



THE GEOSCIENCES IN CANADA, 1987

**CANADIAN
GEOSCIENCE
COUNCIL**

ANNUAL REPORT

Prepared by
The Canadian Geoscience Council

Edited by D.F. VanDine

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ACRONYMS COMMONLY USED IN THIS REPORT

AECL	Atomic Energy Canada Limited	GSA	Geological Society of America
AEG	Association of Exploration Geochemists	GSC	Geological Survey of Canada
AGID	Association of Geoscientists for International Development	IGC	International Geological Congress
CANQUA	Canadian Quaternary Association	IGCP	International Geological Correlation Program
CCCESD	Council of Chairman of Canadian Earth Science Departments	IGU	International Geographical Union
CGC	Canadian Geoscience Council	IMA	International Mineralogical Association
CGS	Canadian Geotechnical Society	INQUA	International Union for Quaternary Research
CGU	Canadian Geophysical Union	IUGG	International Union for Geodesy and Geophysics
CIDA	Canadian International Development Agency	IUGS	International Union of Geological Sciences
CIM	Canadian Institute of Mining and Metallurgy	MAC	Mineralogical Association of Canada
CSEG	Canadian Society of Exploration Geophysicists	NSERC	Natural Sciences and Engineering Research Council of Canada
CSPG	Canadian Society of Petroleum Geologists	ODP	Ocean Drilling Program
EMR	Department of Energy, Mines and Resources (Canada)	UNESCO	United Nations Educational, Scientific and Cultural Organization
GAC	Geological Association of Canada		

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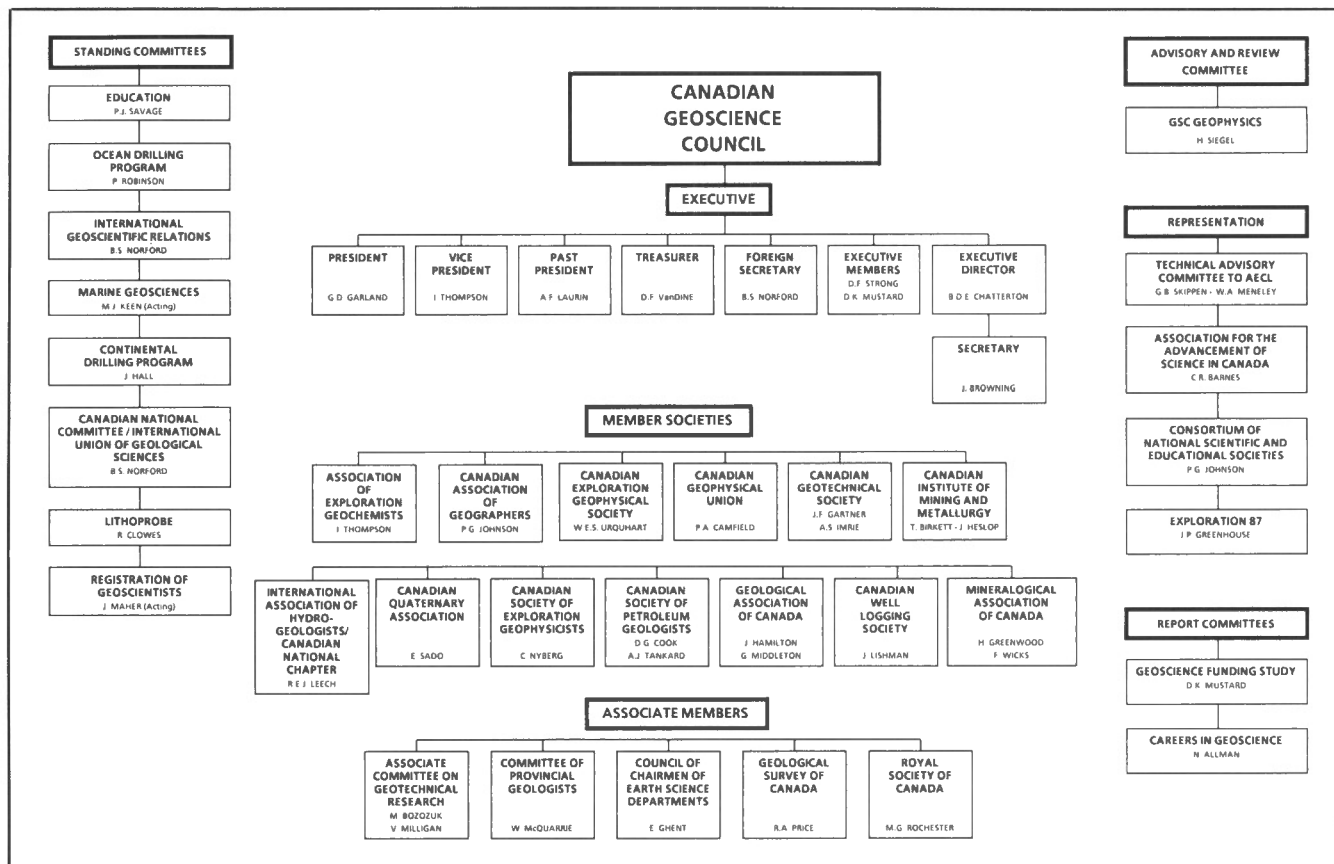
REPORT OF THE PRESIDENT

Introduction

The objectives of the Canadian Geoscience Council are to provide a central forum for earth science societies in Canada, to provide advice to governments on geoscience policy, to enhance the health of the geosciences in Canada, and to increase public awareness of the vital role which these sciences play in our country. The Council, through its member societies, represents some fifteen thousand earth scientists.

During 1987, the executive of the Council took positive steps to increase its contacts with decision makers at both national and provincial levels. These meetings are described below. The full Council met four times: in March, at the Pacific Geoscience Centre, Sidney, B.C.; in June, in Saskatoon on the occasion of the annual meetings of the Geological and Mineralogical Associations of Canada; in October, in Toronto, immediately after the conference, Exploration '87, and in December, in Ottawa with officials of EMR. The conference Exploration '87 of which CGC was a prime sponsor, was most successful, being attended by over 900 scientists from 76 countries. Not only were there technical sessions on the leading edge of geophysical and geochemical exploration, but field schools were held for scientists from developing countries. The assistance of CIDA and the United Nations in making these schools possible is gratefully acknowledged.

