SGA News

NOVEMBER 1996 Number 2

Mining and Exploration in Finland

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Finland has a long history of mining activity, and Finnish metallurgical technology and manufacturers of mining equipment are well known throughout the international mining community. The exploitation of copper, nickel, cobalt, zinc and lead ores as well as chromium, vanadium and iron deposits has provided the raw material base for the country's metal industry, with significant processing and refining of copper and nickel concentrates at Harjavalta, zinc at Kokkola, chromium at Kemi by the Outokumpu Group and of iron at Raahe by Rautaruukki Oy. The major industrial minerals mined in Finland are apatite and talc and, to a lesser extent, limestone.

Finland opened its borders to foreign mining companies in 1994 as a prelude to its integration into the European Union and a number of international companies have already commenced exploration projects in the country. Recent discoveries include a number of gold, base metal and mineral pigment deposits, as well as diamond-bearing kimberlites. Finland can currently be considered as one of the most prospective exploration areas in Europe.

Geological overview

Finland occupies the central part of the predominantly Late Archean and Early Proterozoic Fennoscandian Shield, which is exposed over an area of more than 1 million km^2. The bedrock can be subdivided into three broad domains that have shared a common history since about 1.8 Ga. These three crustal units essentially comprise a Late Archean cratonic nucleus flanked on both sides by early Proterozoic mobile belts. The Kola-Lapland domain, to the NE of the Karelian craton, records the amalgamation at around 1.9 Ga of several distinct crustal units of both Proterozoic and Archean age, and is more characteristic of collisional tectonic processes. In contrast, the Svecofennian domain, to the SW of the Karelian craton, is entirely Early Proterozoic in age, and indicates relatively rapid formation and accretion of new crust between about 1.97-1.86 Ga.

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Welcome to Turku - Tervetuloa Turkuun!
4th Biennial SGA Meeting in Turku, Finland, August 11-13, 1997

Heikki Papunen, chairman of the Organization Committee

Under the general theme "Research and exploration - where do they meet" the organizers invite academic and professional economic geologists to discuss current issues on academic geology and mineral deposit exploration in order to bridge the gap between the basic and applied sciences.

Turku, the former capital of Finland, has two universities, the Åbo Academy University for Swedish-speaking students and the University of Turku for Finnish-speaking students. Both universities have a Department of Geology. A joint unit, the Geocenter, has been established to co-ordinate the courses and research in geology. The venue of the meeting is the Rantasipi Congress Hotel where the Geocenter organized the Nordic Geological Winter Meeting in January 1996. The 450 participants at that meeting were delighted with the environment and the organization. The Congress Hotel has 300 beds and additional accommodation has been reserved in the downtown hotels. Good co-operation is the key to the success of the organization. The Organizing Committee is aided by professionals of the University Congress Office, who have experience of several successful scientific conferences.

In addition to local academic institutes, the Organizing Committee also includes members of the Geological Survey of Finland, the Geological Societies of Finland and Sweden, representatives of the sponsoring organizations SGA and SEG, and the Finnish mining giant, Outokumpu Oy.

Turku is centrally located in northern Europe and forms a good starting and end point for the field trips. We have good flight connections to Helsinki, Stockholm and Hamburg, train and bus connections to Helsinki and several daily routes by ferry to Stockholm. You can experience the splendid late summer ferry trip across the wide archipelago of SW Finland. The geological field trips will be described elsewhere in this issue, but note that Finland, NW Russia and Sweden host several world-class mining camps which will be visited during the excursions. In order to reduce the bus drive between the excursion targets, we have arranged the field trips both on a thematic and a regional basis. The living costs in these countries are relatively high and hence the prices of the excursions are unfortunately not cheap, although we will try to make them as economical as possible.

The programme of the meeting will be organized in several parallel sessions and the large number of pre-registrants, 380, by the end of September, promises a variety of topics in the programme. We anticipate that the growing interest in mineral deposit exploration in Nordic countries will result in the substantial participation of international exploration companies in the meeting, where they can contact local geologists and get updates on the economic geology of the area. A great deal of interest has already been shown in the session on gold deposits and exploration, and even more exotic for the SGA Meetings will be the session on diamond deposits and exploration, which was included in the programme as the result of recent diamond discoveries and exploration activity in the area. The sessions will have conveners and we will have distinguished keynote speakers, e.g. D. Groves, A.J.A. Janse, A.J. Naldrett, J.A. Plant, S.D. Scott, R. Sillitoe and others.

A workshop on the topic "The use of wallrock alteration and primary geochemical dispersion in mesothermal gold exploration" will be organized by Dr. Pasi Eilu, Dr. Edward J. Mikucki and Prof. David I. Groves from the University of Western Australia, on Sunday, August 10, 1997. A short course on "Application of Geochronology and Isotope Geochemistry to Ore Deposits" will be given by A. Cheilletz and F. Saupé (Nancy), A. Fallick (Glasgow), and R. Moritz (Geneva) also on Sunday 10. We can accept only a limited number of participants for the workshop and the short course and a special participation fee will be levied.

Extended abstracts of the papers will be published prior to the meeting in the same way as in the preceeding SGA Meetings, and we anticipate that this Proceedings Volume will be as successful as an updated work on economic geology as the previous ones. The second circular, which will be mailed to the pre-registrants by the end of October, will include detailed directions how to prepare the camera-ready abstracts.

A social programme will be organized including the conference banquet in Turku Castle, a city tour with a cruise in the archipelago and a visit to the "Blue Mussel Visitor's Centre" to study the cultural and natural history of the Baltic Sea.

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SGA News

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Information for contributors
Items for publication may be sent to: SGA News (see address below)
Manuscripts should be sent in computer diskette in Macintosh or DOS formats using Microsoft Word or WordPerfect. Please always send a paper copy and indicate the format you are using.

Deadline for SGA News Nr. 3:
31 MARCH 1997

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NEWS OF THE SOCIETY

☞ Treasurer's note to all SGA members

If you have changed your mailing address, please notify the Treasurer's Office as soon as possible to avoid any problems with receiving your copy of *Mineralium Deposita*. I will forward your new address to Springer-Verlag, which is responsible for mailing the Journal. Please note that *Mineralium Deposita* is not mailed from the Treasurer's Office! It is sent from Springer-Verlag.

All SGA members will soon receive the new SGA Membership Directory which has been prepared based on the information provided in response to our questionnaire. Last updates to the directory were made in September 1996. If your name, address, telephone, fax or email is not correct, please inform me as soon as possible.

If you have paid your membership fees and do not receive *Mineralium Deposita*, please inform the Treasurer immediately. I will check your records and advise Springer-Verlag accordingly. If you do not receive your copy of *Mineralium Deposita*, please check that you have paid your membership fees. Late payment may result in mailing of *Mineralium Deposita* being discontinued.

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☞ International Conference on Cathodoluminescence and Related Techniques in Geosciences and Geomaterials (Nancy, September 1996)

The International Conference on Cathodoluminescence and Related Techniques in Geosciences and Geomaterials was held in Nancy, France from 2 to 4 September 1996 organized by the Society for Geology Applied to Mineral Deposits (SGA), the Society for Luminescence Microscopy and Spectroscopy (SLMS), and the Société Française de Minéralogie et de Cristallographie (SFMC) in cooperation with the Institut Lorrain des Géosciences. 110 participants from 18 countries attended and 82 oral and poster communications were presented.

The field of cathodoluminescence in geosciences was reviewed by A.S. Marfunin, G. Walker, P.D. Townsend, G. Remond, M. Phillips, K. Ramseyer, H.G. Machel, O.C. Kopp, M. Schvoerer, D.J. Marshall, and O.C. Kopp and a broad range of CL applications was presented. The advantages of using CL to determine the chemical and structural variations in materials were discussed. Quantitative to semi-quantitative trace element determinations were presented on calcite and apatite. The use of CL is recommended prior to *in situ* trace element or isotopic determination. This was clearly illustrated by several communications on U-Pb dating of zircons. A round-table was organized on standard and calibration of CL apparatus. New members (Ph. Blanc, R. Neuser, G. Remond and G. Walker) were included on the SLMS Standards Committee chaired by Don Marshall.

A book including most of the invited lectures and a selection of the communications is scheduled to be published by end of 1997. SLMS President Hans Machel suggested organizing the SLMS 10-year Anniversary Conference in North America in 1998.

For the Organizing Committee
Maurice Pagel, Vincent Barbin, Philippe Blanc, and Daniel Ohnenstetter,
Nancy, France

☞ A new Mineralium Deposita Office in the USA

A new Mineralium Deposita Editorial Office will open at the United States Geological Survey in Denver, Colorado, USA. For details see pages 5-6.

☞ SGA Special Publications

Strongly reduced prices on SGA Special Publications (see page 15).

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

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✂

CHANGE OF ADDRESS FORM

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

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Name: .....
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from 2: WELCOME TO TURKU

The registration fees of the conference will be FIM 1300 (~260 US$) for non-members and FIM 1100 (~240 US$) for SGA and SEG members, the fees including lunches and refreshments during the meeting. Students will have a reduced registration fee (FIM 900 = ~200 US$) and special low-rate accommodation will be organized on request. A number of travel grants will be available, mainly for junior and student SGA members with accepted contributions.

The information on the meeting will be continuously updated and will be available in the Dept. of Geology homepage (http://www.utu.fi/ml/geologia/sga.htm). The abstract forms will be sent only to those who intend to present a paper or a poster at the meeting.

On behalf of the Organizing Committee, I would like to welcome you to Turku and the 4th Biennial SGA Meeting.

Heikki Papunen, Chairman of the Organizing Committee

If you want to get a copy of the second circular, please contact: Congress Office/SGA Meeting 1997, University of Turku, Lemminkaeisenk. 14-18 B, FIN-20520 Turku, Finland, Tel: +358-2-3336342, fax: +358-2-333 6410, e-mail: cescon@utu.fi

SOCIETY FOR GEOLOGY APPLIED TO MINERAL DEPOSITS (SGA)

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SOCIETY FOR GEOLOGY APPLIED TO MINERAL DEPOSITS

Report of the Executive Secretary about membership

23 Regular Members, 2 Corporate Members, 2 Junior Members and 13 Student Members applied for membership from April 1996 to September 1996.

LIST OF NEW SGA MEMBERS
(April 1996 - September 1996)

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

Mineralium Deposita

Mineralium Deposita is the official journal of the SGA. It is one of the most authoritative international journals in mineral deposit geoscience. It publishes papers on the geology and genesis of a world-wide spectrum of metallic and non-metallic mineral deposits. It is characterized by being a high quality journal with a reputation for exciting minerals deposit science.

A new *Mineralium Deposita* Editorial Office has been established in North America in the United States Geological Survey in Denver and Dr. Richard Goldfarb will co-edit the Journal and will be initially mainly involved with promoting the Journal and the Society in North America.

We asked the current Editor of *Mineralium Deposita*, Dr. David Rickard, to describe the dramatic changes in the Journal that have taken place over the past few years.

The SGA Journal : Mineralium Deposita

David Rickard
Editor of Mineralium Deposita,
Department of Earth Sciences, University of Wales, Cardiff CF1 3YE. Wales, UK.

Increased circulation of Mineralium Deposita

Mineralium Deposita, the official journal of the SGA, is one of the few scientific journals to be increasing its circulation. In fact, it is anticipated that final figures may suggest a growth in subscriptions of more than 10% in 1996! No-one in industry, government or academy, genuinely claiming to be at the forefront of international mineral deposit geology can afford to be without *Mineralium Deposita*. It is traditionally the international journal of global mineral deposit geology. *If you don't have it, you just haven't got it!*

Increased size of journal

The number of pages published has risen to 600 pages each year in six issues. There are no page charges for publishing in *Mineralium Deposita* and no limits to the size of papers published: this is up to the Editors to decide. Even with this increase in size, *Mineralium Deposita* is unable to publish much more than one third of the manuscripts it receives.

