Economic Geology Research and Exploration in Central and Eastern Europe

Ferenc Mohári and Jeffrey W. Hedenquist

1Department of Mineralogy, Eötvös Loránd University, Budapest, Hungary
2Mineral Resources Department, Geological Survey of Japan, Tsukuba, Japan

Representatives of government organizations, universities and exploration companies from seven countries of Central and Eastern Europe attended a short-course entitled "Origin of and Exploration for Epithermal Gold Deposits", held in Budapest during early September 1995, following the SGA Biennial meeting in Prague. The short-course was organized by the Department of Mineralogy of Eötvös Loránd University, and IGCP 356 (Plate tectonic aspects of Alpine metallogeny in the Carpatho-Balkan region) provided support to some of the participants. We took the opportunity of having about 40 economic geologists and students from the Carpatho-Balkan region to ask them some questions about research and exploration activities in their countries.

Here we summarize the responses to our short questionnaire; to some extent we have integrated these answers with our own comments where we had first-hand experience. The following comments are unlikely to fully represent the conditions in these countries, which are experiencing a period of rapid change; nevertheless, we hope that SCA members not familiar with this region will benefit from our brief summary. Participants were from Bulgaria (government institute), Croatia (university), Hungary (government institute, domestic and international companies, university), Romania (government company), Slovakia (government and international companies, government institute, university), Ukraine (government institute), and Yugoslavia (university). About half of the professionals provided written responses.

Mining in Central and Eastern Europe has a long history, dating to Roman times. Archaeological studies also indicate Bronze Age mining in some areas. During Medieval times, this region was the main producer of precious metals (up to 2500 kg Au and 10000 kg Ag) of annual production during the 13th-15th centuries in the Hungarian Kingdom) until the findings of the "Conquistadors" in Latin America. From the 18th Century the principal mining academy (Schermitz Bergakademie) was located at Banská Štiavnica, in the midst of the Au-Ag-Pb-Zn-Cu mines of the region (Figure 1). A large number of ore minerals were first identified from these deposits, notably many tellurides (e.g., petzite, stützite, sylvanite, krennerite, nargyrite) and semenite. We summarize here the more recent activity, particularly the changes occurred over the past five years.

NEW!!!
4th Biennial SGA Meeting
August 11-13 1997
Turku, Finland
Research and exploration - where do they meet?
(see pag. 12 for details)

Strongly reduced price for student members:
38 DM! (ca. 29 US$)
(see pag 3 for details)
The SGA is 30 years old

3rd Biennial SGA Meeting Presidential address, Prague, August 1995

Z. Johan, SGA President 1994-1996

The SGA is thirty years old, and this is a birthday that should be remembered. In June 1965, a small group of scientists met at Heidelberg, where they decided to create the Society for Geology Applied to Mineral Deposits, and to start the publication of Mineralium Deposita. The SGA was scheduled to be formally established at the I.G.C. in Prague in 1968, but the constituent assembly had to be postponed due to interruption by Soviet tanks. What a symbolic event - this Biennial Meeting held today, 30 years later, in the same town!

I would like to stress the importance of the Biennial SGA Meeting. We have met at Nancy, then Granada, and now Prague. We all agree that this series of meetings must continue. Our Biennial Meeting is an event that is recognized and appreciated by the international scientific community. We need to earn this recognition. We must ensure that the scientific level is not only maintained, but also improved. This will demand a strong commitment from the organizers of our future Biennial Meetings.

I am sure that our Meeting will demonstrate that, despite the current economic situation which remains unfavorable to mineral raw materials, the metallogeny and on a wider scale, all aspects of economic geology, still have an important role to play within the Earth Sciences, and that they deserve attention not only from scientists, but also from all those who are responsible for the future of our respective countries and the well-being of our planet Earth.

Should we abandon, in view of the present circumstances, all studies concerning the origin of mineralizations, their distribution and their exploration, just because some metal prices are low? Most certainly not! This would challenge the independence not only of fundamental research, but also of applied research. However, research must react according to mining operators' needs. Although we must respond to environmental problems linked to mining in general, we cannot transform ourselves into a learned environmental Society.

The political development over the last five years has resulted in a scientific boom of countries in Central Europe and the ex-Soviet Union. The SGA must play a role in the integration of scientists from these countries into European science. We must find a way for scientists from Central and Eastern European countries to become members of our Society. Another concern is the need for a rejuvenation of the SGA. We need to make ourselves known to the young people in our domain, and also make the SGA attractive to them. Young scientists should benefit from specific conditions, enabling them to join the SGA at a special membership rate. The first goal of the Society to be achieved was the publication of its journal Mineralium Deposita. A new format was introduced in 1994 by the editor, D. Rickard. Several thematic issues have been brought to light in this journal, and according to our knowledge, were received with interest. Mineralium Deposita is not only a mean of communication within our Society, but also its showcase. We now, however, feel the need for other communication means, such as the just born SGA News and the SGA homepage in Internet. Finally, I would like to mention the fruitful collaboration with the SEG. We have agreed that each time an occasion arises, we should mutually sponsor our meetings, workshops and field trips.

This support should also mean offering reduced subscription rates for members of the SEG and SGA. We hope that this "twinning" will contribute to a better mixing of people and ideas between North America and Europe.

On behalf of SGA, I would like to thank the organizers of this Meeting, particularly the Czech Geological Survey and the Secretary of our Biennial Meeting, Jan Pasava, as well as the Czech and foreign sponsors who made this scientific gathering possible.
NEWS OF THE SOCIETY

**SAGA NEWS - PRESENTATION**

The Council of the Society for Geology Applied to Mineral Deposits (SGA) decided during the Prague Meeting in August 1995 to launch a SAGA newsletter. In Prague, it was discussed if the SGA newsletter should be distributed as an Internet homepage or as a more traditional printed version. The final decision was to do both in your hands now, as the first issue of SAGA NEWS. The Ore Deposit Group at the University of Geneva, Switzerland, will serve as editor for the first 4 issues of the SAGA NEWS. The Internet homepage will be maintained by the Ore Deposit Group at the University of Geneva (see page 6).