Table 1. Organization Chart and CGC representatives 1987.



Executive Action

During the Council meeting in March, the executive met with the Honourable Jack Davis, Minister of Energy, Mines and Petroleum Resources for British Columbia. Discussion emphasized such matters as the importance of the geoscience data base, not only in exploration, but in the mitigation of natural hazards, and the particular opportunities that existed in British Columbia to develop centres of excellence. In April, the executive met in Ottawa with the Honourable Frank Oberle, Minister of State for Science and Technology, and with the Honourable Gerald Merrithew, Minister of State for Forestry and Mines. The importance of the geosciences to Canada was emphasized, and a particular point was made of the desirability of increasing the representation of those sciences on the Prime Minister's National Advisory Board on Science and Technology.

The Council was represented, by invitation, at the meeting of Ministers of Mines, held in St. John's, Newfoundland in August. This was only the second time that CGC has made a submission to this important meeting. In September, the executive met with senior officers of the newly re-structured Department of Northern Development and Mines of Ontario, and carried out a useful exchange of views on future developments in that Department.

The President of the Council contributed with other Society Presidents to two important submissions to the Prime Minister. The first urged increased government support for science in Canada. The second urged that appropriate attention be given to the mineral industry at the Commonwealth Conference held in Vancouver in October. This request resulted in facilities being made available, during the Conference, for a CGC display emphasizing Canadian expertise in the geosciences and in mineral exploration in particular.

On the occasion of the December meeting of Council, some members of the Executive met separately with the Secretary of MOSST, members of Parliament with an interest in science, members of the Department of the Environment, and officers of the Prime Minister's Office. Matters discussed included the visibility and public appreciation of the earth sciences, and their contribution to the national economy.

Publications

In addition to the *Annual Report and Current Research in the Geological Sciences in Canada*, the reports of two advisory committees were completed during the year.

1. The Quaternary Geosciences in Canada (J.B. Bird, Chairman)
2. Engineering and Quaternary Geology at the GSC. (M. Church, Chairman)

All were published in both official languages by the Geological Survey of Canada.

Research and development in the Earth Sciences

The major study undertaken during the year investigated the level of support for R and D in the Earth Sciences in Canada, in comparison with other countries and with other disciplines in Canada. A contract was awarded to the Centre for Resource Studies at Queen's University to carry out the study, which involved discussions with institutions in other countries, and the canvassing of many organizations in Canada. This contract has been funded by generous contributions from EMR, provincial agencies and private industry. The collection of material and writing is being carried out by a senior staff member of the Centre, acting under an advisory committee of the Council. The report is well advanced, and it is expected that it will be available for distribution in 1988.

Major National Programmes in the Earth Sciences

The year 1987 saw renewed funding of the major study LITHOPROBE, and increased Canadian participation in the Ocean Drilling Program (ODP), two activities which CGC actively developed and promoted. LITHOPROBE received a commitment for five-year funding from NSERC and EMR, and its Board of Directors, of which three members are CGC nominees, was appointed. The Board chose the University of British Columbia as the host university, and appointed the Scientific Director of LITHOPROBE. Extensive field work during 1987 was carried out over the Kapuskasing Structural Zone in northern Ontario.

The CGC maintains a close collaboration with the Canadian Council for the ODP, and is represented on it. During the year, CGC made representations to NSERC in connection with funding necessary to maximize the effectiveness of participation of Canadian scientists in the international ODP. The Council also made recommendations, to NSERC and to EMR, of persons suitable to form a review committee on the effectiveness of Canada's first years of participation.

Continental drilling may well form a major project of the future in Canada, and the Council decided to recognize the Steering Committee of the Canadian Continental Drilling Program as a committee of CGC.

Advisory Committees

In addition to the advisory committees previously mentioned, CGC also appoints members to the Technical Advisory Committee to AECL on Nuclear Fuel Waste Management Program. The Council produced a list of recommended names for the External Advisory Committee to the GSC on Geophysics, and it began discussions with the Tyrrell Museum of Palaeontology, Drumheller, on the establishment of an external review committee for that museum.

International Affairs

This past year saw a number of major international geoscientific meetings in Canada, including the International Union of Geodesy and Geophysics in Vancouver, the International Quaternary Association in Ottawa, and the International Society of Rock Mechanics in Montreal. The CGC continues to administer the finances for the Canadian National Committee of the International Union of Geological Sciences, and will have some involvement in Canadian participation in the forthcoming International Geological Congress in Washington D.C. in 1989.

Other Activities

The Canadian Geoscience Council is a federation of societies, intended to cover the entire spectrum of the earth sciences. For some time, the Council was concerned that the important discipline of hydrogeology was under-represented. It is therefore a pleasure to welcome, as a full member the Canadian National Chapter of the International Association of Hydrogeologists

The Council is aware of the need to enhance the awareness of the public, and of students in particular, to the opportunities offered by the geosciences. It supports a program of workshops for school teachers, and is actively working to revise the Careers in Geoscience booklet, whose earlier edition was so successful. The rewriting of the careers booklet is well advanced, having been carried out by a geoscientist with experience in journalism.

The December meeting of Council was attended, on invitation by Dr. Marvin Kaufman, Executive Director, American Geological Institute. It is hoped that, in future, annual meetings of CGC and AGI will regularly be attended by observers from the other institution to discuss projects of mutual interest.

At the same meeting, the Council was asked to establish an advisory committee on Geochemistry at the GSC. Preliminary discussions were also held on two matters which CGC may conduct studies in the future: the role of the earth sciences in formulating a water policy for Canada, and the integrity and mutual compatibility of digital data sets in the earth sciences.

Acknowledgments

The President of CGC could do little without the active support of the other members of the Executive and of the central office, effectively conducted by the Executive Director, Dr. B.D.E. Chatterton. It is a pleasure to acknowledge this support, as well as, the financial support which the Council receives from provincial and national agencies.

