the immediate future in order to further understand geological processes and to meet the expectations of the mineral industry with due attention paid to environmental aspects.

The meeting will be held in Kraków, Poland, at the Main Building of the University of Mining and Metallurgy (UMM).

#### GENERAL INFORMATION

##### *Travel to Kraków*

Kraków has convenient flight connections with major European international airports including Frankfurt, London, Paris, Vienna, Zurich, Rome and Chicago. Good railway and bus connections are also available with western, eastern and southern Europe.

Public transport is available from and to the Kraków Airport and railway station. Bus numbers are indicated in the sketch map. The Organising Committee

recommends the Radio Taxi Company to provide transport in the city area (dial 919). Approximate transportation cost from/to the Kraków Airport is 15.USD (one way).

##### *Language*

The official language of the Meeting will be English. All publications and information will be issued in English. Simultaneous translations of oral presentations will not be available.

##### *Meeting Venue*

The Meeting will be held at the Main Building of the University of Mining and Metallurgy in Kraków, 30-059 Kraków, Al. Mickiewicza 30.

#### SCIENTIFIC PROGRAMME

##### *Thematic Sessions*

There will be three days of oral and poster

**S1.** The role of organic matter in the formation of mineral deposits and related environmental issues (co-sponsored by the IGCP 429).

**S2.** Lead-zinc deposits

**S2.1** Special session co-sponsored by the GEODE: Geodynamic setting of major basin-hosted lead-zinc mineral provinces)

**S3.** Formation and evolution of stratiform and strata-bound copper deposits

**S4. Styles and global comparison of volcanogenic massive sulphide deposits (VMS) - ancient and modern**

**S5. Mineralising systems associated with acid magmas (co-sponsored by the IGCP 373)**

**S5.1** Special session co-sponsored by the GEODE: Balkan-Carpathian magmatic hydrothermal Cu-Au-Pb-Zn-Ag Province

**S6. Mineral deposits associated with mafic and ultramafic rocks, including chromitites, Fe-Ti oxides, Ni-Cu sulphides (intrusive or extrusive), Ni-Co laterites**

**S6.1** Special session dedicated to Professor Eugen F Stumpff: Genesis of PGE deposits -further thoughts 2001

**S7. Gold and precious metal deposits**

**S7.1** Special session co-sponsored by the GEODE: Gold deposits in orogenic belts focusing on the Variscides)

**S8. Metamorphism affecting mineral deposits**

**S9. Industrial mineral deposits**

**S9.1** Special session co-sponsored by the IGCP 443 - Magnesite and Talc)

**S10. Environmental aspects of mining industry**

**S11. Economic evaluation of mineral deposits**

**S12. Open session**

#### Workshop

#### Tectonics and metallogeny of Northeastern Asia

Leaders: Dr. W. J. Nokleberg (US Geological Survey, USA), Prof. A. A. Obolenskiy (Russian Academy of Science, Russia)

E-mail: obolensk@uiggm.usc.ru

Topics: Geodynamic and metallogenic maps of NE Asia, preliminary time-space tectonic and metallogenic model of NE Asia from Archean to Present.

#### FIELD EXCURSIONS

The Organising Committee offers a variety of pre- and post-meeting excursions, indicated as A and B, respectively. The excursions aim to present a wide spectrum of geological and environmental problems related to mineral deposits in Poland, Slovakia, Hungary, Ukraine, Scandinavia, Kyrgyzstan and Greenland. Pre-registration for field excursions should be made together with the meeting registration. All excursions are offered on a first come-first served basis. Excursion will be cancelled if insufficient numbers of participants registered. Registration fees should be paid to the Organising Committee except the A5, A6, B6 and B7 trips.

For information please, contact the Field Excursion Manager: Dr. Zbigniew Sawlowicz (E-mail: zbyszek@ing.uj.edu.pl; fax: 48-12-6332270). Additional information on specific excursions can be obtained directly from the named organizer by e-mail, fax or phone.