The objective of the SAGA NEWS and the WWW homepage is to serve the goal of the SGA, “support and promote the application of scientific knowledge to the study and development of mineral resources, geosystems, and the environmental aspects related to mineral deposits” by improving communication among SGA members. The 25th Anniversary Conference of SGA, held in 1991 in Nancy, France, led to the successful Biennial SAGA Meetings (Granada, 1993; Prague 1995) and marked a significant increase in activities of the Society. This increase in SAGA activities is reflected in the number and quality of events organized and co-sponsored by SGA (commonly in close cooperation with IAGOD and SEG), the increasing impact of our scientific journal MINERALUM DEPOSITA, and the growth in membership with greater international representation. This growth and diversity of SGA activities have, however, clearly underscored the need for faster and more efficient communication channels for all SGA members.

To achieve this goal, the editors of SAGA NEWS and SGA Homepage, rely on the collaboration of all SGA members. In page 4, you will find details on how to send SAGA NEWS announcements, comments, criticisms, etc. In fact, we have to admit that, even before this first issue of the SAGA News was prepared, we received our first well-taken comment from Heikki Pappunen, Chairman of the next Biennial Meeting, to be held in Turku, Finland, August 11-13, 1997. He E-mailed us some weeks ago: “I am wondering if the newsletter is coming so late, is it still a newsletter?” Well, Heikki, you are right and we are late. We apologize for this. We will try to do it better in the future.

However, SAGA NEWS will be distributed only twice a year, and even if we try to keep SAGA NEWS as complete and brief (6 to 12 pages), in some areas or topics, we will be always late. For this reason, we envisage SGA news as a complement to and kind of advertisement for the SGA Homepage (http://www.immr.tu-clausthal.de/sga.html). The electronic format of the Internet homepage allows for more flexible and timely distribution of SGA news and announcements.

The present issue of SAGA NEWS contains two articles on exploration and precious metals in Central and Eastern Europe. The inclusion of these articles in the first issue of SAGA NEWS is consistent with the interest of SGA in this region, which was demonstrated by holding our last Biennial meeting in Prague in 1995.

We wish you much fun reading SAGA NEWS and the SGA homepage!

SAGA Newsletter Editors

Lalit Fontboté and Massimo Chiaradia (SAGA News Editors)

**Future activities**

- SGA will co-sponsor the 10th Quadrennial IAGOD Symposium, Broken Hill, Australia, August 1998 (see pages 9 and 11).

(SAGA will co-sponsor the Symposium in honour of Frank Vokes "Formation and metamorphism of massive sulphide deposits", Tromsøheim, Norway, March 17, 1997 (see pages 9 and 11).)

- SAGA will co-sponsor the 5th Biennial SGA Meeting (1995) will be examined by the Council in November 1996.

- The next Council meeting will be in Freiberg, Germany on November 4th-5th, 1996.

**Other news of the Council**

- SGA members with accepted manuscripts may apply for support to publish free color plates in MINERALUM DEPOSITA. Also English correction may be provided for free. Funds for these two initiatives have been approved (see page 1).

- Several travel grants, mainly to junior participants with accepted contributions, were provided to attend the "International SEG Field Conference on Carbonate-Hosted Lead-Zinc Deposites, St. Louis, USA, June 3-6, 1995" (co-sponsored by SGA), the Field Meeting "Rare metal and palaeogenic granitoids of Transbaikalia and related mineralization, Transbaikalia, 1-15 August 1995" (co-sponsored by SGA), and the third Biennial SAGA Meeting held in Prague (28-31 August 1995).

- A revised version of SGA statutes is being prepared. Your comments and announcements are welcome.

- A new Membership directory is being prepared.

- Membership Fees can be now paid with Credit Card.

- The nominating committee was appointed to prepare the next Council elections (to be held at the end of 1997). The committee consists of E. Stumpfl, P. Herzig, D. Richard, and M. Pagel.

- Proposals for possible locations for the 5th Biennial SGA Meeting (1999) will be examined by the Council in November 1996.

- The next Council meeting will be in Freiberg, Germany on November 4th-5th, 1996.

**Elections**

- New councillors were elected on January 16, 1996 (see Council composition on p. 4). We thank all members which have left the Council after years of serving, the Society (J. Aichler, G.C. Amstutz, M. Boni, H. Ettmann, F. Fenioll Hach-Al, J. Guha, I. Plimer, J.C. Touray, M.J. Viljoen). We would like to especially acknowledge the work of Prof. G. C. Amstutz, who has been without interruption at the SAGA Council since its foundation, in 1965, and of Prof. P. Fenioll Hach-Al, Chairperson of the Second SAGA Biennial Meeting (Granada, 1993).

- Prof. D. Klemm was elected "Honorary SGA Member" by the general assembly in Prague in recognition to the high services to the Society as editor of MINERALUM DEPOSITA from 1980 to 1992.

**New: SGA student membership for only 38 DM (about 29 USD)**

The category "SGA Student Member" with a strongly subsidized fee of only 38 DM (about 29 USD) has been created. This category is reserved to students (certificate required) and may be maintained for a maximum of four years before obtaining a Ph.D. degree.

After this change, the different types of SAGA membership and the current fees are as follows:

- Regular Member 98.00 DM
- Junior Member* (up to 4 years after last academic degree, Ms., etc.) 68.00 DM
- Senior Member* (after retirement) 68.00 DM
- Student Member* (max. 4 year, up to Ph.D.) 38.00 DM
- Corporate Member 294.00 DM

*Certificate required

All categories include the annual subscription to MINERALUM DEPOSITA and SAGA NEWS (corporate members, three copies). SAGA members can benefit from reduced fees in SAGA-sponsored conferences and are eligible for grants to attend many SAGA-sponsed events. In addition, they may apply for subsides for publication of color plates in MINERALUM DEPOSITA.
SOCIETY FOR GEOLOGY APPLIED TO MINERAL DEPOSITS

Society of Economic Geologists

President: T. A. Thomas
Executive Secretary: B. Skinner

LIST OF NEW SGA MEMBERS
(September 1995 - March 1996)

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Isabel FANLO CONZALES, Facultad de Ciencias, Zaragoza, Spain
Mohamed YADLIA, Chaoua University, Punta, Czech Republic

Student members

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Stef LUTTMANN, Freiberg University, Germany

"lost" members (can you help us with the address of these "lost" members?)

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Eckart Buhmann
Sergio Castro-Beiro
György Ciftsin
Kelly J. Cliver
Ariane Gionanni
Andrey Jiang
Iao J. Lawery
Willem Lodder
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Département de Minéralogie, Rue des Maraichers 13
CH-1211 Genève 4, SWITZERLAND

Fax: +41 22 320 57 32
E-mail: SGANEWS@scu.unige.ch

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

Production of Au and Cu from epithermal and porphyry deposits has increased over the past five years, whereas Pb and Zn production has decreased, with overall metal production corresponding to less than half of that during peak mining activity. The closure of several mines is imminent due to unprofitability, whereas the Elastite and Assarel open pit porphyry Cu mines (Figure 1) are likely to remain open.

