

# The Gangue



## GAC - Mineral Deposits Division Newsletter

Issue 35

April 1991

### OCEAN DRILLING SYMPOSIUM

#### MIDDLE VALLEY RESULTS

The *Joides Resolution*, the drill ship for the Ocean Drilling Program will commence a 63-day cruise to drill the Middle Valley sedimented-ridge sulphide deposits and their environment this July. These deposits are located in Canadian territorial waters about 200 kilometres southwesterly from Vancouver Island. Co-chief scientists Earl Davis (GSC) and Mike Motte (Univ. of Hawaii) have assembled an international team of roughly two dozen scientists for this cruise which includes several well known economic geologists: GAC



President Jim Franklin and Wayne Goodfellow (both GSC) as well as Rob Zierenberg (USGS, Menlo Park).

Sedimented ridges provide an unparalleled opportunity for quantitative studies of the fundamental physical and chemical processes associated with submarine hydrothermal systems. A regionally continuous, relatively impermeable sediment cover over zero-age crust, limits the recharge and discharge of hydrothermal fluids and conductively insulates the underlying crust. Where discharge of fluids does occur, very large hydrothermal sulphide deposits can be produced. The sediments may also preserve a relatively continuous stratigraphic record of magmatic, tectonic, and thermal events, providing clues to the spatial and temporal variability of these processes.

This summer, holes are planned at a series of five primary and three alternate sites in Middle Valley. On the basis of structural, thermal, and geological constraints available from numerous cruises to the area, sites have been selected to characterize the processes and products in all parts of the hydrothermal system, including possible recharge zones, a high temperature 'reservoir' zone, and localized discharge zones.

Immediately after the drill campaign at Middle Valley the ship will dock in Victoria, British Columbia, from September 11 to 15. A symposium is planned which will include first impressions of core recovered from this important active sulphide depositional site as well as opportunities to tour the ship and its labs, and likely also to view core.

It is hoped and expected that the large sulphide/sulphate deposits at Escanaba Trough, about 500 kilometres

northwest of San Francisco, will be drilled in a subsequent cruise. Better understanding of these large active sulphide depositional sites will result from ODP work, thus enhancing our understanding of, and ability to find, land-based VMS deposits.

MDD members and other interested earth scientists are invited to be in Victoria Friday September 13 to attend the symposium, get *hot-off-the-press* news of Middle Valley and tour the drill ship.

### THE GANGUE FOSSIL-CARD INSERT

**Phanerozoic Biochronology, Geochronometry and some Mineral Deposits in the Canadian Cordillera and Adjacent Parts of Alaska**

Compiled by R.G. Anderson and E.T. Tozer  
Geological Survey of Canada, Vancouver

*Were it not for fossils, geology would be mere vulgar engineering*

Anon

Time is geology's fourth dimension. The breadth of geological time makes geology not only unique among physical sciences but provides a long-ranging perspective with which to interpret crustal processes such as economic mineral deposition.

For more than a century, paleontologists with the Geological Survey of Canada, universities and industry have provided age determinations which have been instrumental in developing a stratigraphy and correlation of the Phanerozoic rocks of the western Cordillera and have contributed to a time scale of worldwide application. The time scale card included with this edition of *The Gangue* has three objectives: it illustrates the diversity of Canadian Cordilleran fossil biotas and underscores their importance in precise age dating; it indicates the correlation of a numerical time scale based on isotopic ages to the *relative* but more precise biochronology; and it lists well

dated and well known mineral deposits typical of some Cordilleran metallogenic environments and episodes. Additional copies of the card are available as Geological Survey of Canada's Open File 2373 (\$3.00).