BP: Budapest, BR: Bratislava, KS: Kosice, MS: Miskolc, BT: Belchatów

#### Premeeting trips

**A1. Miocene rock salt deposit in Wieliczka near Kraków**

CANCELLED

**A2. Miocene brown coal deposit (tectonic type) in Belchatów (Central Poland)**

CANCELLED

**A3. Polymetallic mineralisation and mineral deposits of Slovakia and Hungary**

CANCELLED

**A4. Mineral deposits of the Lower Silesia (including the Sudety Mts.) (Poland)**

CANCELLED

**A5. Paleozoic geodynamics and intrusion-related Au deposits in the Altai (Kyrgyzstan)**

Course leaders: A. Bakirov, R. Jenchuraeva, R. Maksumova, N. Maliukova, N. Pak, V. Pomaskov, Yu. Rykov

Trip Organising Committee: Chief Organizer: R. Seltmann (NHM London/UK), A. Bakirov (Director, Institute of Geology, NAS), R. Jenchuraeva (Chief of the laboratory, Institute of Geology), S. Murzagaziev (Director, Agency of Geology and Interior Protection), O. Sadyrov (Director, Alex Stewart Assayers Kyrgyzstan Ltd. Kara-Balta), K. Kudaybergenov (President, Kyrgyz Altyn, Kumtor Operating Company), Terry Rogers, T. Shaildaeva (Kumtor Operating Company).

18-25 August 2001 (8 days) Start and end: Bishkek, Maximum number of participants incl. leaders is 32. Cost: 1000.- USD. (Fee includes local flight, accommodation and food for excursion period from 18 Aug. a.m. to 25 Aug. 2001 incl., i.e. 8 days and 7 nights, but does not include accommodation and subsistence before and after those dates. Not included are the travel expenses to/from Kyrgyzstan that may be block-booked when number of participants is known. Contact address for more detailed information and payment: Dr. Reimar Seltmann (rs@nhm.ac.uk) Natural History Museum, Department of Mineralogy, Cromwell Road, London SW75BD, UK; Phone: +44 207 942-5042; Fax: +44 207 942-5537.

Provisional Itinerary: *Details of the programme may be changed depending on international flight schedules and accessibility.*

**Saturday, 18 August:** 8:00 a.m. local time departure by plane (Yak-40) for Makmal gold deposit. Visit to open pit, lunch and return to Bishkek in the evening (hotel). Impregnation-type gold mineralisation at the contact of Permian leucocratic granites (magnetite skarns, rare-metal greisens, massive pyrite-base metal and impregnated gold-sulfide ore mineralisation) controlled by quartz-plagioclase metasomatites, beresites and zones of silicification.

**Sunday, 19 August:** Breakfast and bus trip to Orlovka settlement (110km), 2 nights at hotel. Bus trip (14km) to the Taldy-Bulak Levoberezhny gold deposit (adit, outcrops) and to the Boordy Au-bearing base metal deposit. Taldy-Bulak Levoberezhny: gold-sulfide-quartz-tourmaline mineralisation (copper-gold porphyry, grade: Au - 4.7 ppm; Ag - 4.5 ppm) in the melange zone hosted by subvolcanic intrusions accompanied by explosive breccias. Orebodies are controlled spatially by diorites and monzo-diorites (D-C). Boordy: temporarily closed base metal deposit with gold mineralisation hosted in quartz-tourmaline veins at the contact of rhyolite dikes with porphyritic granites and gneisses.

**Monday, 20 August:** Early breakfast and bus trip (70km) to the REE-base metal deposit Aktyuz (open pit). Field lunch, at 2 p.m. departure to the Issyk-Kul lake (180km). On the way: Devonian bimodal volcanics and megacrystalline Akkulen syenites.

The Aktyuz REE-base metal deposit (Nb-Th-Zr-REE-base metals) comprises two separated stocks of alaskite-type granite and granophyre (P). The main ore mineralisation is controlled by quartz-sericite and quartz-sericite-chlorite metasomatites.