Figure 1: Sketch-map of the Carpatho-Balkan region indicating the location of the deposits mentioned in the text.

Exploration by domestic groups is limited compared with five years ago, with expenditures at less than half of previous levels.

At present Bulgaria is revising its exploration and mining laws, with discussion before the Parliament. However, it is not clear when the new laws will be introduced. As a result, there are no foreign companies officially exploring in the country, though there are several companies conducting preliminary investigations. Nevertheless, an Irish group has recently entered into a joint-venture agreement with the state mining company at the Chelepech high-sulfidation Au-Cu deposit.

A group of Bulgarian researchers is actively studying the deposits of the region, particularly epithermal gold deposits, including fieldwork in Turkey. However, funding for study is very limited, leading to a stagnation of the research.

Croatia

Mining in Croatia and adjacent areas has ceased or is severely curtailed. There are no epithermal or porphyry deposits. Mineralization in the country consists largely of bauxite resources and some sediment-hosted Fe deposits. There is very little production of natural resources and exploration activities are minimal, though a legal framework for foreign participation in the country does exist.

Funding for research in economic geology is very poor at the moment and many economic geologists have emigrated.

Hungary

There was intensive exploration in this country during the 1970s and 1980s. This led, for example, to extensive drilling and underground work in the Reccsk porphyry Cu-Au deposit, which underlies the Lahóca high-sulfidation Cu-Au deposit in the Mátra Mountains. Following this period, the government curtailed exploration expenditure, and work was continued only by few domestic companies. However, after establishment of new mining laws three years ago, consistent with EU standards, several international companies began working in the country, some in joint-venture investigations. Much of the exploration effort is now focused in the Tertiary volcanic arc of the Carpathians, particularly on epithermal gold mineralizations.

The principal exploration activities are located at Recsk (Figure 1), with mapping and drilling aimed to target shallow disseminated Au mineralization. This activity is a joint-venture between domestic and Australian companies. The other area that is attracting the greatest interest, not only for the quality of its mines, is that of the Tokaj Mountains, which is the location of the Telkibanya low-sulfidation epithermal vein deposit (Figure 1), one of the most important Au producers in the Hungarian Kingdom from the 13th to the 15th century. In this deposit there are many areas of alteration, dominated by silicification and steam-heated acid alteration, indicating little erosion and shallow paleodepths.

Present mining activity is restricted to uranium for use in nuclear power stations, and to a small underground Mn mine. There is extensive industrial mineral production of dolomite, illite, kaolinite, bentonite, and diatomite, plus quarrying of perlite (the fifth largest in the world), glass sand, and rock.

Funding for mapping and research by the Geological Institute is continually decreasing, though there are some co-operative efforts planned with the U.S. Geological Survey to study the potential for Carlin-type mineralization in the country, while there is an existing co-operative program with the USGS on ore-deposit modeling. University funding from the Ministry of Education for post-graduate students and research has been decreased by the present Government from previous levels of investment. Assistance for research and training from the World Bank and the EU began three years ago, but is now declining. Research on epithermal and other ore deposit environment is being pursued vigorously by some isolated researchers. The Academy of Sciences has a very active K-Ar dating laboratory, and provides rock and alteration ages to many groups in several countries of the region.

Romania

The Carpathians extend in a tight arc through north-western Romania, with their volcanic portion hosting most of the epithermal deposits of the country. There are many mines still in production, including Au-Ag and Cu-Pb-Zn veins. Exploration by a government company is now reassessing old mining districts and prospects, principally for Au-Ag, both in the Oas-Gutti Mountains (the Bai Mare district) and the western part of the Apuseni Mountains (Figure 1).

At present there is no formal exploration by international companies in Romania. The laws pertaining to mining activities have yet to be modified to allow foreign investment, though BRGM has some involvement in the country.

Research on ore deposits at the Ph.D. level is being conducted...
in the country, also by people working in exploration. Some of these individuals are associated with foreign universities.

**Slovakia**

Five years ago mining focused on Pb-Zn veins in Banská Štiavnica (Figure I), and some Cu and Sb, but following privatization, most activities were stopped. The majority of mining is now conducted by state-owned companies, and some coal and iron ore, operations include magnesite, talc, and bentonite and one mine producing 400 kg of Au per year. There is little state-sponsored exploration apart from that for coal. The only exception is one locality explored for Au. Efforts are also being directed towards industrial minerals. Several foreign companies have recently begun exploration in the country, some in joint-venture operations. The existing mining laws allow foreign investment, and are in the process of being modified to be compatible with EU standards.

Government funding for geological mapping, and study of water resources, environmental problems and other investigations, as well as for research, is continually decreasing, though the Geological Institute and the Academy of Science maintain active programs in the study of ore deposits and metallogenic modeling. State-funded activities are increasing in the area of reclamation of old mines and tailings.

**Ukraine**

State companies in the Ukraine are now mining Fe, Mn, Ti, kaolin and coal, and also produce petroleum. There is no foreign exploration or mining involvement in the country, and at present there are no laws to allow such activities. Government-sponsored research has decreased greatly since 1992, although study on and exploration for Au, Hg, Pb-Zn, U, and fluorite deposits continue. There is significant potential for low-sulfidation epithermal Au mineralization in the Beregovo district, near Hungary (Figure I).

**Yugoslavia**

There is a tremendous number of Au deposits and prospects in the northern Balkan volcanic arc, notably the Bor high-sulfidation epithermal deposit (underlain by a porphyry deposit), accompanied by other porphyry and epithermal deposits in the district (Figure I). The Yugoslavian portion of the Carpatho-Balkan volcanic arc continues northward into Romania, and eastward into Bulgaria; the belt constitutes one of the world's major Cu (and Au) provinces, with significant potential for exploration.
Gold in the Czech Republic

Petr Morávek

AUREA: Geology, Mineral Resources, Consulting
1 májé 296, 254 01 Jiřové u Prahy
Czech Republic

The territory of the Czech Republic is made up of several geological units of the Bohemian Massif, which represents the easternmost segment of the Variscan belt in Western and Central Europe. The presence of gold deposits is one of the characteristic features of the metallogeny in the Bohemian Massif. Gold has been mined here since the Celtic period and up to present times; the period of the 13-14th century was the most prosperous. Total historical production is estimated at about 100 tons of gold.