Truly International Journal

The SGA, the parent Society of *Mineralium Deposita*, was founded in continental Europe and is still registered in Switzerland. At present its President is French (to become Austrian in 1997), the Vice-President is German (to become Czech in 1997), the Treasurer is German, and its Executive Secretary is French. Members of the present SGA Council hale from 16 different countries.

Mineralium Deposita extends this tradition of genuine internationality. The journal now has an Editorial Board of 12 Associate Editors from 8 countries world-wide. These are the distinguished international scientists whose job it is to advise the Editors if the manuscript is suitable for publication in *Mineralium Deposita*. In 1996, these Associate Editors included Fontboté (Geneva), Herzig (Freiberg), Urabe (Tokyo), Kerrich (Saskatoon), Eriksson (Pretoria), Shelton (Columbia), Reed (Oregon), Marcoux (Orleans), Ryabchikov (Moscow), Walshe (Canberra), Prichard (Cardiff -Book Review Editor), Lehmann (Clausthal), McNaughton (Perth).

The Associate Editors normally serve for 3 years and then rotate off. For example, Brown (Montreal) and Hedenquist (Tokyo) will be joining the Board in 1997. Distinguished previous Associate Editors include Marco Einaudi who has left to take over the Editorship of Economic Geology from Brian Skinner. These Editors work with a network of international referees and some 110 referees reviewed *Mineralium Deposita* manuscripts in 1996.

The net result of this intrinsic internationality on the journal is two-fold:

(1) *Mineralium Deposita* is particularly aware of the problems of authors whose first language is not English. In fact, a majority of our authors fall into this category. The journal is also sympathetic to authors who have not previously published in the international literature. The Associate Editors work very hard indeed with authors to get manuscripts into shape for publication. As a support an English Language Service is now available at the Cardiff Editorial Office (see below).

(2) *Mineralium Deposita* encourages authors describing new deposits in new countries. The Associate Editors help authors who may not be familiar with the traditions of the international scientific publishing scene to get their names into print. The new *Mineral Deposit Letters* section (see below) may help authors publish thumbnail accounts of new deposits in new regions.

***Mineralium Deposita* Editorial Office Opens in US**

I journeyed to Denver, Colorado in September 1996 to set up a new *Mineralium Deposita*, Editorial Office for North America.

The new Office will be in the United States Geological Survey in Denver and the new Editor will be **Richard Goldfarb**. Dr. Goldfarb will co-edit the journal and will be mainly involved with promoting the journal and the Society in North America.

Dr. Richard Goldfarb is an internationally known mineral deposit geologist with a major publication record. He is in the same research group as Dr. David Leach, the SGA Vice-President for North America.

Dr. Leach will work with Dr. Goldfarb in the promotional work. North American mineral deposit geologists are presently largely unaware of the opportunities presented by the SGA and *Mineralium Deposita* and Drs. Leach and Goldfarb are certain that the new initiative will arouse considerable interest amongst North American professionals.

The SGA looks forward to the new opportunities offered by the North American base. In particular, it looks forward to even closer co-operation with the SEG.

Fast publication times in *Mineralium Deposita*

All authors want their work published rapidly. At *Mineralium Deposita* we aim to print it within 6 months of acceptance. The problem has been the backlog of manuscripts at the publishers awaiting publication. During 1996, the Cardiff Office worked hard with the publishers to get out the mountain of manuscripts awaiting publication.

The mountain was removed on schedule by June 1996 and now only enough papers for 1 -2 issues are kept at the Publishers.

This means that accepted manuscripts should normally be published within 3 issues or 6 months after acceptance. Of course, referees take time, but Mrs. **Vera Walters** in the Cardiff Editorial Office keeps everyone on their toes by a graded series of faxes, e-mails and then (most feared by Associate Editors!), a telephone call.

We aim to turn manuscripts around in a month and have a cut-off system after 12 weeks.

I have to say that the longest delays in publication are often caused by the authors themselves, however....

Mineral Deposit Letters

Mineral Deposit Letters are short accounts which are normally published in the next but one issue after acceptance. This means a publication time after acceptance of less than 2 months. *Mineral Deposit Letters* have strict limitations in terms of size (up to a maximum of 4 *Mineralium Deposita* pages: i.e. ca. 9000 key strokes / ca. 2000 words / ca. 10 ms pages) and number of display items (4, including Tables, Figures and Plates). Details can be found on the inside back cover of any issue of *Mineralium Deposita* and Instructions to Authors are available from the Cardiff Office.

Mineral Deposit Letters are particularly useful for publishing short descriptions of new deposits, mining camps, metallogenic terranes etc. as well as rapid publication of new scientific results.

Thematic Issues

Thematic Issues have become a popular feature of *Mineralium Deposita* and we presently publish 1 or 2 per year. Previous issues have included Australian Archaean Gold Deposits, Australian Proterozoic Au-Cu Deposits, South African Mineral Deposits, Swedish Proterozoic Deposits, and Zeolites. In 1997, we will publish Thematic Issues on the Iberian Pyrite Belt and on New Exploration Initiatives in South Africa.

New *Mineralium Deposita* benefits to SGA Members.

1. **Colour plates**: a particular feature of the journal recently has been the incorporation of superb colour plates. The Springer presses have produced images of the highest quality. Many authors who have high quality colour images of deposits, ores and minerals are now approaching us for publication. An added attraction is that SGA members may get these colour plates free. Since colour plates cost up to DM 1200 (ca. US$ 720) each, the annual regular membership fee for the SGA of DM 98 (ca. $US60) is a bargain!

2. **English-language editing**: nowadays, to get ahead you have to publish in English. For many authors whose first language is not English this is a daunting task. However, the Cardiff Editorial Office has opened an English-Language Correction Service. Here author's manuscripts are corrected by native English-speaking geologists at a flat rate of £UK 3 (US$ 4.50) per page. Again this service is free to SGA members. So if you want to publish in the international literature, *Mineralium Deposita* is the journal of first choice and best opportunity.

Subscription Information and Editorial Offices

Membership information is contained on other pages in SGA News. If you need any help in joining the SGA, contact the Executive Secretary or one of the Editorial Offices. There are many deals available - so if you think you can't afford it contact us anyway to see what's on offer. Corporate membership is a really good deal and the number of Corporate Members is increasing rapidly. For each Corporate Membership you get 3 copies of the journal for rapid distribution within your organisation.

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from 1: MINING AND EXPLORATION IN FINLAND

Archean history of the Karelian craton

The Karelian craton is characterized by narrow northerly trending greenstone belts surrounded by areally more extensive granitoids and higher grade gneiss domains. Although rocks up to 3.2 Ga are present throughout the craton, the earliest well-documented magmatic and metamorphic event seems to have taken place at around 2.84 Ga. The lower grade greenstone sequences formed after this event, and were variably deformed and intruded by tonalitic to granitic magmas between 2.75-2.69 Ga. The Kuhmo and Suomussalmi greenstone belts are the most extensive well preserved supracrustal units in the Archean of Finland, outcropping over a strike length of nearly 200 km, though seldom exceeding 10 km in width. They both contain abundant tholeiitic and komatiitic volcanics, together with related intrusive and subvolcanic cumulates, and lesser felsic volcanic and volcaniclastic units.

In spite of complex deformation, primary textures and stratigraphical relationships are widely preserved, permitting detailed mapping and analysis of volcanic facies and hence providing a conceptual basis for regional komatiite-hosted nickel exploration.

The Hattu schist belt, near the southwestern margin of the craton, represents a rather different kind of supracrustal sequence that records rapid crustal growth and deformation between 2.75-2.72 Ga. Felsic volcaniclastic sediments in this belt, and lithofacies, as well as geochemistry of granitoids and some basalts are consistent with a collisional arc setting. Extensive structurally controlled alteration systems have recently been delineated and found to contain numerous encouraging gold targets.

Some indications have also been found for the presence of Zn and Ag mineralization within felsic sequences, including the Taivaljärvi prospect at the southern end of the Kuhmo greenstone belt.

The overall potential for base metal mineralization in late Archean supracrustal rocks of the shield has however, not yet been adequately assessed. Soapstone deposits developed in ultramafic rocks also represent a volumetrically minor but economically significant resource in several greenstone belts, while the 2.6 Ga Siilinjärvi carbonatite, intruding the western edge of the craton, currently represents Finland's largest mining operation in terms of annual tonnage.

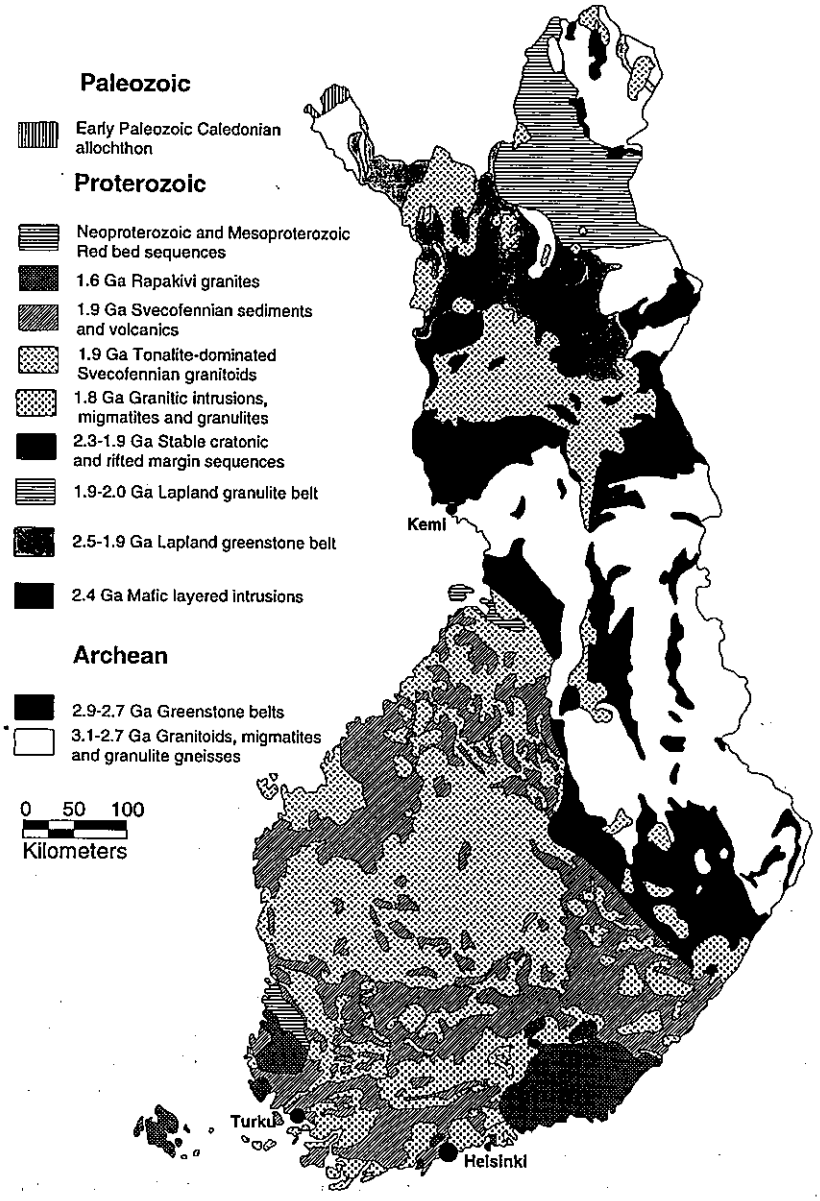


Figure 1: Principal geological units and age subdivisions in Finland.