**Tuesday/Wednesday, 21/22 August:** Issyk-Kul (hotel White Ship). Trip by bus or plane (if mining site of the Kumtor Operating Company will be at disposal) to the large gold deposit Kumtor (about 4,000m a.s.l.). The Kumtor deposit (Au-quartz-type, grade: Au - 4.1 ppm, Ag - 2 ppm, WO<sub>3</sub> - 0.12 %) forms a large stockwork in Vendian carbon-bearing schists. The quartz veins and veinlets are combined with quartz-albite, quartz-feldspathic and sericitic (beresite) wallrock metasomatites. Ore zones are localized in a thick overthrust zone.

**Thursday/Friday, 23/24 August:** Visit to Issyk-Kul coastal placers of gold and ruby. Scientific discussion. Final dinner with cultural programme (picnic on board of the ship "Moskva").

**Saturday, 25 August:** Departure to Bishkek, arrival in late afternoon.

**Sunday, 26 August:** Block-booked or individual return flights of participants.

**A6. Svecofennian ore-forming environments (sponsored by SEG)**

The c.1.9 Ga old Svecofennian crust of the Fennoscandian Shield is the most densely mineralized crustal segment of Europe with a mining record for more than millenium. Metal production includes Fe, Mn, Cu, Zn, Pb, Ag, Au, W, and Mo. This field trip will focus attention on three principal ore-bearing terranes in Sweden: Norrbotten, Skellefte district and Bergslagen with visits to among others Kiruna, Aitik, Kristineberg, Boliden, Sala, Garpenberg, Falun, Bispsberg, Wigstrom and Zinkgruvann.

15-25 August, 2001. Estimated Costs: USD 1450-1700. More information will be obtained from Krister.Sundblad@geo.ntnu.no or Per.Weihed@sgu.se

#### Post-meeting trips

#### **B1. Copper-silver deposits (Kupferschiefer-type) in the Lubin-Glogów district (Poland)**

Course leaders: Zbigniew Sawlowicz (e-mail: zbyszek@ing.uj.edu.pl) and mining geologists.

The copper-silver, Kupferschiefer-type deposit in Lubin District belongs to the largest recently mined base metal localities in the world with mineable reserves nearly 1 Bt of wet ore grading between 1.5 and 2.0 wt.% Cu. The tabular ore zone includes Upper Permian (Zechstein) sandstones, black shales and carbonate sequence. Apart from Cu the disseminated sulphide mineralisation includes numerous trace elements including noble metals. First day (29th August) - late afternoon, departure from Kraków by bus, accommodation in Lubin. Second day (30th August): Visit to the Rudna Mine - thick ore body in sandstones and overlying shales, massive ores and anhydrite bodies in fossil dunes. In the afternoon - visit to the drill-core storage camp. Accommodation in Lubin. Third day (31st August): Visit to the Polkowice Mine - typical ore zone in sandstones, shales and carbonates, oxidized facies with presumed economic concentrations of Au and PGM. In the afternoon - return bus trip to Kraków (optionally to Wrocław) included.

29-31st August, 2001 (three days). Start and end: Kraków (optionally Wrocław). Minimum and maximum: 10-15. Cost: 200 USD (includes transport Kraków-Lubin-Kraków/Wrocław, accommodation and meals).

#### **B2. Zinc and lead deposits (MVT), in the Muschelkalk carbonates, transgressive contact of the Muschelkalk with the Paleozoic basement (Poland)**

Course leaders: Maria Sass-Gustkiewicz (e-mail: sass-gus@geol.agh.edu.pl), Marek Michalik (e-mail: michalik@ing.uj.edu.pl), Jerzy Socha.

The "Pomorzany" Mine near Olkusz; 40 km NW from Kraków - Kraków-Silesian lead and zinc deposits (MVT) hosted in the Muschelkalk carbonate rocks - metasomatic and breccia ores, mineralized karst with the internal karst sediments; Boleslaw - abandoned open pit, gossan (galman) ores; Stare Gliny near Klucze - transgressive contact of Triassic carbonates with Devonian rocks, Triassic paleogeography.