An extensive geological exploration undertaken during the last 15 years resulted in discoveries of new gold deposits, new types of gold mineralization and provided the data necessary for developing new metallogenic theories. The total gold potential of the Czech part of the Bohemian Massif has been estimated to approximately 400 tons. The newly explored deposits represent a good basis for the renaissance of economically significant gold mining in the Czech Republic. However, possible future mining activities must be carried out in accordance with relatively strict legal and environmental regulations and must overcome certain barriers and suspects of the population, resulting from the insensitive approach of mining toward the environment during the past regime.

The outstanding position of gold in the metallogeny of the Bohemian Massif is illustrated by a multitude of primary deposits and occurrences, as well as by placer accumulations of gold. Most of them are situated along the boundary separating the slightly metamorphosed Upper Proterozoic volcano-sedimentary complex of the Bohemicum from the highly metamorphosed rocks of the Moldanubicum. Other important gold-bearing zones are also situated within the crystalline rocks of the Moldanubicum, as well as in Devonian volcano-sedimentary units in the Jeseniky Mts.

The origin of gold deposits can be explained in terms of four metallogenic models:
- volcanogenic model for lithologically controlled pre-metamorphic Au-base metal mineralization, resulting from the

![Figure 1: Mokrská West deposit: distribution of gold in the cross section (after Morávek, 1990).](image1)

![Figure 2: Kasperské Hory deposit: cross section of the Main ore zone (after Puncachór, 1992). Legend: 1-biotite paragneiss, 2-quartzite paragneiss, 3-migmatitic paragneiss, 4-shears, faults, 5-stratiform scheelite mineralization, 6-gold-quartz lodes.](image2)
submarine-hydrothermal processes associated with the Paleozoic and/or Upper Proterozoic volcanism (Zlaté Hory a.o.).

- porphyry model for the Petříková Hora deposit nearVacíkov, spatially related to porphyry granodiorite intrusions into volcano-sedimentary rocks of Cambrian age of the Bohemian.

This deposit is geochemically characterized by the association Au-Ag-Bi-Cu-Mo-Te-W;

- metamorphic-hydrothermal/metamorphic-plutonic model for Early Variscan gold-quartz mineralization of vein and stockwork type, characterized by a high gold fineness and the Au-As-Bi-Mo-Te-W association. Deposits of this type are hosted by "greenstone-granite" rocks (Jilové, Mokrsko a.o.), as well as by crystalline rocks of the Moldanubicum (Kasperské Hory a.o.). Gold mobilization mainly from Upper Proterozoic volcano-sedimentary sources is attributed to heat flow associated with Early Variscan granite intrusions or regional metamorphic events;

- hydrothermal model for late Variscan gold-quartz mineralization with a low gold fineness (Au-Ag-As association - Roudry deposit a.o.) and gold-anthimony deposits (Krášná Hora a.o.) of vein or stockwork type. These deposits, related to regional tectonic zones, occur within the geological units consolidated by metamorphic processes and/or granitoid bodies.

The most important discoveries of the past exploration, funded by the State budget of the Czech Republic, are represented by two deposits of low grade/large tonnage type, situated in the central part of the Bohemian Massif (the Mokrsko deposit containing up to 90 t of gold for openpit mining. Figure 1, and the Petříková Hora deposit with 30 tons of gold). Past exploration also included the re-evaluation of the Kasperské Hory district (Figure 2), with estimation of the resources to up to 80 tons of gold (plus interesting resources of scheelite). These deposits attracted actually foreign mining companies such as RTZ, Greenwich Resources, and TVX Gold, which currently evaluate their reserves. These deposits, which were visited on the occasion of the Third Biennial SGA Meeting held in Prague during August 24-26 1995, are an example of the possibility for discovering economically interesting mineralization in regions up to now poorly explored. New exploration will certainly complement existing data and stimulate new scientific research on the metallogenic processes in the Central and Western European Variscides.

References


ANNOUNCEMENT

SEG NEVES CORVO FIELD CONFERENCE 1997 - CO-SPONSORED BY SGA

The Neves Corvo Field Conference will be held at the Rectory of the University of Lisbon, Portugal, May 11-14, 1997, with pre- and post-meeting field trips. This is the first field conference outside North America to be sponsored by the Society of Economic Geologists (SEG), and is cosponsored by the Institution of Mining and Metallurgy (IMM), the Society for Geology Applied to Mineral Deposits (SGA), Departamento de Geologia da Faculdade de Ciências da Universidade de Lisboa (GEOFUCIL), Instituto Geológico e Mineiro (IGM), Instituto de Ciência Aplicada e Tecnologia (ICAT) and Sociedade Mineira de Neves Corvo (SOMINCOR). The three-day meeting at the University of Lisbon will focus on the geology and genesis of massive sulfide deposits and present-day oceanic equivalents. A full-day symposium is dedicated to the presentation of the results of a major research investigation, funded by SOMINCOR, on the geology and genesis of the Neves Corvo massive sulfide deposits. This research covers a broad spectrum ranging from regional geology through mine geology to detailed petrologic and geochemical investigations relating to the Neves Corvo deposits. Invited keynote speakers include Jim Franklin (Ottawa-SEG), Michael Russell (Glasgow-IMM) and Peter Herzig (Freiberg-SGA). The conference is expected to attract international participation and will provide an excellent opportunity for discussion on the newest developments relating to massive sulfide deposits, particularly with respect to the relationships between modern, submarine hydrothermal processes and their fossil counterparts, the VMS deposits. Three field trips are planned. A three-day field trip, including an underground visit to the Neves Corvo Mine, will be held both pre- and post-meeting. Space on this trip is limited to 120 persons (six groups of twenty each). Two other field trips will accommodate another 120 participants. One in Portugal will focus on regional geology and will visit the Aljustrel Mine. The other trip will be held in Spain with visits to Rio Tinto and Aznalcóllar. Additional field trips will also be available. People interested in participating in field trips are advised to contact the organizers as soon as possible.

At the time, the organizers are issuing a request for expressions of interest and call for papers. Abstracts are solicited for both oral and poster presentations on topics directly related to massive sulfide geology and genesis, and present-day submarine hydrothermal activity. All abstracts should be submitted in English, the official language of the conference.