Early Proterozoic rifting of the Karelian craton

The northern part of the Karelian craton, particularly in Finnish Lapland, records a prolonged and episodic history of sedimentation, rifting and magmatism throughout the Early Proterozoic. The Lapland greenstone belt is the largest mafic-dominated province preserved in Finland. A sequence of bimodal komatiitic and felsic volcanics dated at around 2.5 Ga unconformably overlie the Archean basement and represent the onset of rifting. Continued rifting of the Archean crust resulted in the widespread emplacement of gabbro-norite layered intrusions between 2.45-2.39 Ga. These intrusions host the important Kemi chromite mine, and also contain widespread PGE-Au enrichment, although to date no economic deposits have been discovered. Terrigenous clastic sediments discordantly overlie these layered intrusions, with further episodes of mafic magmatism recorded as sporadic lavas and sills dated at around 2.2 Ga, 2.10 Ga, and 2.05 Ga. This latter phase includes the Keivitsa polymetallic deposit and coincided with rifting and subsidence of the Karelian craton margin, recorded by coarse clastic turbidites, carbonates, iron formations and finer-grained graphitic schists, the latter hosting the extensive, though low grade Talvivaara nickel deposits.

Rifting culminated in extensive mafic and ultramafic volcanism within the Lapland greenstone belt and the formation of oceanic crust at 1.97 Ga, fragments of which were subsequently thrust back onto the Karelian craton as the Jormua and Outokumpu ophiolites, the latter being best known for its Cu-Co-Zn deposits and chromian skarns.

Early Proterozoic Svecofennian domain

The plate tectonic paradigm has been widely applied in interpreting crustal growth, deformation and metallogenesis in the Svecofennian domain. Northeast-vergent emplacement of the Outokumpu ophiolite onto the Karelian craton foreland is inferred to record the initial collision with a Svecofennian oceanic island arc, generating primitive tonalites from a low-K tholeiitic source. Continued volcanism within this arc at 1.92-1.90 Ga led to the formation of volcanic-hosted massive sulfide deposits, including the Pyhäsalmi Zn-Cu mine, with hydrothermally altered host-rocks subsequently being metamorphosed to distinctive cordierite-orthoamphibole lithologies. Reversal of subduction polarity following collision, or a further arc-arc collision is invoked to explain the most extensive phase of volcanism, magmatism and deformation in southern and western Finland between 1.89-1.86 Ga. Ultramafic intrusions within reduced sedimentary sequences provided an important setting for nickel mineralization, including the Vammala and Kotalahti nickel belts. The gold potential of this region is also being increasingly recognized, with the currently operating Orivesi mine possibly representing a metamorphosed high-sulfidation epithermal deposit, while other shear and vein-hosted gold occurrences are closely associated with magnetite-series granitoids.

Deep seismic studies in combination with geochemical and isotopic data indicate that extensional collapse and widespread intracrustal melting took place in the period 1.84-1.80 Ga; this is presently interpreted as a thermal and gravitational response to tectonic thickening of the lithosphere, although it is currently uncertain whether or not a mafic underplate was required as an additional heat source. A distinctly separate thermal input from the mantle is however invoked to account for later extension and rapakivi magmatism at 1.6 Ga.

Base metal mining

The history of mining in Finland dates back to 1540, when the quarrying of iron ore commenced in the southern part of the country. Since then some 260 metallic mines have been exploited, with the total amount of ore hoisted being around 250 Mt.

The discovery of the historically important Orijärvi copper-zinc deposit in 1757 marked the beginning of extensive mining in the area, with the last mine in the area having closed as recently as 1974. Other mines in this district include Malmberg (iron) from 1670 - 1866, Aijala (copper-zinc) from 1948 - 1961 and Metsämonttu (copper-zinc-lead) from 1951 - 1974. This makes the Orijärvi area the most active mining field in the country's mining history.

Tracing the provenance of a mineralized glacial boulder some 50 km back along the direction of ice transport to its ultimate source resulted in the discovery in 1910 of the famous Outokumpu copper ore. The main Outokumpu mine (Keretti) produced 28.5 Mt of ore grading 3.3% copper, 0.8% zinc, 0.25% cobalt and 0.8 g/t gold. Other copper-zinc mines associated with Outokumpu ophiolite complex include Luikonlahti, operated by Malmikaivos Oy during 1958 - 1983 and Vuonos operated by Outokumpu Oy during 1967 - 1986. Production in the Outokumpu region as a whole came to an end in 1989.

As well as the historical iron ore production from southern Finland, some 25 Mt of magmatic-hosted iron ore was mined at Otanmäki by Rautaruukki Oy from 1949-1985, providing the domestic raw material base for steel manufacturing and also for the production of ilmenite and vanadium. At present, however, there are no iron ores in operation, and all iron ore for the Rautaruukki Oy's iron and steel plant at Raahe, on the coast of western Finland, is imported.

The discovery of the Vihanti deposit in 1947 led to the mining of zinc-copper-lead ores over the period 1952 - 1992. The Vihanti mine produced 28 Mt ore grading 5.2% zinc, 0.5% lead and 0.4% copper. Several other massive sulfide ore deposits have been found in association with Svecofennian felsic volcanic rocks, most notably the Pyhäsalmi mine, which has been in continuous operation since 1959. Total production of ore at Pyhäsalmi is 28 Mt grading 2.6% zinc, 0.8% copper and 0.4 g/t gold. Current annual ore production is about 1 Mt with an expected mine life of about 5 years remaining. The nearby Mullikkoräme deposit will come into full production this year. All these base metal mines have been operated by Outokumpu Oy.

Finnish production and smelting of nickel has been based on extensive mining of Svecofennian mafic-ultramafic hosted deposits. The Kotalahti mine produced 12 Mt ore grading 0.66% nickel and 0.26% copper from 1957 - 1987; the Vammala mine produced 7.6 Mt ore grading 0.67% nickel and 0.42% copper between 1974 - 1994; and the Enonkoski mine produced 6.7 Mt ore grading 0.78 nickel and 0.21% copper from 1984 - 1994. The only currently operating nickel mine is Hitura which has produced over 8 Mt ore grading 0.55% Ni and 0.20% copper since 1965. All these nickel mines have been owned and operated by Outokumpu Oy.

The Kemi chromite deposit is hosted by one of the 2.44 Ga mafic layered intrusions in northern Finland. Mining of the most important chromite deposit in Europe started in 1966 and 19 Mt of ore grading 25% Cr_2O_3 have been mined so far, with current annual production being about 1 Mt chromium ore. Mining and production of ferrochrome at Kemi is integrated with the stainless steel plant at Tornio, only some 20 km away and together they have formed the basis for expansive and successful stainless steel manufacturing by Outokumpu Stainless Steel Oy.

Gold deposits

Unlike most other shield areas Finland has never been an important gold producer and very little money has traditionally been invested in gold exploration. Gold was however extracted as a significant by-product from massive sulfide deposits such as the Keretti mine in the Outokumpu district, which produced a total of some 20 t of gold. In the past the only deposit producing gold as the main constituent was the Haveri Au-Cu mine in southern Finland, which produced some 4.2 t of gold between 1942 and 1960. A comprehensive gold exploration program was initiated during the early 1980's and has so far led to the opening of three mines, with a number of additional deposits undergoing feasibility studies, as well as the discovery of more than 70 bedrock gold occurrences, most of which have been evaluated to some extent by drilling.

The Paleoproterozoic Lapland greenstone belt in northern Finland is the most extensive greenstone terrain in the shield, extending for over 500 km from the coast of Norway southeastwards to the border between Finland and Russia. The Lapland greenstone belt hosts a number of gold deposits and

showings typically associated with carbonate-albite alteration domains and shear zones within mafic volcanics and epiclastic sediments. Two deposits have been exploited so far; Outokumpu Finnmines Oy commenced mining at the Saattopora deposit in 1988, which produced 2.1 Mt grading 3.3 g/t gold and 0.3% copper before closure last June. The ore mainly comprised a set of parallel thin sulfide-quartz-carbonate veinlets within a hydrothermally altered albite schist.

Terra Mining Oy commenced exploitation of the Pahtavaara deposit in central Lapland during June of this year. Planned annual production is for 400,000 t grading 3-4 g/t and proven reserves allow 5-year production with good potential for finding additional ore. Processing is based solely on gravity concentration, which is expected to yield about 85% recovery of the fairly coarse grained gold. Mineralization is associated with sulfide-poor dissemination, and quartz-baryte lenses and veins in a sheared and altered ultramafic volcaniclastic sequence.

A number of gold-cobalt deposits have been discovered in the Kuusamo district in the southeastern part of the Lapland greenstone belt. The ore type is characterized by breccias and banded disseminations of abundant iron sulfides within a strongly altered feldspathic sedimentary rock. Typical grades vary between 0.5-10 ppm for Au and 0.1-0.3% for Co, with anomalous U, Cu, W, Mo, Te, Bi and As. The Juomasuo deposit has reserves of about 1 Mt grading 5-6 g/t Au and 0.2% Co and Outokumpu Finnmines Oy carried out feasibility studies on the deposit during 1992; difficulties were encountered in the simultaneous benefication of gold and cobalt.

The Paleoproterozoic Svecofennian complex of southwestern Finland hosts a number of gold occurrences, most of which are spatially associated with tonalitic and subvolcanic intermediate intrusions. Mineralization is characterized by deformed quartz vein systems and less commonly by disseminations in shear zones. Sulfides are relatively abundant consisting of iron sulfides, chalcopyrite and arsenopyrite. Two deposits have been exploited, including the Haveri mine which produced a total of 1.5 Mt ore, averaging 2.8 g/t Au and 0.37% Cu between 1942 and 1960. The deposit comprised sulfides and gold in the contact zone between a felsic intrusion and sheared tholeiitic basalt.

Outokumpu Finnmines Oy commenced mining of the Orivesi deposit in 1994. Ore reserves of 360,000 t grading 8 g/t have been delineated down to a depth of 260 m and annual production is some 150,000 tpa. The ore comprises vertical pipe-like features that continue downwards to at least 300m and gold occurs as fine-grained disseminations with tellurides in a sulfide-poor pervasively altered sericite-quartz rock. The deposit has been interpreted as a metamorphosed and deformed high-sulfidation epithermal ore body.

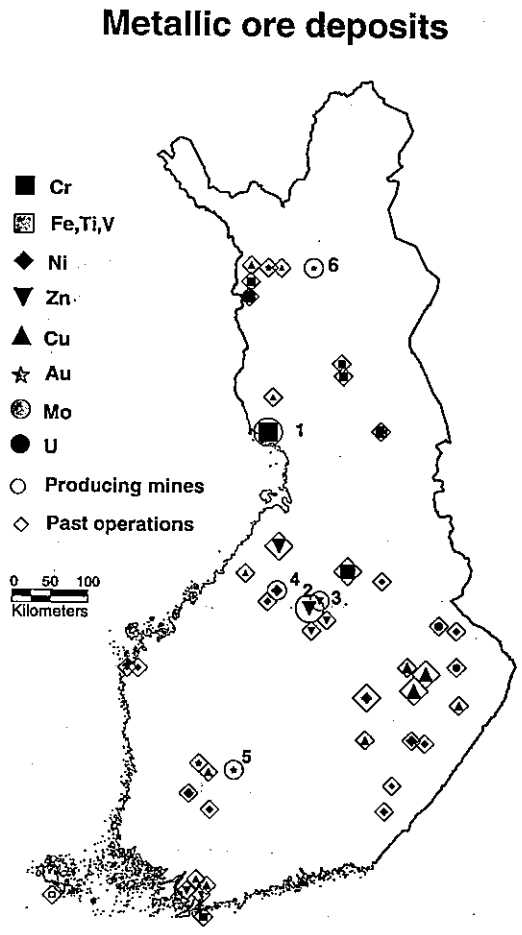


Figure 2: Currently operating metallic mines in Finland. 1. Kemi; 2. Pyhäsalmi; 3. Mullikkoräme; 4. Hitura; 5. Orivesi; 6. Pahtavaara.