G.D. Garland

REPORT OF THE EXECUTIVE DIRECTOR

The office of the Canadian Geoscience Council was housed at the University of Alberta during 1987. The completion of renovations to the Department of Geology allowed the Executive Director to return to his office in the Earth Science Building. The CGC office remained in South Lab, however, half way across the university campus causing occasional problems for the Secretary and Executive Director. Near the end of the year, Judy Browning resigned as Secretary and Susan Gordichuk returned to assist in moving the office to Waterloo.

During the year office work involved handling the usual large amount of mail. The office distributed few publications since CGC ran out of the English versions of the booklet on Careers in Geoscience, and the French version is very dated. The demand for the earlier CGC publications still available dropped to very low numbers

Topics of particular concern to Council during the year included the registration of geologists (and the problems CGC had in forming a registration committee); marine geosciences and threats to the funding and facilities of that branch of the earth sciences; LITHOPROBE and the evolution and success of that organization; the political activities of CGC and the need to lobby politicians on topics of interest to earth scientists; and the need to produce a new version of the booklet on *Careers in Geosciences*.

Apart from business and administrative matters of the Canadian Geoscience Council (regular reports from the treasurer, foreign secretary and executive), a variety of topics were discussed by Council during 1987. Copies of the minutes of meetings may be obtained by writing to the Executive Director of CGC (numbers in parentheses after each topic refer to the meetings in which they were discussed). Topics discussed included: Registration (60-63); Exploration '87 (60-62); Comparative Study on R&D Funding in Earth Sciences (60-63); Report on Quaternary and Engineering Geology at the GSC (60, 61); Booklet on Careers in Earth Science (60-63); Lithoprobe (60-63); A possible Advisory Committee to the Tyrrell Museum (60, 61); Marine Geosciences (60-63); Canadian Continental Drilling Program (60-63); Council of Chairmen of Canadian Earth Science Departments (60,63); Meetings with Ministers (60, 61, also 62, 63 under executive report); Ocean Drilling Program (61, 63, also under Marine Geoscience); Mines Ministers' Conference (62); Technical Advisory Committee to Atomic Energy of Canada Limited (62, 63); Associate Committee on Geotechnical Research, NRC (63); Advisory Committee on Geochemistry at the GSC (63); EdGeo (63); Royal Society of Canada (63); Association for the Advancement of Science in Canada (63); National Consortium of Scientific and Educational Societies (63); American Geological Institute (63); and a Water Policy for Canada (63).

During the year, the Canadian Chapter of the International Association of Hydrogeologists joined CGC to bring the number of member organizations of CGC to 13.

B.D.E. Chatterton



Plate 1.

Canadian Geoscience Council Executive, 1987.

Left to right: B.S. Norford(Foreign Secretary), I. Thompson(Vice-President), D.K. Mustard(Executive Member), G.D. Garland(President), D.F. VanDine(Treasurer), A.F. Laurin(Past President), B.D.E. Chatterton(Executive Director).

REPORT OF THE TREASURER

Table 2. Approved Budget 1986-1987

EXPENSES	APPROVED
Quaternary Studies Committee	\$ 1 500
Marine Geoscience Committee	1 000
Registration Committee	2 000
Geoscience Funding Study	83 800
CNC/IUGS	\$ 3 000
International Geological Congress	3 000
EdGeo Workshops	9 700
Secretarial Services	4 000
Postage, Stationary, Office Supplies	5 000
Careers in Geoscience Flyer and Booklet	25 000
Executive Travel	10 000
Council Meetings	2 400
Youth Science Foundation, AGID and AASC Memberships	400
Miscellaneous	300
Total Expenses	\$ 151 000
REVENUE	
EMR : IGC grant	\$ 3 000
: CNC/IUGS	3 000
: Operating grant	11 000
Provincial grants	4 000
Membership dues	5 000
Bank interest	10 000
Publication sales	2 500
Geoscience funding study donations	75 000
EdGeo donations	0
Total Revenue	\$ 113 500
EXCESS OR (SHORTFALL)	
Revenue over Expenses	\$ (37 600)
D.F. VanDine Treasurer CGC 9 December 1986	

Table 3. Statement of Operating Revenue and Expenses, Fiscal year 1986-1987

A Non-profit Organization Chartered under the Provisions of Part II of the Canada Corporation Act		
REVENUE	86-87	85-86
Energy Mines and Resources		
operating grant	\$ 11 000.00	\$ 11 000.00
International Geological Congress grant	3 000.00	3 000.00
CNC/IUGS grant	3 000.00	3 000.00
Provincial grants	5 500.00	7 200.00
Membership fees	5 007.75	4 815.25
Interest	6 683.74	5 335.22
Publication sales	70.00	732.50
EdGeo donations refunds	—	1 210.45
Miscellaneous	—	24.99
Total Revenue	\$ 34 261.49	\$ 36 309.41
EXPENSES		
Mineral Research Committee	\$ —	\$ 883.31
Quaternary Studies Committee	—	6 544.88
Geoscience Funding Study	—	1 203.65
International Geological Congress	3 000.00	3 000.00
CNC/IUGS	3 000.00	3 000.00
EdGeo Workshops	5 600.00	1 500.00
Office expenses and services	9 283.57	7 280.25
Printing of flyers and booklets	3,450.00	4 866.21
Council meetings	980.45	1 964.12
Executive travel	8 075.87	4 803.42
YSF, AGID and AASC memberships	300.00	205.23
Miscellaneous	571.60	1 058.34
Total Expenses	\$ 34 261.49	\$ 36 309.41
EXCESS OF REVENUE OVER EXPENSES	NIL	NIL

Table 4. Balance Sheet, Operating Accounts, 30 September 1987

ASSETS	86-87	85-86
Victoria		
Current Account	\$ 2 155.32	\$ 801.78
Savings Account	5 749.80	2 082.28
Term Deposits	97 345.26	99 263.69
University of Alberta		
Operating Account	(220.41)	830.77
Accounts Receivable	—	—
TOTAL ASSETS	\$ 105 029.97	\$ 102 978.52
LIABILITIES		
Accounts Payable	\$ 5 573.91	\$ 3 522.46
TOTAL LIABILITIES	\$ 5 573.91	\$ 3 522.46
FUNDS NOT YET ALLOCATED	\$ 99 456.06	\$ 99 456.06
D.F. Van Dine Treasurer, Canadian Geoscience Council		
20 November 1987		