PLEASE CONTACT:

European Address:
Fernando J.A.S. Barriag
Edificio G2, Piso 5, Campo Grande 1700 Lisboa, Portugal
Phone +351-1-750-0068 Fax +351-1-759-9380
E-mail Fernando.Barriag@cc.fc.ul.pt
http://NevesCorvo.geo.fc.ul.pt

Neves.Corvo@fc.ul.pt

North American Address:
Geoffrey G. Snow
c/o Society of Economic Geologists
5908 South Rapp Street, Suite 209
Littleton, CO 80120, U.S.A
Phone +(303) 797-0332 Fax +303) 797-0417

Organizing Committee:
F. J. A. S. Barriag (GeoFUCIL), R. W. Hutchinson (Colorado School of Mines, SEG), G. Snow (SEG), D. Richards (RTZ, IMM), P. Herzig (Freiberg, SGA), A. Ribeiro (GeoFUCIL), D. Carvalho (IGM), P. Carvalho (SOMINCOR), A. Ferreira (SOMINCOR)

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ANNOUNCEMENTS

INTERNATIONAL CONFERENCE ON CATHODOLUMINESCENCE AND RELATED TECHNIQUES IN GEOSCIENCES AND GEOMATERIALS,
Nancy, France

SGA-Sponsored
2-4 September 1996
Dr. Maurice Pagel, Secretary General, Cregu, B.P. 23, F-54501 Vandoeuvre-lès-Nancy, France; phone: 33-83441900; fax: 33-83440020; e-mail: pagel@cregu.cnr-nancy.fr

From the program:
Application of cathodoluminescence to economic geology (O.C. Kopp);
Cathodoluminescence petrography of the phosphate grains in the Lower Jurassic (Aalenian) ironstones of Lorraine, France (M. Karrakus, R. D. Hagni and A. C. Spring);
Application of cathodoluminescence to skarn-related W-Mo (REE) metallization, R. Scheibner and C.M. Smits; Fluid inclusion chronology in authigenic or microcrystalline minerals: the use of cathodoluminescence (M.C. Boiron and M. Cathelineau);
Cathodoluminescence microcharacterisation of silicon dioxide polymorphs (M.A. Stevens, K. Zalzett and M.R. Phillips); The role of brittle deformation in sandstone diagenesis as revealed by scanned cathodoluminescence imaging (K.L. Milliken); Use of cathodoluminescence for Pb-U zircon dating by ion microprobe (SHRIMP); some examples from high-pressure rocks of the western Alps (D. Rubatto and D. Geriauer); The significance of cathodoluminescence on gemstone recognition (J. Poncelet and F. Brandstätter); Systems of the interacting luminescence centers in natural diamonds: laser-induced time-resolved spectroscopy (C. Panczer, M. Gaff and A. Markunin); Silica cements in central Australian silicicites (H.B. Waithwaite, J. Götzte and H. Wopfner); Luminescence and geochemical composition of phaliterite: an example from the Alpine lead-zinc deposits, Austria/Slovenia (S. Zeeb and J. Kuhlmann)

FRANK M. VOKES 70 YEAR ANNIVERSARY SYMPOSIUM: FORMATION AND METAMORPHISM OF MASSIVE SULPHIDES,
Trondheim, Norway

SGA-Sponsored
17-19 March 1997
Frank M. Vokes Symposium, Tore Prestvik, Dept. of Geology and Mineral Resources Engineering, NTNU, N-7033 Trondheim-NTH, Norway; phone: +47 735 94 806; fax: +47 735 94 814; e-mail: tore@geologi.unit.no

From the program:
-Primary setting and depositional processes
-Metamorphic and deformational processes
-Metallgeny of the Caledonian-Appalachian belt
-Volcanic-hosted massive sulphides vs. Besaht and Sedex type deposits.

10TH QUADRINNIAN IAGOD SYMPOSIUM, Broken Hill, Australia

SGA-Sponsored
August 1998
The proposed program of the Quadrennial IAGOD Symposium comprises pre-symposium excursions, a scientific and social program, intra-symposium field trips, post-symposium excursions, trade exhibitions and rock, core, map and publication display. The program presents an opportunity for delegates to visit many of the famous, large and unusual ore deposits of Australia and the Pacific Rim. And the last chance to visit the Broken Hill deposit.

Pre- and post-symposium field trips (provisional list)
1/ Kalgoorlie; C.A. (Au-Ni); 2/ Kimberley; W.A. (Pb-Zn MVT, diamonds); 3/ Pilbara, W.A. (Fe, Au); 4/ Olympic Dam / Kanmantoo, S.A. (Cu-U, Cu-Pb-Zn); 5/ Western Tasmania (Pb-Zn, Cu-Au, Au-Sn); 6/ Central Victoria (Au); 7/ Parkes / Cobar, N.S.W. (Cu-Au, Au-Pb-Zn); 8/ Broken Hill, N.S.W. (Pb-Zn-Ag); 9/ Mt. Isa, Qld (Cu, Pb-Zn); 10/ Haypen opal, Qld (opal); 11/ Drummond Basin, Qld (Au); 12/ Epithermal Au of Papua New Guinea; 13/ Epithermal systems of New Zealand

Intra Symposium Field Trips
a/ Broken Hill (Pb-Zn-Ag, W); b/ Broken Hill (stratigraphy, structure); c/ Olary Block (U, Cu, barite, Fe); d/ Cobar (Pb-Zn); e/ Cobar (Cu-Zn); f/ Cobar (Au), g/ White Cliffs (opal)

YOU CAN PRE-REGISTER NOW
Please indicate also the number of the excursion you are interested in.

CONVENOR
Prof. Ian Plimer, School of Earth Sciences, The University of Melbourne, Parkville Vic. 3052, Australia
ian_plimer@unsw.aims.melb.edu.au
fax +61-3-39447630
tel +61-3-39446520

HOW TO OBTAIN THE PROCEEDINGS OF THE BIENNIAL SGA MEETINGS?


EPITHERMAL GOLD DEPOSITS: STYLES, CHARACTERISTICS, AND EXPLORATION

A WALL POSTER BY J.W. HEDENQUIST, E. IZAWA, A. ARIRAS, JR., AND N.C. WHITE
SOCIETY OF RESOURCE GEOLOGY, SPECIAL PUBLICATION 1, 1966.

A brief summary of the two end-member styles of epithermal gold deposits, low sulfidation and high sulfidation. For students of economic geology, and explorers of epithermal ore deposits. Full color, with 40 diagrams, 21 photographs, 4 tables; BO in size (1.5 x 1.0 m). Poster accompanied by booklet with text and captions translated to Spanish, French, Japanese and Chinese; also available in 84 pamphlet form, in color, for use in the field. Copies of poster or 84 pamphlet may be ordered from the address below, the cost is US$30 each, which includes translation booklet and airmail postage in a mailing tube; US$25 each for orders of 5 or more; inquire about cost for bulk orders and student discount. Payment may be made by VISA or MasterCard, please send your mailing address plus credit card name, card number and expiration date. Allow 6-8 weeks for processing.