#### BIOCHRONOLOGY:

The first, best known, and probably most important role of fossils is their use as geological chronometers. The time scale is the geological 'calendar' and comprises successively finer divisions of time: periods (e.g., Triassic), epochs (e.g., Late Triassic) and ages (e.g., Norian). Development of the time scale was based on the observation that certain rock horizons were endowed with distinct and characteristic fossil assemblages recognizable over broad regions. These rock units represented geological stages, the basic building blocks of the geological time scale. Each stage can potentially be subdivided into fossil zones, provided that sufficient stratigraphic and taxonomic work has defined more than one stratigraphically unique fossil association within the stage. The succession of fossil zones represents biochronological divisions of very short time span – at some levels, less than 1 million years. For some biota (e.g., early Paleozoic and late Mesozoic radiolaria), precise zonations have been developed elsewhere but have yet to be confirmed or refined in the Canadian Cordillera.

Through the efforts of Geological Survey of Canada, university and industry paleontologists, the Canadian Cordilleran biochronological scheme was developed and continues to be refined. Geological mapping and the search for mineral and hydrocarbon resources are the principal beneficiaries. The following paleontologists have provided published and unpublished data incorporated into the time scale: Wayne Bamber (G.S.C.), Joanna Beyers (U.B.C.), Bruce Cameron (G.S.C.), Beth Carter (Consultant), Fabrice Cordey (PDF, G.S.C.), Peter Forster (U.B.C.), Bill Fritz (G.S.C.), Jim Haggart (G.S.C.), Russell Hall (University of Calgary), Charles Henderson (University of Calgary), Steve Irwin (U.B.C.), Sandy McCracken (G.S.C.), Colin McGregor (G.S.C.), Dave McNeil (G.S.C.), Bernard Mamet (Université de Montréal), Walter Nassichuk (G.S.C.), Brian Norford (G.S.C.), Willy Norris (G.S.C.), Godfrey Nowlan (G.S.C.), Mike Orchard (G.S.C.), Tim Patterson (Carleton University), Alan Pedder (G.S.C.), Terry Poulton (G.S.C.), Paul Smith (U.B.C.), Art Sweet (G.S.C.), Ray Thorsteinsson (G.S.C.), Howard Tipper (G.S.C.), Tim Tozer (G.S.C.), John Utting (G.S.C.), Tom Uyeno (G.S.C.), John Wall (G.S.C.), and James White (G.S.C.).

#### NUMERICAL TIME SCALE:

Calibration of paleontologically well constrained intervals by isotopic dating provides numerical estimates for durations of stages, yields dates for geological events and

spawned the 'absolute' time scale. However, the precision limitations of isotopic dating and the rarity of biostratigraphically well-controlled sequences suitable for dating, prohibit the same precision achievable in biochronology. We chose the Decade of North American Geology (DNAG) time scale (Palmer, A.R., 1983, *The Decade of North American Geology 1983 Geologic Time Scale, Geology*, v. 11, p. 503-504) because it provides numerical estimates of uncertainty for the absolute ages of stage boundaries. The uncertainties are instructive when trying to correlate isotopically dated events with the biochronological time scale. For example, uncertainties in Early Jurassic stage boundary ages are on the order of the one-half the duration of the Jurassic period. A more recent time scale compilation by W.B. Harland, R.L. Armstrong, A.V. Cox, L.E. Craig, A.G. Smith, and D.G. Smith (1990, *A Geological Time Scale 1989*, Cambridge University Press, 279 p.) is somewhat more refined than the DNAG scale, is particularly applicable to the Cordillera and differs somewhat from the DNAG compilation (e.g., many Early and Middle Jurassic stages 4-10 Ma younger, some Middle and Late Triassic stages 5-7 Ma older, and Paleozoic period boundaries 1-5 Ma older than the DNAG scale).