30th August, 2001 (one day). Start and end: Kraków. Minimum and maximum number of participants: 10-14. Cost: 80 USD (including transport and lunch).

#### **B3. Zinc and lead deposits (MVT) in the Muschelkalk carbonates, Paleozoic and Mesozoic formations in Kraków region (Poland)**

Course leaders: Marek Szuwarzyński, Marek Michalik (e-mail: michalik@ing.uj.edu.pl).

The "Trzebionka" mine in Trzebinia (35 km W from Kraków) - Kraków-Silesian lead and zinc MVT ore deposits in the Muschelkalk carbonates; metasomatic ores and processes; Psary - Lower Muschelkalk limestones; sedimentation in epicontinental Triassic sea, Czerna - abandoned exploitation of oxidized ores; old galleries, Dubie quarry - Devonian carbonate rocks and Permian volcanics, contact metamorphism.

31st August, 2001 (one day). Start and end: Kraków. Minimum and maximum number of participants: 10-14. Cost: 80 USD (including transport and lunch)

#### **B4. Mineral deposits of the Eastern Carpathian Mts. (Ukraine)**

Leaders: Pawel Boltruchuk (fax: 0380 322 351030), Zbigniew Sawlowicz (e-mail: zbyszek@ing.uj.edu.pl)

Geology of the Eastern Flysch Carpathian Mts., Marmarowskye "diamonds" (bipirymidal quartz), Muzejevskye epithermal Au and polymetallic deposit, Beregovskye kaolinite and alunite deposits, Biegan polymetallic epithermal deposit, Ilnicky natural pigments, brown coal and bentonite deposit, Sokirmicky zeolite deposit Slotvinsky rock salt deposit - open pit, Saulak Au-polymetallic deposit, Jazowskye sulphur deposit.

30th August - 4th September, 2001 (six days, including 2 days travel. Field excursion starts in Kraków. Participants are transported to and from Lviv (Ukraine) by bus. Minimum and maximum number of participants: 15-25. Cost: 480 USD (includes bus transport Kraków-Lviv-Kraków and local travels, accommodation and meals).

#### **B5. Banded iron formation deposits of Kriviy Rih (Ukraine)**

CANCELLED

#### **B6. The Skaergaard Intrusion (SGA and IGCP 427 "Ore-forming processes in dynamic magmatic systems"), Kangerdlugssuaq, Greenland.**

Start: Keflavik 31 August p.m.; End: Keflavik 12 September p.m.

Maximum number of participants, incl. leaders is 32.

Registration Fee: 3400 USD. A deposit of 1200 USD is required by 1 September 2000 to secure the ship. The registration fee includes travel, accommodation, and expenses from Keflavik, Iceland. Flights to Keflavik are available from most major airports in Europe and North America. A comprehensive personal travel insurance is required.

Attention: Registration fee must be paid to the Camborne School of Mines and not to Organizing Committee, Krakow.

Trip Organizing Committee: C.K. Brooks (Danish Lithosphere Centre, Copenhagen, Denmark), J.C. Andersen (Camborne School of Mines, University of Exeter, UK), T.N. Irvine (Geophysical Laboratory, Carnegie Institution of Washington, USA), S.J. Barnes (University of Quebec, Chicoutimi, Canada).

Excursion Leaders: C.K. Brooks, J.C. Andersen (E-mail: andersen@csm.ex.ac.uk), T.N. Irvine

Itinerary for the field trip (provisional): Details of the programme may be changed dependant on the accessibility of the East Greenlandic coast.

31 August: Arrival of participants at the Keflavik international airport with flights from Europe and America. Reporting for boarding of ship at the Keflavik Harbour at 4 p.m.

2 September: Expected arrival at the Skaergaard intrusion during the morning. Introductory lectures and discussions on board.