The Society of Resource Geology, Nagizaka Bldg., 6-41, Akasaka 2-chome, Minato-ku, Tokyo 107, Japan.
Fax +81(3)3475-0824; E-mail <SRG1@net.ad.jp>
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. Current fees are: i) Regular Member 98.00 DM, ii) Junior Member* (up to 4 years after last academic degree, Ms., Sc., Ph.D.) and Senior Member* (after retirement) 68.00 DM, iii) Student Member* (max. 4 years, up to Ph. D., 38.00 DM, iv) Corporate Member 294.00 DM. They include the annual subscription to Mineralium Deposita (corporate members, three copies). Do not send money now: you will be invoiced.

*Certificate required

Surname/Corporation ............................................................................................................................................................................................................................................................................................................
First name .........................................................................................................................................................................................................................................................................................................................
Title .................................................................................................................................................................................................................................................................................................................................
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Nationality....................................................................................................................................................................................................................................................................................
Degrees obtained from Universities or Colleges .................................................................................................................................................................................................................................................................................................
Present position ..........................................................................................................................................................................................................................................................................................

Membership of other scientific societies ..........................................................................................................................................................................................................................................................................................

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

□ Regular Member
□ Junior Member (up to 4 years after last academic degree, Ms., Sc., Ph.D.)*

Date of degree..........................................................................................................................................................................................................................................................................................

□ Senior Member (after retirement)*
□ Student Member (max. 4 years, up to Ph. D.)*
□ Corporate Member

*Certificate required

Signature .................................................................................................................................................................................................................................................................................................
Place and date .................................................................................................................................................................................................................................................................................................

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Name, place, date, signature

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*If you have difficulty in finding sponsors, send this form to the Executive Secretary and your application will still be considered.

Send the Membership Application Form to:
Dr. Maurice Pagel
SGA Executive Secretary
CREGU, B.P. 23,
F-5401 Vandœuvre-lès-Nancy Cedex, France
Tel.: +33 83 44 19 00
Fax: +33 83 44 00 29
e-mail: pagel@cregu.cnrs-nancy.fr

Join the SGA now...

The Society of Geology Applied to Mineral Deposits was established in 1965 by an international group of economic geologists. Its Journal MINERALUM 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
- Cooperation with other scientific societies, especially with SGE and IAGOD
- 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
- Publication of MINERALUM DEPOSITA and scientific volumes

MEMBERSHIP

Membership in SGA is open to all persons interested in economic geology, mineral resources, industrial minerals and environmental aspects related to mineral deposits. 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 MINERALUM DEPOSITA also may be applied. Current membership fees are listed on the left-side column of this page.

MINERALUM DEPOSITA

Editor: David Rickard, Department of Geology, University of Wales, Cardiff CF 1 3YE, UK.
There are two types of submission:
- Regular manuscripts for publication as Scientific Papers
- Fast Track manuscripts for publication as Mineral Deposit Letters

...and receive MINERALUM DEPOSITA and SGA News!!!

Additional information in the SGA homepage on Internet:
http://www.immr.tu-clausthal.de/sga.html
1996

July 25-August 2
ICCP 361 (East Asian Activated Zones), ICCP 354 (Economic superaccumulations of metals in the lithosphere) & IAGOD FIELD MEETING IN MONGOLIA - Prof. O. Gere, Mongolian Technical University, P.O. 46, Ulaanbaatar, Mongolia; phone: +976-1-324500; fax: +976-1-324212

August 4-14
30th INTERNATIONAL GEOLOGICAL CONGRESS Beijing, China.- Symposium 9-6: Organic matter-related mineral deposits / Fluorite and barite deposits, organized by IAGOD COFAB and IGCP 220: Geology of the Chinese Plateau, 398-405 South Xinjiang Rd 26, Fuchengmenwai, 100037 Beijing, P.R. China; phone: 86-1-832-3188; telex: 222272 CAGS CN; fax: 86-1-831-0894

August 18-31
ICCP 336 (Intraplate Magmatism and Metamorphism).- INTERNATIONAL FIELD CONFERENCE AND SYMPOSUM ON LAYERED MAFIC COMPLEXES AND RELATED ORI DEPOSITS OF NORTHERN FINNLANDSCANDIA.- Rovaniemi, Finland (Symposium) plus field trips to Finland, Norway and Russia. - Prof. Heikki Papanen, Department of Geology, University of Turku,芬26500 Turku, Finland; fax: +358-21-633 5480; e-mail: papanen@utu.fi

September 2-4
INTERNATIONAL CONFERENCE ON CATHODOLUMINESCENCE AND RELATED TECHNIQUES IN GEOCHEMISTRY AND GEOMATERIALS Nancy France.- Dr. Maurice Pagel, Secretary General, Crgu, B.P. 23, F-54501 Vandoeuvre les Nancy, France; phone: 33-83441809; fax: 33-83444000; e-mail: pga@crgu.cnrs-nancy.fr (see page 9)

September 4-11
AGE AND ISOTOPES OF SOUTH AMERICAN METALLOGENIC PROVINCES, Final Meeting of ICCP Project 342, Salvador, Bahia, Brazil. Technical Sessions and Field trips to Serrinha-Lopiancuri greenstone belt; Fazenda Brasiliero gold mine; Serra de Jacarbas gold conglomerates, Chapada Diamantina, etc. During and following Brazilian Geological Congress (Sept. 1-6). - Aroldo Mist, IGEO, Univ. Fed. Da Bahia, Rua Caetano Moura, 123, Pedrao Salvador, Bahia 40210-340, Brazil, phone: +55-71-2356793; fax: +55-71-2473004; e-mail: mis@ufba.br, or M. Zentilli, ICCP 342 Leader, Department of Earth Sciences, Dalhousie University, Halifax, BSH-315, Canada; phone: +1-902-494-3875; fax: +1-902-494-3873; e-mail: marcos.zentilli@dal.ca