Table 5. Statement of Revenue and Expenses for the Geoscience Funding Study Trust, Fiscal year 1986-1987

STATEMENT OF REVENUE AND EXPENSES GEOSCIENCE FUNDING STUDY (FUNDS HELD IN TRUST) 1 OCTOBER 1986 to 30 SEPTEMBER 1987		
REVENUE	86-87	85-86
Grants	\$ 54 500.00	—
Interest	742.41	—
TOTAL REVENUE	\$ 55 242.41	—
EXPENSES		
Queen's Centre for Resource Studies	\$ 29 378.54	—
D.K. Mustard	1 588.11	—
TOTAL EXPENSES	\$ 30 966.65	—
FUNDS NOT YET ALLOCATED	\$ 23 275.76	—

Table 6. Balance Sheet, Geoscience Funding Study Trust, 30 September 1987

ASSETS	86-87	85-86
Victoria		
Current Account (Trust)	\$ 3 877.24	—
Term Deposits	20 398.52	—
Accounts Receivable	—	—
TOTAL ASSETS	\$ 24 275.76	—
LIABILITIES		
Accounts Payable	—	—
TOTAL LIABILITIES	—	—
FUNDS NOT YET ALLOCATED	\$ 24 275.76	
D. F. Van Dine Treasurer, Canadian Geoscience Council 20 November 1987		

23 November 1987

TO: MEMBERS OF THE CANADIAN GEOSCIENCE COUNCIL

RE: Examination of 1986-1987 fiscal year end statements of Canadian Geoscience Council

We have examined the financial records of the Council (Treasurer's ledger, records, cancelled cheques, bank statements, etc.) for the year ending 30 September 1987.

All records are in order and we believe the financial standing of the Canadian Geoscience Council to be correctly represented on the accompanying financial statement sheets and balance sheets dated 20 November 1987.

This report is not to be considered an audit but rather an examination of its records by the under-
signed as directed by the council.

Gilbert McArthur Member GAC, CIMM

C. Peter Lewis Member, GAC

Table 7. Foreign Secretary's Accounts, Fiscal year 1986-1987, ending 30 September 1987

A. CNC/IUGS Account – Statement of Accounts		
Funds not yet allocated (1 October 1986)		\$8 698.67
Revenue	\$3 667.97	
Expenses	\$2 622.80	
Excess of revenue over expenses		\$1 045.17
Funds not yet allocated (30 September 1987)		\$9 743.84
B. International Geogological Congress Account Statement of Accounts		
Funds not yet allocated (1 October 1986)		\$6 000.00
Revenue	\$3 394.54	
Expenses	—	
Excess of revenue over expenses		\$3 394.54
Funds not yet allocated (30 September 1987)		\$9 394.54
D.F. VanDine Treasurer, Canadian Geoscience Council 20 November 1987		

REPORT OF THE FOREIGN SECRETARY

The Foreign Secretary acts as a link between the Canadian Geoscience Council and international non-governmental organizations with geoscientific activities that involve Canada. This liaison is achieved through the Standing Committee on International Geoscientific Relations (SCIGR) and the Canadian National Committee for the International Union of Geological Sciences (CNC/IUGS) both chaired by the Foreign Secretary. The SCIGR held its annual meeting in Ottawa, on December 2, 1987 and this was followed on the same day by the annual meeting of the CNC/IUGS. Minutes of both meetings are available from the Foreign Secretary or the CGC Executive Director. The reports which follow are based on these minutes and incorporate some subsequent developments.

Standing Committee on International Geoscientific Relations

The Standing Committee is an advisory body on international geoscientific activities distinct from those of the IUGS and the International Geological Congress (IGC). SCIGR acts as a reporting forum to the CGC from Canadian organizations involved in such activities, and recommends to the CGC responses to international initiatives.

The 1987 meeting was attended by 16 representatives from most of the relevant earth science associations. Others sent written submissions.

1. Association of Exploration Geochemists (C.E. Dunn)

Canadian scientists comprise about 30 per cent of the total membership of approximately 7000. An international meeting (April 23-26, Orléans; with field trips in France, Spain, Portugal and Tunisia) focused on exploration and prospecting with special themes of geochemical prospecting for precious metals, geochemical exploration under extreme climatic conditions, integrated mineral exploration using geochemical techniques, and developments in analytical chemistry. In May 1988, a symposium on geochemical exploration for the platinum group of metals will be held in Baltimore, U.S.A. and the 13th International Geochemical Exploration Symposium is scheduled for Rio de Janeiro, Brazil (October 1989).

2. Association of Geoscientists for International Development (A.R. Berger)

AGID continues to run an active and many-faceted program from its head office in Bangkok, Thailand and through the President's office in Sri Lanka. President Gerald Cooray provided a keynote talk at the *Exploration '87* conference in Toronto in September, and took the opportunity to strengthen links with IDRC and CIDA. CIDA has now agreed to provide a two-year grant towards the association's programs. Canada remains the chief financial sponsor of AGID activities. Of special interest to Canada are two separate projects. First, the AGID service that recycles geoscience books and journals surplus to Canadian needs to Third World libraries is again operating from a base in Ottawa, after a hiatus of several years. Literature valued at close to \$20 000 that has come from Canadian geologists is now awaiting shipment to developing countries. More donations are being sought.

The other development was the founding in mid-1987 of *Small Mining International* a non-governmental mechanism to strengthen the contribution of the small mining sector to economic and social development, especially in the Third World. The outcome of a meeting in India in July under the sponsorship of IDRC and AGID, SMI is now establishing an interim secretariat in Canada with assistance from IDRC, the Mineral Exploration Research Institute in Montreal and several other Canadian organizations. Expressions of interest and support from many private and intergovernmental agencies for the venture augur well for its future.