3 - 10 September: Day excursions to areas of the Skaergaard intrusion and its host rocks. The following areas will be visited (for abbreviations and nomenclature, see Irvine et al. 1998, GSA Bulletin, v. 110, 1398-1447):

Uttental Plateau and the toe of Forbindelsesgletcher. The lower intrusive margin and the lower part of the MBS. A suite of ultramafic autoliths (or xenoliths) in the MBS, transition between the MBS and the LS (the cross-bedded belt), igneous layering of the LZa and b, suites of autolith blocks, anorthositic replacement structures, and gabbroic pegmatite bodies. The toe of Forbindelsesgletcher displays the Triple Group and the Platinova Au and Pd reefs.

Kraemer Island and Ivnarmiut. The western margin of the intrusion including a possible intrusive breccia, the chilled margin, the perpendicular feldspar rock, pyroxene replacement structures, pegmatitic features, and layering (colloform banding) in the MBS. The transition between the MBS and the LS. Layering in the LZc and MZ, and its relations to the autolith blocks (including impact and other magmatic-sedimentary structures). Basaltic xenoliths on the south coast of Kraemer Island.

The plateau to the west of Basistoppen peak and the Skaergaard peninsula. Layering in the UZ, pegmatitic replacement of layers, the trough banding, the "purple band", transgressive granophyres, the Basistoppen Sheet, and the Sandwich Horizon.

The Eastern shore of Skaergaardsbugt. A section through the UBS with the exposures of the UBS units and the upper intrusive contact. Furthermore, the Tinden granophyre sill can be examined.

The Kraemer Island macrodike and the Kraemer Island syenite. The western part of Kraemer Island offers an opportunity to examine an example of the late, alkaline magmatic activity in the area. Massive syenites, intrusive breccias and peralkaline pegmatites are well exposed. The macrodike is one of a suite of small layered intrusions which occur in the Skaergaard area. If ice conditions permit, a brief visit will be made to the Kap Edvard Holm complex, which is many times larger than Skaergaard, to look at the very fine-layered features.

Sodalen. A section through the lowermost volcanic rocks of the east Greenland plateau basalt province. This includes successions of hyaloclastites, pillow breccias, and lavas, and a sequence of Cretaceous to Early Tertiary sediments. En route to Sodalen we will pass Hangefeldet where it is possible to examine from the ship the coastal flexure and the coast parallel dike swarms.

11 September: Departure to Keflavik, expected arrival on 12 September in the afternoon.

In the unlikely event that the Skaergaard area can not be reached due to weather or sea-ice, an alternative program will be arranged to intrusive centers further south. Due to the complex arrangements of this trip, no cash refund can be expected if the schedule is changed.

Contact address for more detailed information and payment: Dr. Jens C. Andersen (E-mail: andersen@csm.ex.ac.uk) Camborne School of Mines, University of Exeter, Redruth, Cornwall, TR15 3SE, UK, phone: +44 1209 714866, fax: +44 1209 716977.

#### B7. Field Correlation in Slovakia - Magnesite and Talc Deposits

Course leaders: M. Radvanec, P. Grecula

Program: field correlation on magnesite and talc deposits in Slovakia, relating to their geology, mineralogy, dressing and environmental impacts of exploitation. Localities: Kosice, magnesite deposits: Jelsava and Lubenik; talc deposits: Gemerska Poloma and Mutnik.

30 August - 3 September, 2001. Starting point: Kraków or Kosice. No. of participants: 10-25. Cost: 150 USD. Excursion is organized by IGCP 443 (Magnesite and Talc-Geological and Environmental Correlations). All requests should be sent directly to: nemeth@dodo.sk