#### MINERAL DEPOSIT AGE AND CORDILLERAN METALLOGENY:

Fossil-rich strata which host mineral deposits provide a minimum age for the mineralizing event. Where mineral deposition occurred simultaneously with deposition of the dated horizon, e.g., sedimentary exhalative (SEDEX) and volcanogenic massive sulphides (VMS), geochronology provides a precise age estimate of the age of mineralization. Examples of Silurian, Devonian and Mississippian mineral deposits whose ages are well constrained by the conodont ages of their bounding strata include: the SEDEX Llandoverian Howards Pass and Vulcan base metal deposits; Eifelian-Givetian Walt/Cathy barite deposit; Frasnian Macmillan Pass base metal deposit; Famennian Driftpile, Cirque, and Fluke base metal deposits; and Mississippian Tea barite deposit. The Windy-Craggy VMS deposit is a similar example from the Triassic. Radiolarian biochronology holds great potential for delimiting the age of stratabound Jurassic deposits such as at Eskay Creek.

K-Ar,  $^{40}\text{Ar}/^{39}\text{Ar}$ , and zircon U-Pb geochronometry play a comparable role to fossils for plutons and non-fossiliferous volcanic strata hosting base and precious metal veins. Examples abound: Triassic-Jurassic Highland Valley porphyry Cu-Mo; Early Jurassic Iskut 'Golden Triangle' mesothermal and epithermal precious metal; Early Cretaceous Britannia base metal VMS; Late Cretaceous Bralorne-Pioneer mesothermal precious metal; Eocene Grew Creek gold; and Late

## The Gangué No. 35 April 1991

The Gangué is published quarterly by the Mineral Deposits Division, GAC, and is distributed to all members of the MDD as part of their membership fee.

#### Publication Schedule:

SUBMISSION DEADLINE	PUBLICATION DATE
December 15	January
March 15	April
June 15	July
September 15	October

#### Information for contributors:

The objective of this newsletter is primarily to provide a forum for members and other professionals to voice new ideas, describe interesting mineral occurrences or expound on deposit models. Articles on ore deposits, deposit models, news events, field trips, book reviews, conferences or other material which may be of interest to the economic geology community are welcomed. Reprints of presentations given to companies, mining groups or conferences are particularly welcome.

Manuscripts should be submitted on 5/4" or 3 1/2" IBM-formatted diskettes in any major word processor format. A printed version should be included. Illustrations should be in camera-ready format; photos should be of good quality. Short items dealing with news events or meetings may be submitted by FAX.

All contributions may be edited for clarity or brevity.

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\* \* \*

All members are encouraged to convince more geologists to join the division; more members mean a wider base from which to draw both articles and information which may be of interest to all.



Miocene Salal Creek porphyry-Mo deposits are a few of the well known and well dated deposits. Ages of mineralization based on isotopic dates may be more interpretative than ages of SEDEX deposits based on biochronology. Commonly it is difficult to date the mineralization directly and the geochronologist must rely on dates of host and crosscutting igneous units to bracket the age of mineralization.

The mineral deposits listing was based on Chapter 19 ("Metallogeny") in the DNAG Canadian Cordilleran volume (Dawson, K.M., Panteleyev, A., Sutherland Brown, A. and Woodsworth, G.J., in press, *The Cordilleran Orogen: Canada*; H. Gabrielse and C.J. Yorath (Eds.), Geological Survey of Canada, Geology of Canada, No. 4). G.S.C. Cordilleran Division regional mappers as well as mineral deposit experts and/or geochronologists Grant Abbott (Geological Services, INAC), Georges Beaudoin (University of Ottawa), Ken Dawson (G.S.C.), Philippe Erdmer (University of Alberta), Tryg Höy (B.C. Geological Survey Branch [B.C.G.S.Br.]), Rod Kirkham (G.S.C.), Dave Lefebure (B.C.G.S.Br.), Craig Leitch (G.S.C.), Bill McMillan (B.C.G.S.Br.), Jim Mortensen (G.S.C.), Randy Parrish (G.S.C.), Chris Roddick (G.S.C.), Don Sangster (G.S.C.), Dave Sinclair (G.S.C.), and Bob Turner (G.S.C.) provided discussion, many useful comments, and unpublished data to supplement or revise the DNAG mineral deposit lists.