3. Decade of North American Geology (J.O. Wheeler)

Canada is responsible for nine volumes. The most advanced (Quaternary Geology of Canada and Greenland) reached the final stages of copy editing, drafting and translation, with publication expected in 1988. Of the six regional volumes, one was in the midst of copy editing at the end of 1987, three were at the final stages of scientific editing and two were still in stages of manuscript compilation, as was the Mineral Deposits volume. The final, summary volume will be compiled after the other eight are finished.

DNAG geological maps at 1:5 million have been compiled for the Appalachian Orogen, Cordilleran Orogen, Cratonic Cover, and the Superior and Grenville provinces. The rest of the Precambrian Shield has been compiled at 1:1 million. Maps at 1:2 million for the Innuitian Orogen and Arctic Platform are virtually complete. The Magnetic Anomaly Map of North America was published in August 1987 and printing of the Gravity Map commenced at the end of the year. Tectonic maps have been compiled for the Appalachian and Cordilleran orogens and for the Superior and Grenville provinces.

4. International Association of Engineering Geologists (J. Locat)

The Engineering Geology Division of the Canadian Geotechnical Society is the national body for IAEG. Owen L. White (Ontario Geological Survey) serves as President of IAEG, and D. Crudden (Alberta) chairs IAEG's Commission on Landslides and other Mass Movements. The governing council of IAEG met in Beijing, China in May 1987 and plans to meet in Greece in September 1988.

5. International Association of the Genesis of Ore Deposits (I.R. Jonasson)

Quadrennial symposia and publication of their proceedings are some of IAGOD's prime activities. The second and third volumes of the proceedings of IAGOD VI (Tbilis) were published in 1987 in Moscow but appear to be of limited availability. The proceedings of IAGOD VII (Lulea) will be published early in 1988.

IAGOD's Commission on the Tectonics of Ore Deposits currently has four working groups whose chairmen reported to IAGOD VII; one of these dealing with Statistical Treatment of Tectonic and Mineral Deposit Data is chaired by Fritz Agterberg (GSC, Ottawa). Canadians participate in all other CTOD working groups. This project is expected to continue through to 1989 when a final report will be presented to IAGOD at the International Geological Congress. Other commissions and working groups, including Paragenesis, Fluorite and Barite Deposits, Ore Forming Fluids in Inclusions, Metallogeny of Bohemian Massif, and Tin and Tungsten Deposits continued to be active through 1987; all expect to report progress through symposia either at IGC (1989, Washington) or IAGOD VIII (1990, Ottawa).

IAGOD Symposium VIII will be held at Carleton University in Ottawa from August 12th to 18th, 1990. R.W. Boyle will be the Chairman and will be assisted by numerous colleagues from Carleton and Ottawa universities and the GSC. The Geological Survey of Canada has advanced seed money in the form of a grant of \$3000 towards printing of circulars and advance, programs, and has also made available the services of secretarial staff. R.W. Boyle is preparing a First Circular for distribution early in 1988.

6. International Federation of Palynological Societies (D.C. McGregor)

IFPS is a federation of 22 palynological societies representing some 3400 palynologists (about 80 Canadians) in 62 countries. It is affiliated with both IUGS and IUBS (International Union of Biological Sciences) and about three quarters of IFPS's palynologists are not geologists. Canadians on the 28-person Council in 1987 are Colin McGregor, President; David Jarzen, Secretary-Treasurer; and John Utting, Councillor representing the Canadian Association of Palynologists. Another Canadian, R.A. Fensome, is the Associate Secretary and responsible for compiling the World Directory of Palynologists. Its data base, containing over 4000 names, is in the final stages of preparation for publication. IFPS has received support from IUGS to assist in distribution of the directory.

The 7th International Palynological Congress will be in Brisbane, Australia in 1988 (Aug. 28 to Sept. 2). It will include about 39 symposia, and 9 multiday excursions in Australia and New Zealand. The Congress will immediately follow the meetings of the International Geographical Union in Brisbane, and the International Organization of Paleobotany in Melbourne. It is endorsed officially as an Australian Bicentennial Event. The symposia will cover the whole spectrum of applications of palynology, including such subjects as palynomorph morphology, allergy studies, evolution, paleoecology, paleogeography, environmental quality, climatic change, floral history, biostratigraphy, hydrocarbon source-rock analysis, archeology and forensic studies. A substantial financial surplus from the 1984 Congress (Calgary) is being used as seed money for the Brisbane Congress.

7. International Geographical Union (P.G. Johnson)

L. Kosinski (University of Alberta) continues as IGU's Secretary General and Treasurer and Canadians (L.S. Bourne, University of Toronto; M.J. Troughton, University of Western Ontario; H. French, University of Ottawa) chair three of IGU's fifteen commissions, those dealing with urban systems, changing rural systems and periglacial phenomena. The commission on periglacial phenomena published two special volumes in association with the 1987 INQUA meetings; *Periglacial phenomena: ancient and modern* and *Periglacial processes and landforms*.

Three principal themes have been identified for IGU's contribution to the International Geosphere Biosphere Project: mankind as an agent of global change; data collection for IGCP particularly concerning the regional impact of mankind on the land; global database planning and design. The last is vital to global monitoring and relates to many other initiatives such as a global digital cartographic data base, agriculture, soils and terrain data bases, hydrology programs, remote sensing, the geological control map of the world, environmental monitoring. IGU will sponsor a major meeting in England in May 1988 to clarify the needs of diverse interests and to identify problems that need to be resolved in the formulation of a global data base. R.F. Tomlinson of Ottawa, Ontario chairs the organizing committee for the global data base project.

Other international activities of Canadian geographers include a snow and ice hydrology project in Pakistan (Wilfred Laurier University, Universities of British Columbia, Ottawa and Waterloo), a joint Canada-France study of ground-freezing and the effects on pipelines (Carleton University), Quaternary stratigraphy in East Africa (University of Lethbridge, York University), hydrology and archaeology in China (McMaster University, University of Lethbridge) and training programs for Thailand (University of Sherbrooke).