#### ABSTRACT AND THE PROCEEDINGS VOLUME

The Organising Committee kindly invites the participants to prepare oral presentations and/or posters. Extended abstracts will be reviewed by the Scientific Committee and those accepted for publication will be printed in the Proceedings volume, distributed at the Meeting. The price of Proceedings volume is included into the registration fee. The abstract language is English. Abstracts submitted by non-English-speaking authors should be checked by native English speakers. The official Publisher of the Proceedings volume will be A.A. Balkema. The maximum length of abstract manuscripts is four pages including figures, gray-tone photographs and references. Coloured photographs and drawings will not be accepted. Abstracts will be printed only if the registration fee is paid together with the submission of camera-ready manuscript (i.e. before April 30th, 2001). For late payments (after April 30th, 2001) publication of abstracts cannot be guaranteed. Authors of papers to proceedings have to type these in a form suitable for direct photographic reproduction by the publisher. In order to ensure uniform style throughout the volume, all the papers have to be prepared strictly according to the instructions set below. Poster session will be held from August 27 to 29, contemporaneously with the thematic sessions. The offered space is: vertical length 195 cm, horizontal length 95cm. Poster authors will be requested to reserve time for discussion.

#### DEADLINES

The above material should be submitted to the Organising Committee before **January 31, 2001**. Any material received too late will not be considered. Abstracts will be accepted before **February 28, 2001** and returned to the Authors for corrections. Final versions in camera ready form must be submitted before **April 30, 2001**. The accepted abstracts will be printed only if the registration fee is paid by the returning of abstract. Send the material by airmail or by courier well packed and on time. Be sure that all pages are included in the parcel.

#### SOCIAL PROGRAMME

26 August 18.00: Ice-breaking party at the Wawel Castle Restaurant

27 August 20.00 : Concert

28 August 19.00: Conference dinner at the Wieliczka Museum (departure from hotels at 18.30)

#### Accompanying persons programme

The accompanying persons programme will be organized by the "Symposium Cracoviensis". The following activities will be available: Kraków tours - sightseeing of the Old Kraków Wieliczka Museum - visit to underground mine and museum Concert - to be scheduled Auschwitz/Birkenau - visit to the memorial and museum is possible under separate request (minimum number

of participants required) Other activities will be possible at the request but minimum number of participants will be expected.

#### REGISTRATION

*Meeting Venue:* The Meeting will be held at the Main Building of the University of Mining and Metallurgy in Kraków, 30-059 Kraków, Al. Mickiewicza 30.

The registration form enclosed as a separate page contains registration for the Meeting and its social events, for field trips and workshops, and hotel booking. Please, indicate the code of session for which you intend to submit the presentation(s) or poster(s) and the code of field trip or workshop you wish to attend. Registration will be confirmed in writing. The registration fee includes the scientific programme, Proceedings volume, lunches and refreshments during thematic sessions. Please, return your registration form at the following address: Dr. Wojciech Mayer University of Mining and Metallurgy Faculty of Geology, Geophysics and Environment Protection Al. Mickiewicza 30; 30-059 Kraków, Poland; phone: (+48 12) 617 23 85; fax: (+48 12) 633 29 36, e-mail: wmayer@geol.agh.edu.pl

#### PAYMENTS OF FEES

	<i>before April 30</i>	<i>after April 30</i>
SGA/SEG Non-members:	150 USD	200 USD
SGA/SEG Members:	100 USD	150 USD
SGA Junior Members :	75 USD	125 USD
Students:	50 USD	100 USD
Accompanying person:	50 USD	100 USD
Conference dinner:	50 USD	50 USD

Registration fee should be paid in USD, by bank transfer or internationally accepted credit card (VISA, MasterCard, EuroCard, Dinners Club), free of bank charges to the recipient, at the Organising Committee bank account:

BPH S.A. IV O Kraków 10601389-380000021929

Swift code: BPHKPLKA (with the note "SGA 2001")

Unfortunately, we are unable to accept personal, company or Euro cheques. Attention! Polish participants are kindly requested to pay the equivalent of registration fee in PLN (at the daily NBP exchange rate for the day of money transfer) at the following account: BPH S.A. IV O Kraków 720140903 with the note "SGA 2001". In agreement with the SGA Board the Organising Committee has allocated limited funds to cover travel and accommodation expenses for a number of students and junior staff.

#### Cancellation

The written cancellation must be sent to the Organising Committee before July 10, 2001. A refund of 80% of registration fee will be made before this deadline. No refunds are possible after this date. For hotel booking full refund is possible before July 10, 2001. After this date a deposit for first day will be charged by the Symposium Cracoviensis.