## STRUCTURAL SETTING OF MASSIVE SULPHIDES IN THE BATHURST CAMP, NEW BRUNSWICK

Abstract by Van Staal, Cees R., GSC  
GAC/MAC Vanc '90

Massive sulphides of the Bathurst Camp occur in the Tetagouche Group, which consists of a lower sequence of bimodal rift volcanics of Llanvirn/Llandeilo age and an upper sequence of feldspathic wacke, black shale and minor alkali basalt of Llandeilo/Caradoc age. The Tetagouche Group is structurally overlain by the ophiolitic Fournier Group and is disconformably underlain by Lower Ordovician quartzose sediments. Both U-Pb zircon dating and geochemical/structural mapping show that the intricate interleaving and repetition of rock units is due to thrusting and folding rather than stratigraphic complexity as suggested by previous workers. The massive sulphides are spatially associated with silicic volcanic rocks, although their immediate host rocks are wackes and shales of the upper

## NONRENEWABLE RESOURCES - the JOURNAL

On August 9, 1990, the International Association for Mathematical Geology (IAMG) entered into an agreement with Oxford University Press, Inc., to publish a new journal entitled *Nonrenewable Resources* (the Journal). The first issue will appear in 1992 and will be published as a Quarterly. The aim of the Journal is to provide an international forum for original contributions of papers that cover such topics as mineral and energy exploration, resource assessment, and the economics of resource supply, recovery, restoration and conservation. Such topics are all part of the further quantification of geoscience which is a primary goal of IAMG.

It is intended that the Journal will appeal to a broad-based audience of exploration geologists, resource analysts, corporate energy and mineral management personnel and others dealing with risk analysis or cost/benefit studies on nonrenewable resources.

Richard B. McCammon, President of the International Association for Mathematical Geology, has agreed to serve as the first Editor of the Journal and Michael Hohn of the West Virginia Geological Survey will serve as Deputy Editor. An Advisory Board made up of an international panel of experts from academia, industry and government whose specialties range from energy and mineral exploration to resource economics will assist in the review of manuscripts, in commissioning articles for publication, and policy matters related to the Journal.

For further information on this new Journal please contact the Editor, *Nonrenewable Resources Journal*, P.O. Box 34600, Bethesda, MD 20827, USA.

sequence (Caribou-type) or epiclastic and pyroclastic sediments of the lower sequence (Brunswick type). The older Brunswick type forms part of a laterally extensive iron formation and has a different lead isotope signature than the Caribou-type deposits. The history of rock alteration in the area is complex. It involved halmryolysis, synvolcanic hydrothermal activity and syntectonic advective diffusive mass transport, which combined with the high strain of most sulphide deposits, prohibits positive identification of footwall feeder pipes. Feeder pipes have not been recognized under the Caribou-type and, if present, are poorly developed under the Brunswick-type.

*Please contact the indicated distributor or your favourite technical bookstore to obtain copies.*

### USGS Newsletter

The U.S. Geological Survey, Office of Mineral Resources publishes a newsletter entitled *MINRES*, which is available free to anyone interested in mineral resource activity and information. It is a quarterly review of USGS minerals-related programs, research results, issues and news. The most recent copy I received discussed USGS programs on lead-zinc deposits of the Mississippi Valley-type (MVT), joint platinum group element research of the Noril'sk-Talnakh deposits by USGS and Soviet geologists and, co-operative metallogenic research of the Soviet Far East and Alaska by USGS and Soviet economic geologists. This same issue, (Winter 1991) listed 16 free circulars on strategic minerals as well as several on more general topics such as Carlin-type gold deposits and on results of geological mapping programs.

Although the newsletter itself is brief, about 8 pages, most of the short articles are complimented by the name and phone number of a USGS geoscientist who is most able

## GEOLOGY IN PRINT

Compiled by Brian Grant

*The following are publications which have come to my attention and which may be of some interest to the MDD membership. Information on new publications of economic or general geological interest will be welcomed by the Edi-*

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to provide further information on the subject at hand. The Fall 1990 issue contained a short review of USGS research on gold and identified 36 geologists by geographic area and their area of expertise.