8. International Geological Correlation Program (D.G. Benson)

Brian Norford acted as Chairman during Tony Naldrett's sabbatical. The annual meeting at Toronto in March was attended by Brian Skinner, Chairman of the Scientific Committee of IGCP, who presented his views on the current UNESCO/IGCP situation, a matter that also was covered in a written report by Tony Naldrett at the IGCP 1987 Board meeting. In 1987, Knut Heir (Norway) was elected Board chairman of IGCP and Pat Suggate (New Zealand) and Tony Naldrett (Canada) as Vice-Chairmen. Two Canadian proposals for new projects were debated. Henry Hall's proposal on Precambrian Dyke Swarms was approved (as Project 257). Arthur Darnley's proposal on international geochemical mapping was considered important but the Board requested elaboration of the proposed techniques for standardization and resubmission in 1988. A new subprogram, *Quaternary Geology for Human Survival* was initiated within IGCP but with its training component expected to be financed outside IGCP. IGCP's main funding continues to be from UNESCO but USA and the UK provide additional funding (U.S. \$80 000 in 1987) via IUGS, now that they are not directly involved in UNESCO. There are some 45 ongoing IGCP projects.

Canadian participation in IGCP continues at about the same level, as previous years, with 8 projects ending in 1987-88 and 6 new ones with extensive Canadian involvement beginning. Requests for funding by CNC/IGCP were received from 14 of the 23 such Canadian projects. Funding, totaling \$24 200 was awarded, including major amounts for three field conferences.

Projects of special interest to Canadian geoscientists include:

- 29 Precambrian-Cambrian Boundary (conference and field trip held in Newfoundland)
- 156 Phosphorites
- 157 Early organic evolution and mineral and energy resources (final meeting planned in 1988)
- 158 Paleohydrology of the temperate zone during the last 15 000 years (final meeting held in 1987)
- 161 Sulphide deposits in mafic and ultramafic rocks (concluded 1987)
- 171 Circum-Pacific Jurassic (final reports being compiled)
- 196 Calibration of the Phanerozoic time scale
- 197 Metallogeny of ophiolites
- 199 Rare events in geology (Canadians participated in sessions held in China, Canada and Spain)
- 200 Sea level correlation and applications (final conference and field trip held in Nova Scotia)
- 203 Permo-Triassic events of eastern Tethys and their intercontinental correlation
- 215 Proterozoic fold belts (sessions and field trips held in Saskatchewan)
- 216 Global biological events in earth history
- 217 Proterozoic geochemistry (sessions held in Saskatchewan)

- 219 Comparative lacustrine sedimentology through space and time (sessions and field trips in Saskatchewan and Manitoba)
- 233 Terranes in the Circum-Atlantic orogens (Canadians participated in conference in Mauritania)
- 245 Non-marine Cretaceous correlations (a Canadian participated in sessions and field trips in China)
- 247 Precambrian ore deposits related to tectonic styles (Canadians participated in sessions and field trips in Tanzania)
- 250 Regional crustal stability and geological hazards (Canadians participated in the initial meetings in China)

Eight new projects were approved by IGCP in 1987.

- 252 The past and future evolution of deserts
- 254 Metalliferous black shales (Canadians participated in the initial meetings in Czechoslovakia)
- 255 Kibaran metallogeny (East Africa)
- 257 Precambrian dyke swarms (inaugural meetings held in Vancouver, H.C. Hall project leader)
- 260 the Earth's glacial record (inaugural meetings held in Toronto)
- 261 Stromatolites
- 262 Tethyan Cretaceous correlation
- 264 Remote sensing spectral properties (inaugural meetings held in Denver)

9. International Mineralogical Association (D.G.W. Smith)

The year 1987 was relatively quiet with activity continuing amongst the various IMA Commissions and Working Groups. Preliminary arrangements are being made for the 15th General Meeting which will be held in Beijing (June 28-July 3rd, 1990). This meeting, which promises to be most exciting and exotic will be preceded and followed by field excursions covering the length and breadth of China. IMA will be participating in several ways at the 1989 IGC in Washington, organising symposia, a workshop on diamonds and possibly sponsoring field excursions.

The Commission on New Minerals and New Mineral Names under the Chairmanship of J.A. Mandarino of the Royal Ontario Museum, has continued to be amongst the most active and almost 100 new mineral names were submitted in 1987. Of these, 60 have been voted on and 54 approved. A number of other previously published mineral names have been revised or discredited. Substantial new guidelines for mineral nomenclature have been published by this Commission in the major mineralogical journals [e.g., *Canadian Mineralogist* v. 25, p. 353-377 (1987)].

10. International Palaeontological Association (T.E. Bolton, B.D.E. Chatterton, D.A. Russell)

A particular focus of the Association is the contribution that paleontology can make to studies of global change, particularly within IGCP Project 216 *Global biological events in earth history*. An international meeting on the topic, *Abrupt changes in the global biota* will be held in May 1988 (Boulder, Colorado). Planning has started for the next (5th) North American Paleontological Convention that will take place in Chicago in 1993. Canadian vertebrate paleontologists are involved in overseas collaboration in Austria, Egypt, Germany, Sweden and especially China. The past year saw extremely successful field work in the Gobi Desert with scientists from the National Museum of Canada and the Tyrrell Museum of Palaeontology working with Chinese colleagues. The Ex-Terra Foundation of Edmonton is a sponsor of the Canadian participation in this four-year project with field work in both China and Canada. Two months of strenuous collecting from camps of tents and tepees yielded excellent and diverse specimens of dinosaurs, their eggs and tracks, turtles, crocodiles and mammal-like reptiles.

11. International Permafrost Association (N. Kalmanovitch)

CNC/IPA organized the first meeting of Council of IPA in August 1987 (Ottawa). In 1988, the Fifth International Symposium on Ground Freezing will be held in England (July, Nottingham), the Fifth International Conference on Permafrost takes place in Norway (August, Trondheim), and the International Association of Hydrological Sciences meets in Canada (August, Vancouver). In addition to CNC/IPA itself, the division of cold regions research of the Canadian Geotechnical Society is expected to have input into the planning of the Canadian contribution to the permafrost conference.