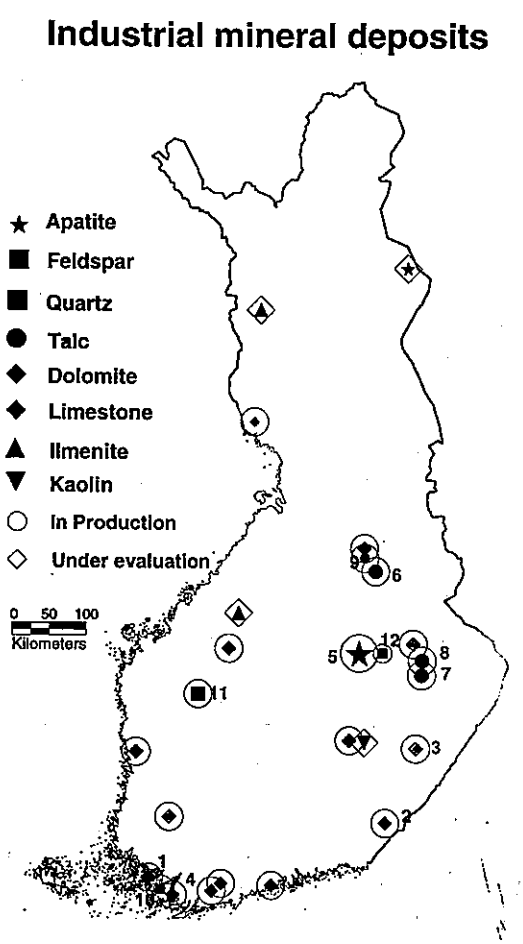


Figure 3: Industrial mineral deposits in Finland. 1. Paraisten; 2. Ihalainen; 3. Ruokojärvi; 4. Förby; 5. Siilinjärvi; 6. Lahnaslampi; 7. Horsmanaho; 8. Lipasvaara; 9. Mieslahti; 10. Kemiö; 11. Haapaluoma.

Recent exploration has shown that Archean greenstone belts in eastern Finland contain gold mineralization similar to that in greenstone belts in the other continents. The first discoveries were made in the Hattu schist belt in easternmost Finland. The Geological Survey of Finland reported exploration and research results to the Ministry of Trade and Industry from a 40 km long gold anomaly zone including a dozen of drill-indicated gold occurrences in 1994. The Ward deposit is estimated to contain 0.5 to 0.9 Mt grading 5-8 g/t down to -100m level with promising intersections at -150m depth. Disseminated ore occurs as several moderately plunging lodes within a felsic to intermediate volcaniclastic host rock. Outokumpu Finnmines Oy purchased the exploration rights for the area from the Ministry of Trade and Industry in 1994, and is currently doing feasibility studies on the deposit.

Industrial minerals

Large scale exploitation of industrial minerals in Finland commenced in the late 1960's and the extraction of dimension stone is also playing an increasingly important role within the mineral sector. In international terms, Finland is a major producer and exporter of TiO_2-pigments, talc, wollastonite and products manufactured from soapstone; reserves of the last three commodities are sufficient for several tens of years.

Potential domestic sources of pigment materials include a number of kaolin occurrences within palaeoregoliths throughout the country. Of these the Virtasalmi area in southeastern Finland seems most promising, with the Geological Survey of Finland having estimated the probable reserves of filler and coating grade kaolin at 17-18 Mt. It is considered that enhanced exploration and research could increase the proportion of domestic carbonate used as paper pigment.

Until 1985 ilmenite from the Otanmäki magnetite-ilmenite ore was used to produce TiO_2-pigments for Finnish industry. Since then there has been an active exploration program in search of new deposits and of the three potential areas so far identified, the most promising is the Koivusaarenneva deposit, hosted by a Svecofennian intrusion at Kälviä in western Finland, where reserves of more than 20 Mt at 9 % TiO_2 have been delineated. Preliminary processing tests have been encouraging.

The industrial mineral sector in Finland is dominated by two large corporations, Partek and Kemira, with several smaller operators, including Saxo Oy (dolomite, quartz), K. Forsström Oy (limestone) and Juuan Dolomiittikalkki Oy (dolomite).

Partek Corporation, through its Industrial Minerals and Nordkalk divisions, is exploiting a number of large limestone and dolomite occurrences in Finland and also produces wollastonite, feldspar and quartz. The Kemira Corporation operates Finland's largest mine at Siilinjärvi, where an Archean carbonatite intrusion supplies apatite to the nearby fertilizer plant; annual production of apatite ore exceeds 7 Mt. Kemira Pigments Oy has a TiO_2-pigment plant at Pori, on the southwestern coast, with the current capacity of 90,000 tpa being expanded to 120,000 tpa.

Partek has a joint venture with Omya group from Switzerland (Partek 51 %, Omya 49 %), Suomen Karbonaatti Oy, which produces micronized calcite (GCC) for paper coating at Lappeenranta (Ihalainen), in southeastern Finland. The capacity of the plant is currently being increased to 400,000 tpa.

Partek has also a joint venture Nordcarb Oy, in conjunction with Speciality Minerals Inc. from the U.S.A. (Partek 30 %, SMI 70 %), for producing PCC for paper filler. Three plants at Äänekoski, Tervakoski and Lappeenranta have a combined capacity of 50,000 tpa. Faxe Kalk from Denmark has three PCC plants at Kuusankoski, Kemi and Kaukopää with a total capacity of 100,000 tpa. Omya Finland Oy (100 % Omya) operates a GCC plant at Förby on the southern coast, utilizing pure limestone from the Förby mine operated by K. Forsström Oy. The installed capacity is 150-200,000 tpa.

Finland's sole talc producer Finnminerals is currently owned by Western Mining Corporation of Australia (50%), and Plüss-Staufer from Switzerland (50%). Finnminerals produced about 450,000 tonnes talc in 1994.

Prolonged weathering of the shield during the late Proterozoic, Palaeozoic and Mesozoic is indicated by the widespread preservation of regoliths beneath Quaternary glacial deposits in Finland, particularly in Lapland. Such intense weathering may be important for example, in having led to phosphate enrichment in the regolith over the Devonian Sokli carbonatite intrusion in northeastern Lapland, as well as in producing the extensive kaolin deposits in the south of the country.

Current exploration activity

Finland can be considered as an attractive exploration target in many respects: geoscientific data coverage is among the best in the world, infrastructure is highly developed, exploration services and a well-trained professional work force are available, the mining law is strong, taxation laws are favourable, large areas can be considered under-explored for many commodities, and Finland is located in close proximity to major markets.

Exploration in Finland prior to 1994 was limited to domestic organizations such as Outokumpu Oy and the Geological Survey of Finland, which had as their main aims the supplying of raw materials needed by the Finnish industry, in particular base metals and certain industrial minerals. However, very little attention was given to commodites more typically explored with risk capital such as gold, platinum group metals and diamonds.

Total exploration expenditure in Finland was FIM 85 million in 1993 but since the changes to the mining law in the beginning of 1994 following Finland's incorporation into the European Economic Area and subsequent admission to the European Union, a number of major and junior companies have become actively involved in the exploration business. Current emphasis is on diamond, gold and base metal deposits.

Diamonds

The first kimberlite in Finland was discovered in the 1960's when a small Finnish copper mining company, Malmikaivos Oy, identified a strong magnetic anomaly associated with a rock characterized petrographically as a magmatic type of kimberlite. Diamond exploration was first initiated in the 1980's by the same company after discovering a train of kimberlite glacial boulders. Malmikaivos Oy set up a joint venture with the Australian company Ashton Mining Ltd. in 1986 with goverment approval and in 1994 Malmikaivos Oy became fully owned by Ashton.

Ashton has so far discovered some 30 kimberlite bodies of which about half are diamondiferous. At least two of the more closely studied pipes contain substantial quantities of clear and colorless diamonds. A 23 tonne sample from a pipe of approximately two hectares in surface area yielded some 26 carats of +0.8 mm diamonds per 100 tonnes, most of which were of good quality. Another pipe, slightly over one hectare in size, contained 13 to 26 carats per hundred tonnes, based on a 9.4 tonne sample.

Other companies active in diamond exploration are RTZ Mining & Exploration Ltd, Finnsearch Oy (subsidiary of De Beers), Canadian Glenmore Highlands Inc., Conroy Plc. based in Dublin, Centurion East European Mining Plc. based in London (subsidiary of Canadian Caledonia Mining Corporation) and Baltic Minerals Finland Oy. These companies have not released any information concerning their success. The Geological Survey of Finland is not engaged in diamond exploration but does offer sampling, sample processing and other exploration services for diamond exploration companies.

Mineral legislation

The Ministry introduced the new GIS-supported Finnish Mineral Titles System at the beginning of this year. The system yields considerable advantages in the processing of applications and investigation of available land.

Rights under the Mining Law may be granted to every Finnish citizen or corporate body, and also to any resident of a country in the European Economic Area (EEA). The same applies to all foreign corporations and foundations established according to the laws and regulations of any EEA member state, provided that their central administration and principal place of business are in one of the member states. The Ministry of Trade and Industry may, at its own discretion, also grant rights under the Mining Law to individuals and corporate bodies from outside the EEA. Anyone applying for a right under the Mining Law must have an address and an agent in Finland.

The Role of the Geological Survey of Finland

In contrast to many national geological surveys, GSF is actively involved in exploration for economic minerals. It has adopted a country-wide strategy in which exploration is directed to the most significant mineral commodities for the nation's economy: copper, nickel, zinc, ilmenite, kaolin, high-quality carbonate rocks, talc, sulphur, gold and building stones. GSF reports the discoveries at an early stage to the Ministry of Trade and Industry, which is responsible for selling the mining rights to companies after a due tendering process. GSF holds no commercial interests in the downstream development of exploration projects.

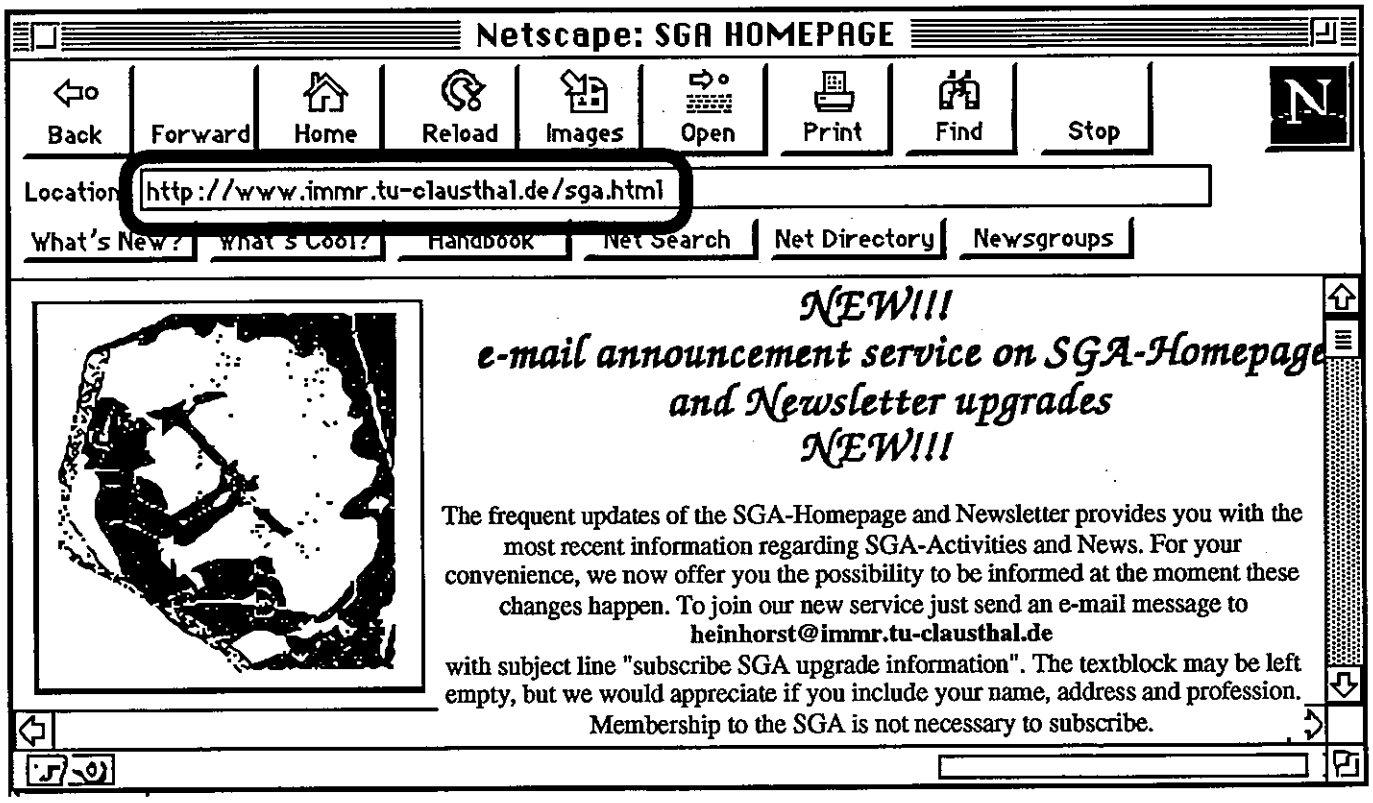
The Survey and its individual scientists have close links with the international geoscientific community and, through, participation within European R & D framework. This enables GSF to continuously evaluate its scientific expertise and the quality of services provided. Results of research and development are made available through 200 annual papers published within international scientific forums and comprehensive of house reports.