September 17-19
THIRD INTERNATIONAL SYMPOSIUM ON ANDEAN GEODYNAMICS, ICCP 345 (Lithospheric evolution of the Andes), St. Malo, France: Organized by the Institut Francois de Recherche Scientifique pour le Développement en Coopération (ORSTOM, Paris, France) and Geoscience Rennes (CNRS, Universite de Rennes 1, France). Correspondence: Denis Capaias and Pierrick Goggin, Geosciences Rennes, Université de Rennes 1, 35042 Rennes Cedex, France; fax: +33 99 28 60 90 (67 80); e-mail: ISAC96@seth.univ-rennes1.fr

September 18-20
SIXTH INTERNATIONAL CONFERENCE ENVIROSOF 96, Development and application of Computer Techniques to Environmental Studies, Como, Italy - Sue Owen, Conference Secretary, ENVIROSOF 96, Wessex Institute of Technology, Ashurst Lodge, Southampton SO4 7ZA, UK; phone: +44-1703-293223; fax: +44-1703-292853; e-mail: CMIL@uk.ac.rie, Ing. e-mail: CMI@lib.ac.uk

September 26-27
7TH ANNUAL MEETING OF THE GDMB: 'Deutsche Rohstoff- und Metalltage', Regensburg, Germany - GDMB Postfach 10 54, 38668 Clausthal-Zellerfeld; phone: 05323 / 937 90; fax: 05323 / 937 937

September 26-28
MESOZOIC GEOLOGY OF THE EASTERN AUSTRALIAN PLATE, Sheraton Brisbane Hotel and Towers, Brisbane, Queensland, Australia. Excursions are being planned to complement the conference themes: Mesozoic-related gold deposits in eastern Australia, gemstones.- Natalie O'Sullivan, Event Organizer, P.O. Box 1290, Milton Queensland 4064, Australia; phone: +61-7-3369-0477; fax: +61-7-3369-1512

1997

March 17-19
FRANK M. VOLES 70 YEAR ANNIVERSARY SYMPOSIUM: Formation and metamorphism of massive sulphides, Trondheim, Norway- Norwegian University of Science and Technology (NTNU). Explanies: Frank M. Vokes Symposium, Tor Prestvik, Dept. of Geology and Mineral Resources Engineering, NTNU, N-7033 Trondheim-NTH, Norway; phone: +47 735 94 806; fax: +47 735 94 814; e-mail: tores@geologi.unit.no (see page 9)

March 23-27
EUROV (EUROPEAN UNION OF GEOSCIENCES), Strasbourg, France - Contact address: EUG 9 Office, EOPG, 5 rue René Descartes, 67084 Strasbourg Cedex, France; phone: +33 88 61 63 93 (45 01 91); fax: +33 88 60 38 87; e-mail: eug@eopg.u-strasbg.fr

May 11-14
NEVES CORVO FIELD CONFERENCE (Massive sulphide Geology and genesis, and present day submarine hydrothermal activity), Lisbon, Portugal. - European address: Fernando J.A.S. Arriga, GEOFULC, Edifico C2, Piso 5, Campo Grande, 1700 Lisboa, Portugal; phone: +351-1-750-0066; fax: +351-1-759-9390; e-mail: Neves.Corvo@cuf.pt. North American address: Geoffrey Snow, Barranca Resources, c/o SEC Office, 5808 Rapp Street 209, Littleton, Colorado, 80120 USA; phone +303-797-0332; fax: +303-797-0417. Information available also on internet: http://nevescorvo.geo.cuf.pt (see page 8)

August 11-13
4TH BIENNIAL SGA MEETING (Research and Exploration - Where do we go next?), Turku Finland. - Congress Office/SGA Meeting 1997, University of Turku, Lemminkäisentie 14-18 B, FIN-20520 Turku, Finland; phone: +358-21-333 6342; fax: +358-21-333 6410 (after 1 October 1996: +358-2-); e-mail: cescon@utu.fi (see page 12)

1998

August
10TH QUADRRIENNIAL IAGOD SYMPOSIUM, Broken Hill, Australia.- Prof. J. Plimer, Dept. of Geology, University of Melbourne, Parkville, Vic 3052, Australia; phone: +61-3-344-6520; fax: +61-3-344-7761; e-mail: ian_plimer@muwayf.unimelb.edu.au (see page 9)

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IAGOD/CODMUR 8TH INTERNATIONAL PLATINUM SYMPOSIUM, Johannesburg, South Africa.- Dr. C.A. Lee, P.O. Box 68108, Bryanston 2101, South Africa; phone: 27-11-411-2253; fax: 27-11-692-3693

WISH TO ADVERTISE FORTHCOMING EVENTS?

Send your announcements to:

SGA News, Département de Minéralogie, Université de Genève, Rue des Maréchaux 13, CH-1211 Genève 4, SWITZERLAND
Fax: +41 22 320 57 32
e-mail: SGANeWS@sc2a.unige.ch

(See the impressum on page 2 for details concerning the format of the documents to be sent)
RESEARCH AND EXPLORATION - WHERE DO THEY MEET?

TURKU, Finland - 11-13 August 1997

The Society for Geology Applied to Mineral Deposits (SGA), established in 1966, is an international association of economic geologists. The Society promotes the science of mineral deposit geology, edits the Journal, Mineralium Deposita, and organizes biennial scientific meetings in Europe, worldwide field trips and workshops.

The 4th Biennial SGA Meeting will be held in Turku, Finland, August 11-13, 1997, at the Rantasipi Congress Hotel, Pispalan tee 7, FIN-20540 Turku, Finland. The official language will be English.

Under the general theme "Research and exploration - where do they meet?", the organizers would like to bring together economic geology scholars and professional exploration geologists to discuss current issues on ore geology and exploration in order to bridge the gap between the basic and applied sciences. Prospective participants are kindly invited to offer papers for oral and poster presentations. The venue of the meeting is the Rantasipi Congress Hotel in Turku, the oldest city and former capital of Finland. Turku is centrally located in northern Europe, with three universities, the town has a long academic tradition. You can get to Turku by several daily nonstop flights from Stockholm, Helsinki and Hamburg, by four daily ferry connections from Stockholm, by train or bus from Helsinki and by a direct bus connection from Helsinki airport. Present exploration activity is high in Finland and Sweden and both countries can boast, world-class mineral deposits and numerous historical and present-day mining camps. Seven pre- and post-meeting field trips will be organized. The participants will visit classic mining districts and new deposit types in Finland, Sweden and northwest Russia.