12. International Society of Soil Mechanics and Foundation Engineering (M.B. Bozozuk)

The Canadian Geotechnical Society, the Canadian National Group of ISSMFE sponsored eleven conferences in Canada in 1987. Internationally the Society participated in the VIII Pan American Conference, held August 16-21, 1987, and will participate in at least five other conferences in the next few years: Switzerland (1988), Symposium on Landslides; Brazil (1988), Workshop for Young Engineers; Brazil (1989), Chile (1991) and India (1993). Canadians are active on 19 Technical Committees of the International Society on Soil Mechanics and Foundation Engineering. Most are involved with organizing technical sessions for the XII International Conference on Soil Mechanics and Foundation Engineering to be held in Brazil in 1989.

A new division of the CGS on Cold Regions Geotechnology has been established. This and revised membership classifications are changes that should attract new members nationally and internationally, from workers in fields such as frozen ground, snow, ice and hydrogeology. CGS expects to be significantly involved in the Canadian contributions to the International Decade for Reduction of Natural Hazards (1990-2000) expected to be sponsored by the United Nations.

13. International Tunnelling Association (R.P. Benson)

The Tunnelling Association of Canada, the Canadian National Group of ITA, includes representatives from contractors, material and equipment suppliers, owners, engineering companies, universities and other individuals and groups. Canadian membership had been steadily increasing and now exceeds 400, with 7 per cent comprised of foreign members. At the 1987 meeting in Melbourne (Australia), Dr. Z. Eisestein of Canada was appointed to the Executive Council of ITA. Canada will host the 1989 Congress held under the auspices of ITA in Toronto in September 1989. Co-hosts of the conference are TAC and the National Research Council who have concluded an agreement to co-sponsor this major international congress. The organizing committee is chaired by J.A. Ramsey, Vice-President (East) of TAC.

14. International Union of Geodesy and Geophysics (D. McDiarmid)

In August 1987, almost 4000 scientists participated in the very successful 19th quadrennial General Assembly of IUGG in Vancouver (Don Russell Chairman, Dick Armstrong Vice-Chairman, both University of British Columbia) with total expenditures of more than \$4 million. At the meetings Gordon McBean (Department of Fisheries and Oceans, Sidney, B.C.) was appointed to serve on the Bureau of IUGG until the 1991 General Assembly in Vienna.

15. International Union of Geological Sciences

15a. IUGS Commission for Comparative Planetology (R.A.F. Grieve)

The year 1987 was the third full year of operation for the Commission. The 18th Lunar and Planetary Science Conference in Houston was co-sponsored by the Commission and was attended by close to 700 scientists from 18 countries. The Commission also co-sponsored a 4-session symposium entitled *Comparative Planetology-Sputnik Commemorative Symposium* at the 19th IUGG meeting in Vancouver. Individual efforts included organizing two microsymbioses in *Comparative Planetology in the U.S.A. and the U.S.S.R.*; helping to organize a symposium on *Global Change: A Geological Perspective on Earth-System Science* at the GSA meeting in Phoenix; a symposium on *Comparative Planetology and Earth Science at Centre National des Etudes Speciales (France)*; and the 20th all Union *Meteorite Conference in the U.S.S.R.*. A world map on terrestrial impact craters has been published and distributed through Episodes as Geological Survey of Canada Map 1658A.

15b. IUGS Commission for Experimental Petrology at High Pressures and Temperatures (A.J. Naldrett)

The Commission encourages scientific activities in all aspects of igneous and metamorphic petrogenesis including experimental petrology, geochemistry and physical processes relevant to petrology, deep mantle petrology, and research on fluid inclusions.

In 1987, the Commission supported a symposium on fluid inclusions in May (Portugal). Papers presented illustrated the very fast development of fluid inclusion techniques in practically all branches of geology. Present day analytical possibilities (Micro Raman Spectroscopy, infrared microscopy, isotope analysis) are impressive and, in many cases, allow a nearly complete, non-destructive analysis of single inclusions. However it is evident that fluid inclusion data alone are often ambiguous or inconclusive and that they must be systematically compared with other independent evidences. This is particularly evident in metamorphic and igneous petrology, but applies as well to the study of ore deposits. Much work is being done on diagenetic processes, and fluid inclusion studies are more and more an essential part of any petrological investigation.

The Commission organized the symposium *Structure of melts at high pressures and petrogenesis in the mantle* within the August meetings of IUGG (Vancouver). Papers presented demonstrated that significant progress had been made during the last decade in studies of the structure and physical properties of silicate melts over wide pressure and temperature ranges. Major progress has also been made in the determination of melting relations of mantle minerals and rocks to pressures of 25 GPa and their application to the melting of the Earth's mantle and the genesis of magmas. Highlights of papers presented will appear in an issue of Episodes.

15c. IUGS Commission for the Geological Map of the World (J.O. Wheeler)

A future project of CGMW that will involve Canada is the Circum-Atlantic Project, currently in the planning stage. Duncan Keppie (Mines and Energy, Nova Scotia), leader of IGCP Circum-Atlantic Project 233 is on the interim Steering Committee. Consideration is being given to a series of time-slice maps, beginning with the Cretaceous. Other maps will include a tectonic map, terrane map, metamorphic map and a metallogenic map. The terrane map, resulting from the IGCP Project, is almost ready and will form the first component of the project. Various products from the Canadian DNAG effort, particularly those from the volume on the Continental Margin of Eastern Canada, should be readily adaptable to the needs of the Circum-Atlantic Project.

16. International Union for Quaternary Research (N.W. Rutter)

INQUA is a broadly based interdisciplinary organization affiliated with the International Union of Geological Sciences. Although loosely allied with many international scientific societies, it is financially independent and supported through direct national contributions from thirty-seven countries. INQUA has held international conferences or congresses about every four years since its founding in 1928, except for the interruption caused by World War II. The union has 13 commissions and a variety of subcommissions engaged in a wide spectrum of paleo-environmental problems. INQUA's objective is to bring together, on a worldwide basis, scientists concerned with the history of the Earth's natural environment during the Quaternary Period, with the broad scientific goal of improving our understanding of the processes by which the natural environment has changed. Only with such historical perspective can a fundamental understanding be achieved of the evolution of the relationship between the human species and the environment and prediction of its future course be attempted. Accordingly, INQUA involves scientists from many disciplines such as archaeology, botany, climatology, ecology, geochemistry, geography, geomorphology, geophysics, glaciology, hydrology, isotope dating, limnology, oceanography, paleontology, palynology, physical anthropology, soil science, tectonics, volcanology and zoology.