References

References to economic geology publications and mining and exploration data can be found at the following website: http://www.gsf.fi/explor/

THE SGA HOMEPAGE ON INTERNET

The SGA has a homepage 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.



SGA BIENNIAL MEETING FIELD TRIPS AUGUST 1997 - TURKU, FINLAND

Pekka A. Nurmi - Field Trip Coordinator
Mineral Resources Department, Geological Survey of Finland, FIN-02150 Espoo, Finland

A number of pre- and post-meeting field trips are planned, representing a variety of ore deposits in different geological settings throughout the Fennoscandian Shield.

Field Trip A1

Archean metallogeny of eastern Finland

The late Archean Karelian craton in eastern Finland and the Russian Republic of Karelia consists of granitoid-greenstone and higher grade gneiss terrains ranging in age from 3.2-2.7 Ga and covering an area of nearly 200,000 square kilometers. In recent years the region has been receiving increased attention with regards to its prospectivity for komatiite-hosted nickel and gold lode deposits, together with the recognition of its potential as a diamondiferous kimberlite province.

The aim of this excursion is to examine both established mining operations as well as consider the geological context of current exploration targets. Two major non-metallic mineral deposits will be visited, namely the Siilinjärvi carbonatite, which is of late Archean age and a major producer of superphosphate and agricultural lime, and the Nunnanlahti soapstone deposit, hosted by late Archean serpentites and forming the basis of an important and innovative industry manufacturing domestic fireplaces and ovens. Late Paleozoic kimberlite occurrences intruding the Karelian craton will also be inspected near their type locality at Kaavi.

The extensive, though relatively low-grade banded iron formations mined at Kostamuksha in Russian Karelia will also be visited, together with nearby intrusive-hosted gold mineralization. Recent developments in exploration and interpretation of gold and nickel mineralization in the Hattu schist belt and Kuhmo-Suomussalmi greenstone belts in eastern Finland form the focus for the remainder of the excursion, with additional visits to a granitoid-hosted Mo prospect and Ag-Zn-Pb mineralization hosted by hydrothermally altered felsic pyroclastics.

Excursion leader: Dr. Peter Sorjonen-Ward, Geological Survey of Finland
e-mail: peter.sorjonen-ward@gsf.fi
Phone: +358 - 205 50 2552; Telefax: +358 - 205 50 12

Duration: 5 days (Tuesday August 5 - Saturday August 9)
Logistics: Hotel and (shared) cabin accommodation. Travel by charter bus and rail ex-Kuopio, concluding at Turku. Tourist visa required for visit to Russia on Day 4.
Cost: FIM 3500 (includes all meals, accommodation, Russian visa and train journey to Turku)
Participants: Maximum of 40

Field Trip A2

Volcanic-hosted massive sulfide deposits and gold deposits in the Skellefte district, Sweden and western Finland

The Skellefte mining district occurs within an early Proterozoic (mainly 1.90-1.87 Ga) magmatic province of low to medium metamorphic grade in northern Sweden. The district contains over 85 pyritic Zn-Cu-Au-Ag massive sulfide deposits, gold lode deposits and subeconomic porphyry Cu-Au-Mo deposits. The massive sulfide deposits tend to be located within, and particularly at the top of, a regional felsic-dominant volcanic sequence attributed to an intense episode of extensional continental or island arc volcanism. The massive sulfides in the Skellefte district span a range in ore deposit style from deep water seafloor ores, to subseafloor replacements, to shallow water and possibly subaerial synvolcanic replacements.

In the last few years two quartz vein-hosted gold lode deposits have been discovered in the eastern part of the Skellefte district; at Björkdal and Åkerberg mines. The Björkdal deposit is currently the biggest gold mine in Europe and is characterized by a quartz vein system at the contact between a granodiorite intrusion and surrounding supracrustal rocks. Gold at Åkerberg is hosted by a set of narrow parallel quartz veins in a shear zone within a gabbroic intrusion.

The field trip will focus on both massive sulfide deposits and gold lode deposits. In the Skellefte district underground visits to the newly open Petiknäs deposit and/or the nearby Renström deposit are planned. One day will be devoted to outcrops of the central and eastern part of the Skellefte district where participants will be able to study type facies of the Skellefte volcanic arc. The final day in Sweden will concentrate on gold lode deposits and a visit to the open pit at Björkdal (Terra Mining) is planned.

Across the Bothnian bay the field trip will continue in western Finland to the Hitura Ni-Cu mine hosted by tholeiitic ultramafic cumulate rock, Pyhäsalmi and Mullikkoräme volcanic massive Zn deposits associated with a bimodal volcanic system, and the disseminated Kopsa Au-Cu deposit hosted by a tonalitic intrusion.

Excursion leaders: Dr. Pär Weihed, Geological Survey of Sweden; and Mr. Timo Mäki, Outokumpu Finnmines Oy
e-mail: par.weihed@sgu.se; Phone: +46-18-179320; Telefax: +46-18-179210

Duration: 5 days (Tuesday August 5 - Saturday August 9)
Logistics: Hotel and (shared) cabin accommodation. Travel by charter bus and ferry ex-Skellefte, concluding at Turku.
Cost: FIM 3000 (full board)
Participants: Maximum of 40

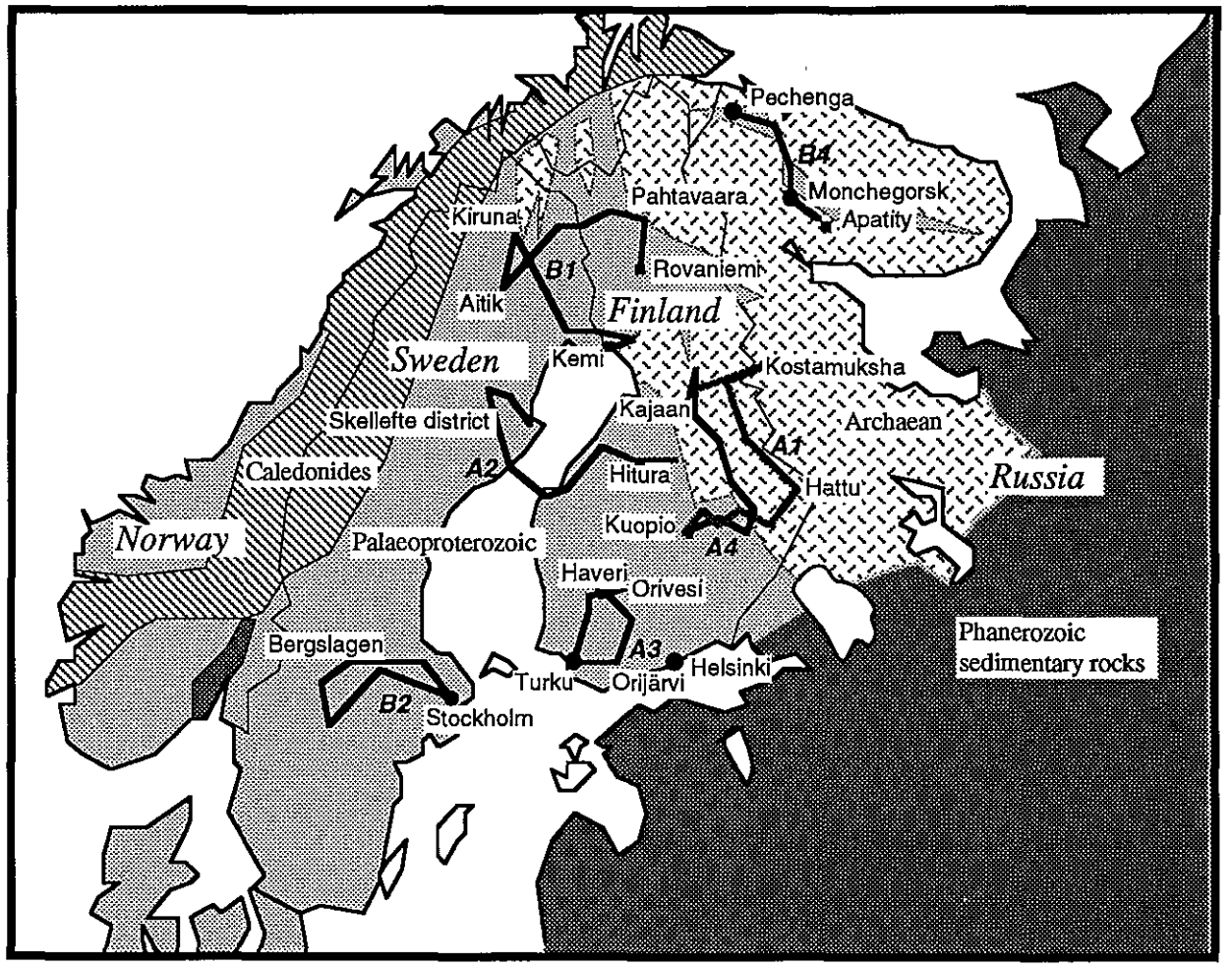


Figure 1: Localization map of the field trips.

Field Trip A3

Gold and base metal deposits in southwestern Finland

The excursion will explore some of the most interesting gold and base metal deposits in the Proterozoic Svecofennian province of southwestern Finland. The Kutemajärvi gold deposit is an operating mine which contains disseminated gold in pipe-like bodies associated with a sericite-quartz rock. The abandoned basalt-hosted Haveri volcanogenic Cu-Au deposit was mined throughout the 1950s. The Jokisivu gold prospect is characterized by coarse-grained gold concentrated in deformed quartz veins in a mafic metavolcanic rock, while at Kaapelinkulma gold occurs within shear zones in a granodiorite. The Vammala Ni-Cu deposit is associated with pods of ultramafic rocks in metamorphosed and migmatitic mica schists. Deposits in the classical Orijärvi Cu-Zn-Pb mining district are related to hydrothermally altered subaqueous volcanic rocks. Several mineralizations have been mined in the area since 1757 when Finland's first Cu-mine commenced operations. The area is once again the site of active prospecting.