For those wishing to subscribe to this information newsletter, contact the U.S. Geological Survey, Office of Mineral Resources, Minerals Information Office, Dept. of the Interior, MS 2647-MIB, 1849 C St., NW, Washington, DC 20240.

### AGI DATA SHEETS - Third Edition for Geology in the Field, Laboratory and Office

Compiled by J. Thomas Dutro, Jr., Richard V. Dietrich and Richard M. Foose

In the early 1970s I 'discovered' a compilation of geological data presented as brief summary sheets in a small ring binder. This became an invaluable addition to my field kit and many of the pages ended their days quite worn and water logged from routine use in the field.

The Third Edition of AGI data sheets (1989), compiled by Tom Dutro and cohorts and produced by Julia Jackson and Margaret Oosterman of the AGI, should prove to be an even more useful publication for geologists trying to figure out how to bring their technical libraries into the field with them. This new edition contains summary sheets covering eighty-nine topics including: geochronologic/chronostratigraphic units; map symbols; structural information; igneous, metamorphic and sedimentary nomenclature and textures; gemstone information; field classifications for common rocks; soil classification charts; sources of information and geoscience databases; mineral identification tables; IUGS classifications for plutonic and volcanic rocks; optical determination data for minerals; calculation of norms; major fossil groups and age distribution in North America; phase equilibria diagrams and, numerous tables and charts of data useful to a geologist working in the field or the lab.

This Third Edition contains some data sheets unchanged from the first two editions, but many others are updated and revised and new sheets have been added. The individual summary sheets represent the results of work by numerous authors and compilers, all of whom are given prominent credit on the appropriate sheets. The volume is nicely balanced by an informative table of contents combined with a brief subject index at the back.

If you haven't guessed by now, I heartily recommend this little volume of geological data, particularly for field reference. The 5" x 7" size combined with a heavy vinyl cover make it a useful and handy reference which fits easily in a packsack.

## WASHINGTON MINERAL INVENTORY

Metal Mines of Washington - Preliminary Report,  
Open File Report 90-18, by R.E. Derkey

The Washington Division of Geology and Earth Resources Open File Report 90-18, 587 pages, summarizes the geology and related features of 541 metal mines in the State of Washington, USA. Mines that have produced about US\$1000 worth of ore (or more) have been included in the data set.

This preliminary report is the first published product developed from the computer database of Washington State's mineral inventory. Prior to the release of this open file summary information was available in M.T. Huntting's DGER Bulletin 37, Inventory of Washington Minerals; Part II, Metallic Minerals.

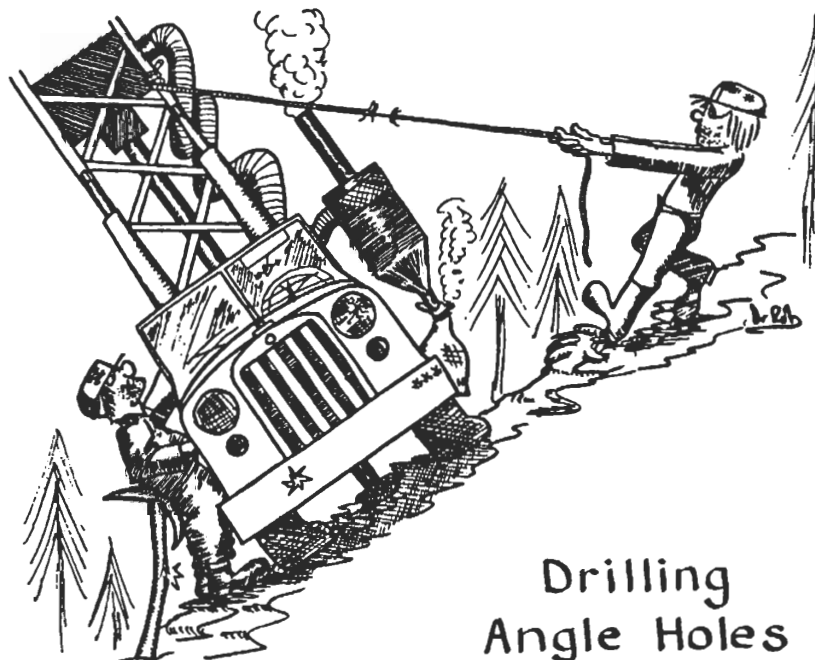
Each entry includes information about location, commodities, ore minerals, gangue, productions and further references. The new inventory also includes additional latitude and longitude and reference to the 1:250 000-scale, 1:100 000-scale and the largest scale (1:24 000 or 1:62 500) topographic map coverage for each deposit.