Tentative topics:
1) Black schists and associated mineral deposits
2) Gold and precious metal deposits
3) Submarine hydrothermal processes and mineralizations
4) Mineral deposits in ultramafic rocks
5) Mineral deposits in sedimentary environments
6) Deposits of industrial minerals
7) Diamond deposits and exploration
8) Metamorphism and ore deposits (IAGOD/WGOM)
9) Mineral deposit modelling in exploration
10) Environmental aspects of mineral deposits
11) Open session

Co-Sponsors:
Geological Survey of Finland (GSF)
Outokumpu Metals and Resources (OMR)
Geological Society of Finland (GSoc.F)
Geological Society of Sweden (GSoc.S)
Society of Economic Geologists (SEG)
University of Turku (UT)

Organizing Committee:
Dr. H. Pappinen, Chairman, UT; Dr. R. Salminen, Secretary General, GSF; Dr. P. Nurmi, Field Trip Coordinator, GSoc.F; Dr. K. Sundblad, Field Trip Coordinator, GSoc.S; Ms. S. Aalto, Abstract Committee, GSF; Dr. O. Eklund, Social Programme Committee, UT; M. M. Isohanni, OMRF; Dr. M. Makela, GSF; Dr. Z. Johan, GSA; Dr. A. Aribas, SEG; Ms. M.-L. Forsanger, Congress Office, UT

Field trips
Both pre- (A) and post-meeting (B) field trips have been planned:
A1. Metallurgy of Archean greenstone belts in eastern Finland and northwest Russia including visits to gold, base metal, phosphorus and diamond deposits (5 days)
A2. Base metal deposits in the Skellefte area, Sweden and western Finland (2 days)
B3. Cold and base metal deposits in southwestern Finland (2 days)
B4. Black schists and associated mineral deposits in Finland (2 days)
B5. Deposits of Lapland including Kemi chromitite, Aitik Cu-Au, Kiruna Fe, Snaefellsbora Au, Pahtavaara Au and Keivisa Ni-Cu-PGE deposits (5 days)
B6. Ore deposits of the Bergslagen area, Sweden (4 days)
B7. Ore deposits of the Kola Peninsula, northwest Russia (5 days)

Social programme
The participants will be offered a varied social programme including outings and the Congress Banquet.

Second Circular
The Second Circular will be distributed in October 1996. Please make sure you receive the Second Circular by returning the attached pre-registration form to the Congress Office as soon as possible.

Important dates
August 31, 1996 Pre-registration, response to the First Circular
October 1996 Second Circular
January 31, 1997 Submission of extended abstracts
February 15, 1997 Acceptance of abstracts
April 30, 1997 Return of camera-ready abstracts
May 15, 1997 Final registration and payment of fees for registration and field trips

Correspondence
Congress Office/SGA Meeting 1997, University of Turku, Lemminkäisenkatu 14-18 B, FIN-20520 Turku, Finland; Tel. +358-21-333 6342, Fax +358-21-333 6410 (after 1 October 1996 +358-2-); e-mail: cescon@utu.fi

4th BIENNIAL SGA MEETING PRE-REGISTRATION FORM

Name ..........................................................
Mailing address ..........................................................
..........................................................Country ...
Tel ............................................. Fax ...................................
E-mail ..........................................................

I intend to attend the Meeting
☐ to take part in field trips no.
☐ to submit a paper
☐ to present a poster

I am interested in sessions ................................

Preliminary title of the paper / poster ..........................

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

Mail to the above address

--- End of Document ---
LAST-MINUTE ANNOUNCEMENTS

8 - 10 (noon) July, 1996, Brest, France
SHORT COURSE: PRESENTING-FORMING HYDROTHERMAL DEPOSITS IN THE OCEANS AND ANCIENT ORES ON LAND: A COMPARISON OF MODERN AND ANCESTRAL MASSIVE SULFIDES AND RELATED DEPOSITS FROM A GEOLOGICAL AND GEOCHEMICAL POINT OF VIEW.
Presented by: Steven Scott (Director of the Marine Geology Research Laboratory and Professor of Ore Deposits Geology, University of Toronto, Canada and invited Professor of the "Université de Bretagne Occidentale")

Université de Bretagne Occidentale - Brest, Les Séminaires de l'Ecole Doctorale des Sciences de la Mer, Faculté des Sciences et Techniques, 6 av. Le Gorgeu
Contact: Mme Gisèle Guemel, Dépt. des Sciences de la Terre, UBO-UFR Sciences et Techniques, Université de Bretagne Occidentale, 8 avenue Le Gorgeu, B.P. 809, 29206 Brest Cedex, France, Tel (33) 98 01 61 76, Fax (33) 98 01 68 20, Internet guemel@univ-brest.fr
Language: English and French
Cost of course and dinner: 300F

April 8-10, 1997, Moscow, Russia
SAGA- eo-sponsored
PRINCIPAL GENETIC PROBLEMS RELATED TO MINERAL DEPOSITS OF MAGMATIC AFFILIATION - A SPECIAL MEMORIAL SCIENTIFIC SESSION AND A SYMPOSIUM TO BE ORGANIZED BY THE INSTITUTE OF GEOLGY OF ORE DEPOSITS, PETROGRAPHY, MINERALOGY, AND GEOCHEMISTRY (IGEM), RUSSIAN ACADEMY OF SCIENCES.


Main topics of the Symposium:
1. Hydrothermal fluids, their nature and ore-forming processes
2. Mineral paragenetic assemblages, stages and other temporal divisions of mineralization processes
3. Physico-chemical problems of endogenous ore-formation
4. Modern analogues of magmatogenic ore-forming systems
5. Genetic interpretation of textures and structures of mineral aggregates
6. New methods of mineral substance investigations
Post-Symposium field trip (5-4 days)
A field excursion to the famous Kort义务skal Paleozoic epithermal gold and Almaty porphyry copper deposits of Tajikistan district of Uzbekistan will be organized for a small group of foreign participants.

The official languages will be English and Russian. A consecutive translation from both will be provided.

REPLY FORM FOR THE A. G. BETEKHIN SYMPOSIUM, MOSCOW, RUSSIA, APRIL 8-10, 1997

Name ____________________________
Position/Title ____________________________
Organization/Institution ____________________________
Address _______________________________________
Tel. __________________ Fax __________________
e-mail ________________________________________________
Preliminary title of the paper/poster ____________________________

I wish to join the Post-Symposium field trip ________________________
My choice of attendance: [ ] certain [ ] fair [ ] slight
I will be accompanied by ____________________________________________
Date __________________ Signature __________________

Second circular will be delivered to those who return this form filled. The attendance at field trip will be limited on the "first paid - first served" basis.