Excursion leader: Prof. Carl Ehlers, Åbo Academi
e-mail: carl.ehlers@abo.fi; Phone: +358 - 22654153; Telefax: +358 - 22654818

Duration: 2 days (Friday August 8 - Saturday August 9)
Logistics: Hotel accommodation. Travel by charter bus ex-Turku, concluding at Turku.
Cost: FIM 900 (full board)
Participants: Maximum of 40

Field Trip A4

Metamorphosed black shales and associated ore deposits in eastern Finland

This trip to the Outokumpu-Kainuu region in eastern Finland will focus on the 1.9-2.1 Ga old formations, some of which host the Outokumpu-type serpentinite-associated massive Cu-Co-Zn-Au deposits. The Outokumpu mine was at one time the largest Cu mine in Europe and together with two other deposits, yielded a total of 1.1 Mt Cu between 1913 and 1989. Serpentinites, calc-silicate rocks, dolomites, fine-grained quartz rocks and black shales associated with the ore will be seen in open pit exposures, with emphasis on the relationships between black shales and ore-forming processes. Further north, in the Kainuu area, Ni-Cu-Zn-rich and Mn-rich black shales hosting the Talvivaara occurrence, as well as the nearby early Proterozoic Jormua ophiolite complex at Jormua, will be examined in outcrops and excavations.

An optional visit to the Geological Survey of Finland regional office at Kuopio has been arranged for the afternoon of Thursday August 7, prior to the commencement of the excursion.

Excursion leader: Dr. Kirsti Loukola-Ruskeeniemi, Geological Survey of Finland
e-mail: kirsti.l-r@gsf.fi; Phone: +358 - 205 50 2482; Telefax: +358 - 205 50 12

Duration: 2 days (Friday August 8 - Sunday August 10)
Logistics: Hotel and (shared) cabin accommodation. Travel by charter bus and rail ex-Kuopio, concluding at Turku.
Cost: FIM 1500
Participants: Maximum of 40

Field Trip B1

Ore deposits of Lapland in northern Finland and Sweden

This excursion will provide an overview of the diversified metallogeny of Lapland. The excursion commences with a general introduction to Early Proterozoic (2440 Ma) layered intrusions followed by visits to the world-class Kemi chromite mine and the Penikat PGE occurrences. In Sweden, 1900 Ma old Kiirunanvaara iron ore and Pahtohavare Cu-Au deposit will be visited. The latter consists of two different ore types: stratiform and economically more important epigenetic type. These are followed by a visit to the low-grade Aitik Cu-Au mine, which has an annual production of 16 million tonnes of ore. Deposits to be examined on returning to Finland include the now exhausted Rautuvaara Fe-(Au-Cu) ore body, and recently worked Saattopora Au and Pahtovuoma Cu-(U) ores. The last stops will be at the komatiite-hosted Pahtavaara Au mine, where operations commenced during summer 1996, and the Kevitsa Cu-Ni-PGE-Au deposit, hosted by a the 2050 Ma old layered intrusive complex.

Excursion leader: Dr. Esko Korkiakoski, Geological Survey of Finland
e-mail: esko.korkiakoski@gsf.fi; Phone: +358 - 205504330: Telefax: +358 - 2055014

Duration: 5 days (Thursday August 14 - Monday August 18)
Logistics: Hotel and (shared) cabin accommodation. Travel by rail and charter bus ex-Turku, concluding at Rovaniemi.
Cost: FIM 3000 (full board).
Participants: Maximum of 40

Field Trip B2

Ore deposits in the Bergslagen area, sout-central Sweden

This excursion will focus attention on the Bergslagen ore district, which is located in south-central Sweden. The ore-bearing successions comprise Early Svecofennian (1.9 Ga) meta-volcanic and meta-sedimentary rocks hosting volcanogenic massive sulphide ores (e.g. Falun, Garpenberg and Zinkgruvan), carbonate-hosted silver ores (Sala) and several types of iron deposits (e.g. Dannemora, Norberg and Grängesberg). A late Svecofennian (1.8 Ga) phase of post-metamorphic granite intrusion is associated with significant W skarn-mineralization at Yxsjöberg and Wigström and granite-hosted Mo-mineralization at Bispbergs Klack.

Excursion leader: Dr. Krister Sundblad, Stockholm University
e-mail: krister.sundblad@geol.su.se; Phone: +46-8-164750; Telefax: +46-8-345808

Duration: 5 days (Thursday August 14 - Monday August 18)
Logistics: Hotel and (shared) cabin accommodation. Travel by ferry and charter bus ex-Turku, concluding at Stockholm.
Approximate cost: FIM 3500 (full board)
Participants: Maximum of 40

Field Trip B3

Gold and base metal deposits in southwestern Finland

For details, see information on Field Trip A3.

Duration 2 days (Thursday August 14 - Friday August 15)

Field Trip B4

Ore deposits in the Kola Peninsula, northwestern Russia

This excursion represents a unique opportunity for an international visit to the Kola Peninsula. The region is currently one of the most important mining provinces in Russia, supplying a significant proportion of the phosphorus, nickel, copper, iron, aluminium, rare metals and mica used by industry throughout the remainder of the Federation. An active exploration programme for metals and minerals such as platinum-group elements, titanium, molybdenum, zirconium, scandium, silver, vanadium, chromite, gold and diamond is currently under way, carried out by Russian and foreign companies and joint ventures. In the course of the excursion we will visit the Pechenga Ni-Cu deposit, Olenegorsk BIF, the Monchegorsk and Imandra layered intrusions and related mineral deposits and Khibiny alkaline intrusion and related deposits. Visits will include both studies on outcrops and quarries as well as underground mines.

Excursion leaders: Dr. Mikhail Torokhnov, Kola Science Centre; and Dr. Markku Iljina, Geological Survey of Finland
e-mail: markku.iljina@gsf.fi; Phone: +358 - 205504213; Telefax: +358 - 2055014

Duration: 7 days (Wednesday evening August 13 - Wednesday August 20)
Logistics: Hotel accommodation. Travel by rail and charter bus ex-Turku, concluding at Rovaniemi. Tourist visa required for visit to Russia.
Costs: FIM 5500 (full board)
Participants: Maximum of 40

WE CONGRATULATE FOR THEIR CENTENNIAL '1896-1996':
SOCIEDAD DE MINERÍA Y PETRÓLEO DEL PERÚ
and
ASSOCIAZIONE MINERARIA SARDA

BOOK ADVERTISMENTS

SGA Special Publications Special Sale

Springer Verlag has dramatically reduced the prices of these two **SGA Special Publications:**

Nr. 9 Bitumens in ore deposits, by Parnell, J., Kucha, H., & Landais, P. Special Publication No. 6 of the Society for Geology Applied to Mineral Deposits, Springer, Berlin, 520 p. (1992). ISBN 55621-4

Old 274 DM, new DM 150. SGA members: **120 DM (ca. 80 US$)**

Nr. 8 Stratabound ore deposits in the Andes. Fontboté, L., Amstutz, G.C., Cardozo, M., Cedillo, E. & Frutos, J. (eds.)., Springer, Berlin, 815 p. (1990) ISBN 52181-X

Old 298 DM, new DM 165. SGA members: **132 DM (ca. 88 US$)**

HOW TO OBTAIN THE 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 Alí Dep. Mineralogía y Petrología Fac. Ciencias Av. Severo Ochoa E 18071 GRANADA, Spain; fax +34 58 243368, (7.000 pts).

Pasava, J., Kríbek, 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, (US$ 105)

PUBLISHED Ph.D. THESIS WORKS

Metallogenetic investigations in the Punta del Cobre belt, northern Chile by R. Marschik (1996) Terre & Environnement, Geneva, v. 5, 200 p. ISBN 2-940153-04-3. Orders to: Département de Minéralogie, Rue des Maraîchers 13, CH-1211 Genève 4, Switzerland: 30 Swiss Francs (ca. 25 US$).

Geochemical (elemental and isotopic) constraints on the genesis of the Mississippi Valley-type zinc-lead deposit of San Vicente, central Peru, by J. Spangenberg (1995). Terre & Environnement, Geneva, v. 1, 123 p. ISBN 2-940153-00-0, Orders to: Département de Minéralogie, Rue des Maraîchers 13, CH-1211 Genève 4, Switzerland: 30 Swiss Francs (ca. 25 US$).

Lithogeochemistry of Lower Cretaceous sediments from the Bilbao Anticline, Basque-Cantabrian basin by I. Yusta. (1994, in Spanish) Orders to: Dpto. Mineralogia y Petrologia, Universidad del País Vasco, Apdo. 644, E-48080 Bilbao, Spain: 2500 pesetas (about 25 US$)

The Pb-Zn-As-Tl-Ba-deposit at Lengenbach, Binn Valley, Switzerland - Petrogenesis based on combined geochemical and isotopical (U,Pb,Rb,Sr,S,O,C) investigations by M.D. Knill. Beitraege zur Geologie der Schweiz, geotechnische Serie, Lief. 90, 1996. 87 p. (includes numerous color figures). Orders: Schweizerische Geotechnische Kommission, ETH-Zentrum, 8092-Zuerich, Switzerland: 35 SFR, (about 28 US$).

Information on Ph.D. Theses on Economic Geology published by a non-profit organization should be sent to SGA NEWS

International Association on the Genesis of Ore Deposits (IAGOD)
Working Group on Tin and Tungsten Deposits (WGTT)

GRANITE-RELATED ORE-DEPOSITS OF CENTRAL KAZAKHSTAN AND ADJACENT AREAS

Edited by V. Shatov, R. Seltmann, A. Kremenetsky, B. Lehmann, V. Popov and P. Ermolov
with 400 pp., 266 figg., 119 tables, 4 appendixes, hardback.

Published by Glagol Publishing House, 4th Liniya 13, St. Petersburg, Russia
ST. PETERSBURG - POTSDAM - CLAUSTHAL - MOSCOW 1996

CONTENTS
Regional setting of Granitic rocks and related ore-deposits in geological framework of Central Kazakhstan and adjacent areas - Main granite-related ore-deposits - Methods and results of petrological and geochemical investigations on granitic rocks and related mineralizations.

✂.....

ORDER FORM

I wish to receive ..... copy/copies of GRANITE-RELATED ORE DEPOSITS OF CENTRAL KAZAKHSTAN AND ADJACENT AREAS (eds. Shatov et al., St. Petersburg, 1996).

Price: 60 U$ per copy (includes shipping and packaging); IAGOD/SGA members: 50 US$ per copy (all inclusive).

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Total amount to be paid: US$ .....

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Completed and signed original of this payment form must be sent to: Dr. R. I. Grauch, IAGOD Chief Treasurer, USGS, Denver Federal Center, MS 973, PO Box 25046, Colorado 80225, USA; phone: +1 303 236 5551; fax: +1 303 236 3200; e-mail: rgrauch@helios.cr.usgs.gov
(If you pay by check, please, attach the Certified Bank Draft).

To receive the book, copies of this form (and, in case of payment by check, also a copy of the Bank Draft) must be sent to: Dr. Vitaly Shatov, VSEGEI, Sredny pr. 74, 199026 St. Petersburg, Russia; phone: +7 812 218 9106; fax: +7 812 213 9555; e-mail: vsg@savam.com

Name: .....
Address: .....
.....
Date: .....
Signature: .....

ANNOUNCEMENTS

EUG 9: EUROPEAN UNION OF GEOSCIENCES
Strasbourg, France.
23-27 March 1997(see also page 18)

Beside the usual geological, mineralogical and geochemical symposia, we draw attention on two special sessions centered on the application of geosciences to environmental problems:

72: Environmental Mineralogy (co-sponsored by the European Mineralogical Union)
Convenors:
S. Weinbruch (Darmstadt); e-mail: dh6d@hrzpub.th-darmstadt.de
G. Chiari (Torino); e-mail: chiari@ch.unito.it
J.C. Petit (Gif-sur-Yvette); e-mail: jcpetit@nanga.saclay.cea.fr

This session will cover mineralogical studies in the field of environmental research. Emphasis will be on monument conservation, weathering of construction materials, conditioning and disposal of nuclear and non-nuclear waste, characterization of atmospheric aerosols and health effects of mineral dust. Contributions regarding new techniques which combine different disciplines are particularly welcome.