This new inventory also presents extensive information about the geology of each deposit including data on deposit type, host-rock name, lithology & age, age of mineralization, description of associated igneous rocks & age, geologic setting, ore controls and tectonic setting.

Data has been compiled by B. Derkey and R. Lasmanis of Olympia and N. Joseph of Spokane using the U.S. Geological Survey program GSMODS (USGS Open File Report 87-636). GSMODS is a mineral occurrence database system designed to organize, analyze and display information used to access mineral potential.

When completed, the new mineral inventory will provide both summary and detailed mineral resource information and will be of use for mineral resource-related aspects of land development and land management. The database will be updated continually. A current version of the database is to be maintained in the Olympia office of the Washington State Department of Natural Resources.

The Division plans a release of the data on diskette, early in 1991. For further information contact Robert E. Derkey, c/o Dept. of Natural Resources, Division of Geology and Earth Resources, Olympia, WA 98504. Tel: (206) 459-6372.



Drilling  
Angle Holes

Copies of AGI Data Sheets may be obtained from the American Geological Institute, 4220 King Street, Alexandria, VA 22302-1507, USA. Tel: (703) 379-2480. You will consider the US\$34.95 (incl. shipping & handling) well spent when you're sitting on an outcrop in the middle of nowhere trying to remember a critical piece of information that one of the AGI data sheets is sure to have.

## MEETINGS, WORKSHOPS & FIELDTRIPS

{Editor's Note: If you are sponsoring or are aware of a meeting or event of potential interest to economic geologists please FAX me a note at (604) 356-7413 so that it may be included in the next issue of *The Gangue*. Notices must include a contact address or phone number. Thanks!}

### APRIL 1991

22 - 27 **GEOSTATISTICS FOR THE MINING INDUSTRY: NEW CONCEPTS, NEW TOOLS.** MDRU Short Course #5. Dept. of Geological Sciences, The Univ. of BC. Presented by FSS International. Fee \$875. Details: Director, MDRU, UBC, 6339 Stores Road, Vancouver, BC, V6T 2B4. Tel: (604) 228-6136 FAX (604) 228-6088.

April 29 - May 1 **15th INTERNATIONAL GEOCHEMICAL EXPLORATION SYMPOSIUM.** Reno, Nevada. Association of Exploration Geochemists. Details: Harold Bonham, Symposium Chairman, 15th IGES, PO Box 9126, Reno, Nevada 89507.

April 29 - May 2 **8th THEMATIC CONFERENCE ON REMOTE SENSING FOR EXPLORATION GEOLOGY.** Denver, Colorado, USA. Contact: Nancy Wallman, ERIM, P.O. Box 8618, Ann Arbor, Michigan 48107-8618, USA.

### MAY 1991

5 - 9 **FORUM '91.** 27th forum on the geology of industrial minerals. Banff Springs Hotel, Banff, Alberta, Canada. Sponsored by the Alberta and British Columbia Geological Surveys. Details: Danny Hora, BC Geological Survey, Victoria, BC, V8V 1X4. Tel: (604) 356-2846; or, Wylie Hamilton, Alberta Geological Survey, PO Box 8330, Station F, Edmonton, Alberta, T6H 5X2. Tel: (403) 438-7634.