#### ACCOMMODATION

The Symposium Cracoviensis has been appointed to provide the accommodation for Meeting participants and accompanying persons. Rooms will be booked at first come-first served base. The Symposium Cracoviensis reserves the right to book another hotel of the same category in case hotel indicated is fully booked. For questions about the accommodation please, contact: Ms. Dorota Dziewonska Symposium Cracoviensis 31-123 Kraków, ul. Krupnicza 3; phone: + 48(12) 422 7600; fax: +48(12)4213857; e-mail: sga@symposium.pl; web-site: <http://www.symposium.pl>

#### INSURANCE

Important notice: The Organising Committee does not take responsibility for any infirmities, personal accidents and damages.

MORE INFORMATION ON THE MEETING AT THE FOLLOWING WEB-SITE:

<http://galaxy.uci.agh.edu.pl/~sga>

## PROGRAMME

25. August	14.00-17.00	Registration at the UMM Main Building, al. Mickiewicza 30
26. August	9.00-17.00	Registration at the UMM Main Building, al. Mickiewicza 30
	18.00	Ice-breaking party at the Wawel Castle Restaurant
27. August	9.00	Opening ceremony
	9.30-12.30	Opening session (coffee break included)
	12.30-13.30	Lunch time
	13.30-14.30	Set up of poster session
	14.30-17.30	Thematic sessions (coffee break included)
	18.00	Business meetings of the SGA and other research groups
28. August	20.00	Concert
	9.00-12.30	Thematic sessions (coffee break included)
	12.30-13.30	Lunch time
	13.30-17.30	Thematic sessions (coffee break included)
29. August	19.00	Conference dinner at the Wieliczka Museum (departure from hotels at 18.30)
	9.00-12.30	Thematic sessions (coffee break included)
	12.30-13.30	Lunch time
	13.30-16.00	Thematic sessions (coffee break included)
	16.15	Closing ceremony

☞.....

## Registration Form

6th BIENNIAL SGA MEETING JOINTLY ORGANIZED WITH SEG: "Mineral Deposits at the beginning of the 21<sup>st</sup> century"  
August 26-29, 2001, Kraków, Poland

(Please, use block letters)

First name .....

Last name .....

Title ..... M  F

Institution .....

Address .....

Street .....

City .....

Zip Code ..... Country .....

Phone .....

Fax .....

E-mail .....

I intend to submit (please tick):

Abstract

Poster

Title .....

.....

.....

.....

Session code .....

I attend field trip (code): .....

I attend workshop (code) .....

I will be accompanied by ..... person(s)

Date ..... Signature .....

Registration fee (before April 30, 2001):

SGA/SEG Non-Member USD 150

SGA/SEG-Member USD 100

SGA Junior Member USD 75

Student USD 50

Accompanying person USD 50

Conference dinner USD 50

Total charge: ..... USD

Payment mode:

Bank transfer:

Foreign participants: BPH S.A. IV O Kraków 10601389-380000021929

Polish participants: BPH S.A. IV O Kraków 720140903

all with the note "SGA 2001"

Credit Card: VISA  MasterCard  EuroCard  Diners Club

Name: .....

Number: ..... Exp.Date.....

For total USD: .....

Date ..... Signature .....

## Hotel Booking Form

Hotels (please tick):

Single

Double

Continental USD 120

USD 150

Cracovia USD 85

USD 135

Logos USD 85

USD 104

Dom Turysty USD 70

USD 85

Dormitory

USD 22

Arrival: ..... Departure .....

By: plane/railway/car

Total charge ..... USD

Payment mode:

Bank transfer to: Symposium Cracoviensis, BRE Bank S.A.

O/Kraków, 11401081-516700-USDCUR01-44, Symposium Cracoviensis,

Kraków - SGA/011

Credit Card: VISA  MasterCard  EuroCard  Diners Club

Name: .....

Number: ..... Exp.Date.....

For total USD: .....

Date ..... Signature .....