76: Environmental Engineering
Convenors:
W. Salomons (Delft); e-mail: wim.salomons@gkss.de
W. Calmano (Hamburg-Harburg); fax: +49 40 7718 25 73

This session will address the use of biogeochemical principles to offer long-term solutions to environmental issues like the containment of solid waste and dredged material, and the management of large scale contaminated areas which cannot be cleaned up with conventional methods. Furtehrmore, it will deal with managing the environmental impact of mining operations as well as remediation of impacts of past mining operations.

XIV ECROFI: EUROPEAN CURRENT RESEARCH ON FLUID INCLUSIONS
Nancy, France.
1-4 July 1997

It is intention of this meeting to actively bring the participation of industry in order to apprise the relevant industries of recent progresses in basic research, and to acquaint scientists and engineers with the current research needs of industry, especially in Europe.

Scientific sessions
I- Advances in analytical techniques and general principles (phase equilibrium, interpretation); II- Sedimentary and diagenetic processes; III- Water rock interactions in the crust, geothermal fields, and hydrothermal ore deposits; IV- High temperature processes (Magmatic fluids, metamorphic P-T paths); V- Fluid migration and deformation; VI- Environment and paleoclimate

Organizing Committee
M.C. Boiron, M. Chatelineau, J. Dubessy, J. Pironon and B. Poty (CREGU-CNRS); G. Giuliani (CRPG, ORSTOM); J. Leroy (Université Henri Poincaré); Ch. Marignac (CRPG-Ecole des Mines)

Correspondence
XIV ECROFI, CREGU, BP 23, 54501 Vandœuvre-lès-Nancy Cédex, France; phone: +33 83 44 19 00; fax: +33 83 44 00 29; e-mail: ecrofi@cregu.cnrs-nancy.fr

Deadlines and key dates

November 1996:	second circular
February 1, 1997:	closing date for abstracts
April 1, 1997:	final registration and payment
May, 1997:	third circular and preliminary program

IMA 98: 17TH GENERAL MEETING OF THE INTERNATIONAL MINERALOGICAL ASSOCIATION,
Toronto, Canada.
10-14 August 1998

Sponsored by The Mineralogical Association of Canada

Committees
Organising Committee:
General Chairman: Tony Naldrett, Dept. of Geology, Univ. of Toronto
Secretary: Eva Schandl

Scientific Programme Committee:
Chairman: Grant Henderson, Dept. of Geology, Univ. of Toronto

Field Excursions Committee:
Chairman: Alexander Cruden, Department of Geology, Univ. of Toronto.

Scientific Program
The provisional programme includes invited plenary lectures and a number of symposia running in parallel, which will cover a wide range of topics in mineralogy, mineral physics, applied mineralogy (including environmental mineralogy), mineral deposits geology, petrology, geochemistry and bio-mineralogy. Contributed oral and poster communications will be accepted, and no scientific activities will be scheduled concurrently with the poster sessions.

Short Courses and Workshops
The Mineralogical Association of Canada and the Mineralogical Society of America have each been approached to sponsor and organise a Short Course prior to or after the General Meeting. Details will be provided in the second circular.

Field Excursions
1. Geology of the Grand Canyon; 2. Geology and Base Metal Deposits of the Bathurst Camp and the Gaspé Peninsula; 3. Metamorphism of the Omenica Belt, British Columbia; 4. Geology and Gold-Mineralization of the Hemlo deposit, Ontario; 5. Mineral Specimen Collecting in the Montreal Area; 6. Mineralogy and Petrology of the Tanco Pegmatite Deposit, Manitoba; 7. Metamorphism of the Grenville Province, Ontario; 8. Geology of Niagara Falls and Southern Ontario Wines; 9. The Mineralogy of the Bancroft area of Ontario; 10. Relationships between the Sublayer, Offsets, and Main Mass of the Sudbury Igneous Complex, Ontario; 11. Nain Plutonic Suite, Labrador; 12. Building stones of Downtown Toronto

Provisional Deadlines

Second circular	May 1997
Final date for submission of abstracts	March 31 1998
Registration and accomodation forms	April 30 1998
Third circular, containing the program	June 1998

Address for Correspondence:
Dr Eva Schandl, Secretary to Organising Committee, Department of Geology, University of Toronto, Earth Sciences Centre, 22 Russell St., Toronto, ON M5S 3B1 Canada; phone +1 (416) 978-7084; fax: +1 (416) 978-3938; e-mail ima98@quartz.geology.utoronto.ca

Note: This circular, together with the response form, is available on the IMA98 web site at:
http://www.geology.utoronto.ca/IMA98

GEOFLUIDS II '97: SECOND INTERNATIONAL CONFERENCE ON FLUID EVOLUTION, MIGRATION AND INTERACTION IN SEDIMENTARY BASINS AND OROGENIC BELTS,
Belfast, UK.
10-14 March 1997

Organizing Committee: Geofluids II, School of Geosciences, the Queen's University of Belfast, Belfast BT7 1NN, Northern Ireland, UK; fax: (+44) 1232 321280; e-mail: geofluids@qub.ac.uk

Supported by: *The Geological Society of London* (Petroleum Group, Tectonic studies group, Mineral Deposits studies group, Geochemistry group) and *The Institution of Mining and Metallurgy*. Industrial support has so far been offered by Lasmo North Sea plc, CSA Ltd., BHP Minerals and Badley, Ashton & Associates.

(cont. to page 18)

⇨⇨⇨FORTHCOMING EVENTS⇨⇨⇨

★ marks a new entry

1996

★November 21-22

XXVI. KOLLOQUIUM FÜR PROSPEKTION UND EXPLORATION: WASSER-ROHSTOFF, NAHRUNGS- UND HEILMITTEL, Berlin, Germany - Contact address: Herr Gadow, Technische Universität Berlin, Fachgebiet Lagerstättenforschung, Sekr. BH 4, Ernst-Reuter-Platz 1, 10587 Berlin, Germany; phone: +49-30-31423389; fax: +49-30-31426591; e-mail: mindepos@bg.tu-berlin.de; World Wide Web page: http://mindepos.bg.tu-berlin.de/lager

1997

★January 5-9

LES FLUIDES GEOLOGIQUES, Aussois (Savoie), France - Organized by the Société Française de Minéralogie et de Cristallographie. Contact address: Jean Dubessy, CREGU, BP 23, 54501 Vandoeuvre Cedex; phone: +33-83-441900; fax: +33-83-440029, e-mail: dubessy@cregu.cnrs-nancy.fr or Cristophe Monnin, Laboratoire de Géochimie, 38 rue des Trente-Six Ponts, 31400 Toulouse; phone: +33-61-556241; fax: +33-61-520544; e-mail: monnin@lucid.ups-tlse.fr

★March 10-14

GEOFLUIDS II, Belfast, Northern Ireland - Correspondence: Geofluids II, Dept. of Geology, Queen's University, Belfast BT7 1NN, Northern Ireland, UK; fax: +44-1232-321280; e-mail: geofluids@qub.ac.uk. Updated conference information may be posted on the World Wide Web site, the URL of which is: http://www.qub.ac.uk/geosci/geology/geofluid/ (see page 16 for details)

March 17-19 *SGA-SPONSORED*

FRANK M. VOKES 70 YEAR ANNIVERSARY SYMPOSIUM: Formation and metamorphism of massive sulphides, Trondheim, Norway - Norwegian University of Science and Technology (NTNU). Enquiries: 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: torepr@geologi.unit.no (see page 9 of SGA News N. 1)

March 23-27

EUG 9 (EUROPEAN UNION OF GEOSCIENCES), Strasbourg, France - Contact address: EUG 9 Office, EOPG, 5 rue René Descartes, 67084 Strasbourg Cedex, France; phone: +33 88 41 63 93 (45 01 91); fax: +33 88 60 38 87; e-mail: eug@eopg.u-strasbg.fr. We draw attention on two special sessions: N. 72 Environmental Mineralogy and N. 76 Environmental Engineering (see page 16 for details)

April 8-10 *SGA-CO-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 Geology of Ore Deposits, Petrography, Mineralogy, and Geochemistry (IGEM), Russian Academy of Sciences, Moscow, Russia. Contact address: N. S. Bortnikov, D. Sc., Secretary of the Symposium, IGEM RAS, Staromonetny per., 35, Moscow 109017, Russia; phone: +7 095 230 8259; fax: +7 95 230 2179; e-mail: symposium@igem.msk.su (see page 9 of SGA News N. 1)

May 11-14 *SGA-CO-SPONSORED*

NEVES CORVO FIELD CONFERENCE (Massive sulphides geology and genesis, and present day submarine hydrothermal activity), Lisbon, Portugal. - European address: Fernando J.A.S. Barriga, GEOFCUL, Edifício C2, Piso 5, Campo Grande, 1700 Lisboa, Portugal; phone: +351-1-750-0066; fax: +351-1-759-9380; e-mail: Neves.Corvo@fc.ul.pt. North American address: Geoffrey Snow, Barranca Resources, c/o SEG 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.fc.ul.pt (see page 8 of SGA News N. 1)

★May 17-18

EUROPE'S MAJOR GOLD DEPOSITS, Newcastle, Northern Ireland - Organized by the Irish Association for Economic Geologists and the Institution of Mining and Metallurgy. Contact address: Kerr Anderson: phone: +353-46-22363; fax: +353-46-22372; e-mail: navanr@iol.ie and Eibhlin Doyle: phone: +353-1-14785656; fax: +353-1-4785660; e-mail: BHP@iol.ie

★June 1-5

GEOANALYSIS 97 (3RD INTERNATIONAL CONFERENCE ON THE ANALYSIS OF GEOLOGICAL AND ENVIRONMENTAL MATERIALS, Vail, Colorado, USA - Organized by the USGS. Contact address: Belinda Arbogast, USGS, Federal Center, Box 25046, MS 973, Denver, CO 80225; fax: +1-303-236-3200; e-mail: geo97@helios.cr.usgs.gov

★June 15-18

SOUTH AMERICAN SYMPOSIUM ON ISOTOPE GEOLOGY, São Paulo, Brazil - Correspondence: M. Basei or W. Teixeira - Instituto de Geociencias, USP, Rua do Lago, 562, CEP-05508-900, São Paulo, SP, Brazil; phone: 011-8183994; fax: 011-8183993; e-mail: BASEIMAS@USP.BR

★August 4-8

VIII CHILEAN GEOLOGICAL CONGRESS, Antofagasta, Chile - Correspondence: Comité Organizador, VIII Congreso Geologico Chileno, Departamento de Ciencias Geologicas, Universidad Catolica del Norte, Antofagasta, Av. Angamos 0610, Casilla 1280; phone: +56-55-241148 (205/368); fax: +56-55-248198; e-mail: dgeologi@socompa.cecun.ucn.cl

★August 6-8

IX PERUVIAN GEOLOGICAL CONGRESS, Lima, Peru - Contact address: Comité Organizador del IX Congreso Peruano de Geologia, c/o Societad Geologica del Peru, Arnaldo Marquez 2277, Lima 11; phone: 511 46 33 947; fax: 511 26 12 362

August 11-13 *SGA-SPONSORED*

4TH BIENNIAL SGA MEETING (Research and Exploration - Where do we meet?), Turku Finland. - Congress Office/SGA Meeting 1997, University of Turku, Lemminkäisenkatu 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 pages 2 and 20)

(C... to page 18)

WISH TO ADVERTISE FORTHCOMING EVENTS?