7 - 22 **BRAZIL GOLD '91.** Meeting and fieldtrips, Belo Horizonte, Brazil. Contact: Brazil Gold '91, Av. Afonso Pena, 3880-3/5 andares, 30130 Belo Horizonte MG, Brazil OR, C.II. Thorman, USGS, Mail Stop 905, 25046 Federal Center, Denver, Colorado 80225, USA.

27 - 29 **GAC/MAC/SEG ANNUAL MEETING. TORONTO 1991.** Joint annual meeting of the Geol. Assoc. of Canada,

Mineralogical Assoc. of Canada and the Society of Economic Geologists. Sessions on Abitibi ore deposits, litho-geochemistry, ore deposits research, gems & gem deposits, geophysics in exploration and application of ore-deposit models to exploration. Details: Toronto 1991, Dept. of Geology, U of T, Earth Sciences Centre, 22 Russell Street, Rm. 1066B, Toronto, Ont. M5S 3B1, Canada. Tel: (416) 978-6588 FAX: (416) 978-3938.

#### JUNE 1991

24 - 28 EIGHTH INTERNATIONAL SYMPOSIUM ON GONDWANA, 'GEOLOGY, GEOPHYSICS & MINERAL RESOURCES'. Hobart, Tasmania, Australia. Contact: Convention Planners Pty., Ltd., GPO Box 844J, Hobart, Tasmania 7001, Australia. Tel: 61-02-233177 FAX: 61-02-237399.

#### JULY 1991

3 - 23 IAGOD 6th INTERNATIONAL PLATINUM SYMPOSIUM and Field Excursions. Perth, W. Australia. Contact: Robin Hill, 6th Platinum, CSIRO, Private Bag, P.O. Wembley, W. Australia 6104.

8 - 11 SIXTH INTERNATIONAL PLATINUM SYMPOSIUM. University of Western Australia, Perth. Contact: Dr. R.E.T. Hill, Sixth Platinum Symposium, CSIRO, Private Bag, P.O. Wembley, Western Australia 6014, Australia.

27 & 28th 1st ANNUAL FORT ST. JAMES EXPLORATION AND MINING CON-

FERENCE: THE INDUSTRY AND COMMUNITY. Sponsored by the B.C. Geological Survey Branch and the town of Fort St. James. Technical presentations on Cu-Au porphyries. For details contact: Kim Bellefontaine or JoAnne Nelson c/o B.C. Geological Survey, 200-756 Fort Street, Victoria, B.C., V8V 1X4, Tel: (604) 356-2830 FAX: (604) 356-8153.

#### AUGUST 1991

27 - 30 INTERNATIONAL SYMPOSIUM ON SULPHIDE DEPOSITS Sponsored by Geological Society of Gansu Province, Geological Society of China, Jinchang, Gansu, China. Contact: Mr. Ji Shengbao, Geol. Soc. of Gansu Prov., 168 Hongxing Lane, Lanzhou 730000, Gansu Province, People's Republic of China.

Aug 30 - Sept 3 SOURCE, TRANSPORT AND DEPOSITION OF METALS; 25th Anniversary Meeting, Society for Geology Applied to Mineral Deposits. Nancy, France. Details: CREGU BP 23, 54501 Vandoeuvre-lès-Nancy Cédex, France. FAX 33-83-44-00-29.

#### SEPTEMBER 1991

9 - 10 ANNUAL FIELD CONFERENCE ON MINERAL DEPOSITS AND EXPLORATION METHODS. Sponsored by the Saskatchewan Section of the Geological Society of CIM - First annual field conference. Papers on Canadian and US deposits; will focus on deposits, geological settings and exploration methods for base & precious metals, uranium and industrial

minerals. 5 field trips in Canada & US. Details: Len Homeniuk, General Chairman, PO Box 8201, Saskatoon, Sask, Canada, S7K 6G5. Tel: (306) 956-6380.