Send your announcements to:

SGA News, Département de Minéralogie, Université de Genève, Rue des Maraîchers 13, CH-1211 Genève 4, SWITZERLAND

fax: +41 22 320 57 32

e-mail: SGANEWS@sc2a.unige.ch

(See page 2 for details concerning the format of the documents to be sent)

from 17: FORTHCOMING EVENTS

★September 1-5

10TH MEETING OF THE AEGS (ASSOCIATION OF EUROPEAN GEOLOGICAL SOCIETIES): CHALLENGES TO CHEMICAL GEOLOGY '97, Carlsbad, Czech Republic - Organized by the AEGS, Czech Geological Society and Czech Geological Survey. Contact address: Dr. Martin Novak, Czech Geological Survey, Geologicka 6, 152 00 Prague 5, Czech Republic; fax: +42-2-5818748; e-mail: maegs@cgu.cz; World-wide-web page: http://www.cgu.cz/maegs.htm

★November 6 - 9

SEG MEETING, Salt Lake City, Utah, USA, in cooperation with Geological Society of America - Contact address: John M. Bartley (GSA) or Erich U. Petersen (SEG, GSA), Department of Geology & Geophysics, 717 W.C. Browning Building, Salt Lake City, Utah, 84112-1183; phone: +1 801-581-6553; fax: +1 801-581-7065

1998

June 29-July 18

IAGOD/CODMUR 8TH INTERNATIONAL PLATINUM SYMPOSIUM, Johannesburg, South Africa.- Dr. C.A. Lee, P.O. Box 68108, Bryanston 2021, South Africa; phone: 27-11-411-2253; fax: 27-11-692-3693

★August 10-14

IMA '98 (17TH GENERAL MEETING OF THE INTERNATIONAL MINERALOGICAL ASSOCIATION), Toronto, Canada - Contact address: Dr. Eva Schandl, Secretary to Organising Committee, Dept. of Geology, University of Toronto, Earth Sciences Centre, 22 Russell Street, Toronto ON, M5S 3B1 Canada; phone: +1-416-978-7084; fax: +1-416-978-3938; e-mail: ima@quartz.geology.utoronto.ca. First circular with response form are available on the IMA98 web site at: http://www.geology.utoronto.ca/IMA98 (see page 16 for details)

August *SGA-CO-SPONSORED*

10TH QUADRIENNIAL IAGOD SYMPOSIUM, Broken Hill, Australia.- Prof. I. 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 of SGA News N. 1)

★October 26 - 29

SEG MEETING, Toronto, Canada, in cooperation with Geological Society of America:

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from 16: ANNOUNCEMENTS

Geofluids II '97 aims to bring together academic researchers and industrial geoscientists from the hydrocarbons, minerals and groundwater industries, to promote cross-fertilization of concepts and ideas, and to highlight common themes associated with fluid processes in the Earth's crust - particularly with relevance to the formation and exploitation of economic resources.

The **conference** will consist of oral and poster sessions, pre-meeting short courses (9th-10th March), a special symposium (10th March), and post-meeting field excursions. Conference themes include:
-Crustal tectonics and large-scale fluid movement
-Faults, fractures and fluid flow
-Reservoir-scale palaeohydrology and diagenesis
-Fluid overpressure
-Metal-hydrocarbon-water-rock interactions
-Geochemical and hydrological modelling of palaeohydrological systems
-Fluids, fluid migration and fluid-rock interaction in the middle crust
-Fluid flow models for massive ore deposits
-Migration and chemistry of shallow groundwaters
-Management of fluid flow in oil and gas fields

Short courses
The following short courses are being offered:
1. Application of wireline logs in stratigraphic analysis and quantitative mineralogical analysis. 2. Identification of the thermal effects of fluid flow in sedimentary basins. 3. Transient effects in basin modelling. 4. Stable isotope monitors of crustal fluid flow. 5. Fluid inclusion systematics and applications. 6. Geostatistics for modelling and prediction of rock properties / geological reserves. 7. Introduction to ground water geochemistry and SOLMINEQ.GW.

Special symposium:
A thematic symposium will take place in Queen's University School of Geosciences on Monday 10th March: *Absolute dating and timing of fluid flow events.*

Field excursions:
Seven field excursions are offered:
1. Gold mineralization in the Sperrin Mountains and Donegal, Ireland; 2. Base metal mineralization in the Irish Midlands; 3. Sedimentary basins of Northern Ireland; 4. Fluid flow and mineralization associated with the Irish Sea Basin; 5. Metamorphic & post-metamorphic fluids in basement: Connemara; 6. The scenic Landscape and rocks of Northern Ireland; 7. Scenic-cultural tour of Northern Ireland

Deadlines:
Camera-ready, edited abstracts 15th November 1996

Correspondence:
Geofluids II, Dept. of Geology, Queen's University, Belfast BT7 1NN, Nortehrn Ireland, UK.
Fax: +44 1232 321 280; e-mail: geofluids@qub.ac.uk
Updated conference information may be posted on our World Wide Web site, the URL of which is:
http://www.qub.ac.uk/geosci/geology/geofluid/

SHORT COURSES during the Biennial SGA meeting,
Turku, Finland.
10 August 1997

1. THE USE OF WALLROCK ALTERATION AND PRIMARY GEOCHEMICAL DISPERSION IN MESOTHERMAL GOLD EXPLORATION
Organizers: Dr. P. Eilu, Dr. E. J. Mikucki and Prof. D. I. Groves (University of Western Australia). The programme of this course will appear in the next issue of SGA News.

2. APPLICATION OF GEOCHRONOLOGY AND ISOTOPE GEOCHEMISTRY TO ORE DEPOSITS

Organizers: Alain Cheilletz (Nancy) and Robert Moritz (Geneva)

Course instructors: A. Cheilletz, ENSG-CRPG-CNRS, Vandoeuvre les Nancy (France); R. Moritz, Mineralogy Dpt, Univesité de Genève (Switzerland); F. Saupé, CRPG-CNRS, Vandoeuvre les Nancy (France); A.E. Fallick, Isotope Geosciences Unit, Scottish Universities Research and Reactor Center.

Programme

1 - K-Ar and $^{40}Ar/^{39}Ar$ dating methods (A. Cheilletz)

2 - Stable isotope ratios of oxygen, hydrogen and carbon (A.E. Fallick)

3 - Isotope geochemistry of sulfur (F. Saupé)

4 - Strontium isotopes as tracers of ore-forming fluids (R. Moritz)

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. Paymnent through major credit cards is possible.
*Certificate required

Surname/Corporation .....
First name .....
Title .....
Mailing address .....
.....
.....
.....
Phone: ..... Fax
.....
E-mail .....
Date of birth..... 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, M. 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 .....

Two SGA Sponsors*

Name, place, date, signature

SPONSOR 1 _____
_____
SPONSOR 2 _____
_____

*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 Vandoeuvre-lès-Nancy Cedex, France
Tel.: +33 383 44 19 00
Fax: +33 383 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 *Mineralium Deposita* is 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

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. Subsides 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: David Rickard (Cardiff, UK) and Richard Goldfaber (Denver, Co, USA).
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 Deposit Letters* within 3 months and regular papers normally within 4 months after manuscript acceptance and usually 6-9 months after manuscript submission.

...and receive
MINERALIUM DEPOSITA & SGA NEWS!!!
Additional information in the SGA homepage on Internet:
http://www.immr.tu-clausthal.de/sga.html

4th BIENNIAL SGA MEETING

RESEARCH AND EXPLORATION - WHERE DO THEY MEET?

TURKU, Finland - 11-13 August 1997

The Society for Geology Applied to Mineral Deposits (SGA), established in 1965, 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, world-wide field trips and workshops.

The 4th Biennial SGA Meeting will be held in Turku, Finland, August 11-13, 1997, at the Rantasipi Congress Hotel, Pispalantie 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. Eight pre- and post-meeting field trips will be organized. The participants will visit classic mining districts and new deposit types in Finland, Sweden and northwestern Russia.

Topics of the sessions

1) Black schists and associated mineral deposits; 2) Gold and precious metal deposits; 3) Submarine hydrothermal processes and mineralizations; 4) Mineral deposits in mafic-ultramafic rocks; 5) Silicic magmatism and ore formation; 6) Mineral deposits in sedimentary environment; 7) Deposits of industrial minerals; 8) Diamond deposits and exploration; 9) Metamorphism and ore deposits (IAGOD/WGOM); 10) Mineral deposit modelling in exploration; 11) Environmental aspects of mineral deposits; 12) Open session

Co-Sponsors

Geological Survey of Finland (GSF), Geological Society of Finland (GSoc.F), Geological Society of Sweden (GSoc.S), Society of Economic Geologists (SEG), the City of Turku, University of Turku (UT), The Academy of Finland, Outokumpu Metals and Resources (OMR), Ashton Mining Ltd., etc.

Organizing Committee

Dr. H. Papunen, Chairman, UT; Dr. R. Salminen, Secretary General, GSF; Dr. P. Nurmi, Field Trip Coordinator, GSF; Dr. K. Sundblad, Field Trip Coordinator, GSoc.S; Ms. S. Autio, Abstract Committee, GSF; Dr. O. Eklund, Social Programme Committee, UT; Mr. M. Isohanni, OMR; Dr. M. Mäkelä, GSF; Dr. Z. Johan, SGA; Dr. A. Arribas, SEG; Ms. M.-L. Porsanger, Congress Office, UT

Field trips (see also page 12)

Both pre- (A) and post-meeting (B) field trips will be organized

A1. Metallogeny of Archean greenstone belts in eastern Finland and northwestern Russia including visits to gold, base metal, phosphorus and diamond deposits (5 days) FIM 3500 (1US$ ~ 4.6 FIM)

A2. Base metal deposits in the Skellefte area, Sweden and western Finland FIM 3000

A3/B3. Gold and base metal deposits in southwestern Finland (2 days) FIM 900

A4. Black schists and associated mineral deposits in Finland (2 days) FIM 1500

B1. Deposits of Lapland including Kemi chromitite, Aitik Cu-Au, Kiruna Fe, Saattopora Au, Pahtavaara Au and Keivitsa Ni-Cu-PGE deposits (5 days) FIM 3000

B2. Ore deposits of the Bergslagen area, Sweden (4 days) FIM3500

B3. = A3

B4. Ore deposits of the Kola Peninsula, northwestern Russia (5 days) FIM 5500

Short-courses on Sunday 10 August (see also page 18)

1. The use of wallrock alteration and primary geochemical dispersion in mesothermal gold exploration. Organizers: Dr. Pasi Eilu, Dr. Edward J. Mikucki and Prof. David I. Groves (University of Western Australia)
2. Application of Geochronology and isotope Geochemistry to Ore Deposits - Organizers: A. Cheillet (Nancy) and R. Moritz (Geneva)

Social programme

The participants will be offered a varied social programme including an Ice-breaking Party and the Congress Banquet. During the meeting a City tour in Turku and a cruise to archipelago and to visit the Baltic Sea Natural Park will be organized for accompanying persons

Fees

Registration fee for SGA/SEG Members FIM 1100; non members FIM 1300; students FIM 900. A number of travel grants are foreseen, mainly for junior and student SGA members with accepted contributions.

Second Circular

The Second Circular distributed in October 1996 to pre-registrants contains detailed information about the conference and excursions and includes forms of extended abstracts. You can receive the Second Circular by sending the attached pre-registration form to the Congress Office. Please inform also if you intend to offer an abstract because the abstracts forms will be sent only to those giving a paper.

Important dates

January 31, 1997	Submission of extended abstracts
February 15, 1997	Acceptance of abstracts
April 15, 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. +358-2-333 6342; Fax +358-2-333 6410; e-mail: cescon@utu.fi; http://www.utu.fi/ml/geologia/sga.htm

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4th BIENNIAL SGA MEETING: ORDER FOR SECOND CIRCULAR (Please type or use BLOCK letters)

Name .....

Mailing address .....

.....

.....Country.....

Tel ..... Fax .....

E-mail .....

I am

- ☐ SGA Member
- ☐ SGA Junior Member
- ☐ SGA Student Member
- ☐ Student

I intend to attend the Meeting

- ☐ to submit a paper
- ☐ to present a poster
- ☐ to take part in field trips no. .....
- ☐ to attend the Gold workshop
- ☐ to attend the Isotope workshop

I am interested in sessions .....

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

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

Mail to the above address