15 - 18 SOFTWARE OF THE 90'S FOR THE MINERAL INDUSTRY The Second Canadian Conference on Computer Applications in the Mineral Industry. New World Harbourside Hotel, Vancouver, B.C. Sponsored by U.B.C., CIM, CANMET, Mining Assoc. of B.C. Conference will include technical presentations and a session of applications demonstrations. Further information contact: A.L. Mular, Conference Chairman, Dept of Mining & Mineral Process Engineering, 6350 Stores Road, The Univ. of British Columbia, Vancouver, B.C., V6T 1W5.

Sept 29 - Oct 2 UNDERWATER MINING INSTITUTE. Hawaii. Ocean Basins Division of the Marine Mineral Technology Center will host the meeting in Hawaii. Technical sessions will feature presentations on deep water mining and activities along the Pacific Rim. Details: Allen H. Miller, UMI Coordinator, Underwater Mining Institute, 1800 University Ave., Madison, WI 53705. Tel (608) 262-0645.

#### OCTOBER 1991

6 - 10 SOCIETY OF EXPLORATION GEOPHYSICISTS, ANNUAL MEETING. New Orleans, LA. Contact: Convention Assistant, SEG, P.O. Box 3098, Tulsa, OK, USA 74101.

21 - 24 SOCIETY OF ECONOMIC GEOLOGISTS/GEOLOGICAL SOCIETY OF AMERICA ANNUAL MEETING. San Diego, California. Details: Michael A. McKibben, SEG Program & Fieldtrip Chairman, Dept. of Earth Sciences, 2413 Geology Bldg., University of California, Riverside, CA 92521-0423. Tel: (714) 787-3444 FAX (714) 787-4324.

#### NOVEMBER 1991

2 - 12 3rd SYMPOSIUM AND WORKSHOP ON RARE METAL GRANITOIDS (IGCP Project 282) and 7th REGIONAL CONGRESS ON GEOLOGY, MINERAL AND ENERGY RESOURCES OF SOUTHEAST ASIA (GEOSEA VII). Bangkok, Thailand. Contact: Dr. S. Nakapadungrat, Symposium Secretary, Geological Survey Division, Dept. of Mineral Resources, Rama VI Road, Bangkok 10400, Thailand.

#### DECEMBER 1991

9 - 11 14th ANNUAL, ONTARIO GEOLOGICAL SURVEY GEOSCIENCE RESEARCH SEMINAR. Toronto, Ontario. Contact: T. Chin, OGS, 11th Floor, 77 Grenville Street, Toronto, Ont. M7A 1W4. Tel: (416) 965-1546.

#### MAY 1992

25 - 27 GAC/MAC ANNUAL MEETING, WOLFVILLE '92. Contact: A. Fricker, Atlantic Geoscience Centre, Bedford Institute of Oceanography, P.O. Box 1006, Dartmouth, N.S. Tel: (902) 426-6759.

## GEOLOGISTS & THE CANADA - USA FREE TRADE AGREEMENT

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Effective mid-January, 1991 all necessary operational procedures were in place at U.S. Immigration and Naturalization Service offices for Canadian geologists to obtain entry into the USA as professionals under the terms of the Free Trade Agreement. The legislation provides for U.S. geologists to enter Canada under the same preferential terms.

Canadian geologists can now take advantage of the streamlined procedures associated with the TC-Treaty Canada-classification for temporary admission into the U.S. to work as a professional. To qualify, an individual must meet the minimum qualifications to engage in the profession, normally a university degree, and must have a bona fide offer of employment in the U.S. that requires his or her professional skills.

To obtain TC status, which is valid for one year and permits multiple entries into the USA, application is made to the nearest office of the U.S. Immigration and Naturalization Service. For this you should submit a letter of application, together with a bona fide letter from the U.S. organization requiring your professional skills, evidence (university graduation certificates, etc.) of your professional qualification, evidence of Canadian citizenship or landed immigrant status, and US\$50 processing fee. Practical experience has shown that TC status can be granted in three to five working days.

For further information, please contact the nearest office of the US Immigration and Naturalization Service.