The prime event in 1987 was the quadrennial congress held in Ottawa for 10 days (July and August). The registration was about 1075, with about 360 Canadian, 278 from the USA and the rest from 44 other countries (major delegations from the UK, France and West Germany). Field trips were held throughout Canada and the National Museum of Canada unveiled a display of mammoths during the meeting. About 1000 papers were presented. There was also the formal presentation to V.K. Prest of the Johnston Medal for service to the development of Quaternary science in Canada. N.W. Rutter (University of Alberta) was elected as President for the next 4 years (1987-1991). As President he plans to focus on the Global Change Program sponsored by the International Council of Scientific Unions (ICSU). The Program is designed to describe and understand the interactive physical, chemical and biological processes that regulate the Earth's unique environment for life, the changes that are occurring in this system, and the manner in which they are influenced by human actions. Although the program will concentrate mainly on basic research there will be almost immediate results that can be applied for the good of mankind. A deeper understanding of the coupled processes that govern the Earth's environment will provide the basis for more rational management of resources and will improve the forecasts of significant global change. Results of much of this work will be presented at the XIII INQUA Congress (Beijing, China 1991).

17. Inter-Union Commission on the Lithosphere, International Lithosphere Program, and Canadian National Committee for the Dynamics and Evolution of the Lithosphere (CANDEL)
(E.G. Nisbet)

During 1987, Euan Nisbet succeeded Mike Berry as Chairman of CANDEL. A number of impressive activities are functioning well or are in the advanced planning stage:

Lithoprobe

Ocean Drilling Program

World Stress Map

Digital Broad Band Seismic Network

Continental Scientific Drilling

Long Baseline Interferometry (CANDEL strongly supports the preservation of the Algonquin Observatory)

Global Geoscience Transects Program (a proposal is underway for a transect north of Lake Superior)

Global Change Project (CANDEL will sponsor a technical session in 1988 at the GAC-MAC meetings, St. John's).

18. United Nations Educational, Scientific and Cultural Organization (C.H. Smith)

In November, a new Director-General was elected, succeeding Mr. Amadou-Mahtar M'Bow. Dr. Frederico Mayor is a former Deputy Director-General of UNESCO and has served as Minister of Education and Sciences in the Spanish Government. Planning is underway for the development of a five-year plan for 1990-1995.

The UNESCO General Conference in Paris saw very active discussion of three initiatives that can be expected to influence strongly UNESCO science programs. The report of the World Commission on Environment and Development (The Brundtland Report) presently is being considered by the General Assembly of the United Nations. It advocates "sustainable development" and will influence the development of UNESCO'S Man and the Biosphere program. Canada now is preparing a formal response to the Brundtland Report and could benefit from more input from each science. UNESCO'S programs in science also will be influenced by the International Geosphere-Biosphere Program of ICSU. This program will benefit from existing projects underway within UNESCO programs, such as marine biosphere-atmosphere chemistry studies sponsored by the Intergovernmental Oceanographic Commission, studies of relationships between changes in vegetation and hydrological cycles (International Hydrological Programs), studies of interaction between the geosphere and the biosphere (IGCP), and UNESCO'S Man and the Biosphere Program. The third initiative is a proposal recently submitted to the United Nations for a International Decade for Reduction of Natural Hazards (1990-2000). In 1987, UNESCO provided 18 per cent (US \$381 000) of ICSU'S funding and the close relations between the two organizations includes monthly liaison meetings to collaborate programs effectively.

Earth science activities by UNESCO mostly operate by provision of seed money and by joint venturing. Examples include major projects *Quaternary Geosciences and Human Survival* and *Geology for Economic Development* (both via IGCP), *Geology and Environment* (with IUGS). UNESCO also publishes earth science reports and sponsors postgraduate education in earth science to assist developing countries. Within its budgeting limitations, UNESCO manages to stimulate, encourage, and assist a wide variety of activities in the earth sciences around the globe. Their impact is welcomed by all countries involved and most particularly by developing nations. Canadian participation in these activities is considerable and highly regarded.

Canadian National Committee for the International Union of Geological Sciences (B.S. Norford)

With the death of Bill Hutchison, Dr. E. Siebold (Past-President) acted as President of IUGS in the latter half of 1987. CNC/IUGS responded to requests for nominations and appointments to the Presidency and Executive Committee of IUGS, to IUGS'S Commission on the History of Geological Sciences, and to the Canadian National Committee for the International Lithosphere Programme. The CNC also contributed to IUGS'S discussion of future funding for the Union and of the planning of future activities.

Miscellaneous

In 1987, together with other members of the Executive of the Canadian Geoscience Council, the Foreign Secretary participated in discussion of the possibility of the creation of a new international award to recognize outstanding achievements in earth and environmental science. Such an award would increase public perception of the importance of these closely related scientific fields in the service of mankind.

REPORTS OF THE MEMBER SOCIETIES

1. Association of Exploration Geochemists (AEG)

In 1987 the Association of Exploration Geochemists maintained its membership at about 950, a level similar to recent years. Canadian residents comprise 30 per cent of the members. Plans are in hand to promote wider interest in the Association, and encourage a larger membership.

Every two years the AEG sponsors an international meeting, which this year took place in Orléans, France, from 23-26 April. This was the 12th International Geochemical Exploration Symposium (IGES), and was held in conjunction with the 4th Symposium on Methods of Geochemical Prospecting (sponsored by the International Association of Geochemistry and Cosmochemistry). Themes for the meeting focused on geochemical prospecting for precious metals; geochemical prospecting under extreme climatic conditions; developments in analytical chemistry; and integrated mineral exploration incorporating geochemical techniques. Some of the 300 participants attended pre-symposium workshops, and field trips to a variety of mineral deposits in France, Spain, Portugal and Tunisia.

The Association's official publication, the *Journal of Geochemical Exploration*, is published bi-monthly, and continues to attract high quality papers from around the world. Forthcoming issues will include the proceedings of : 1) 3rd Chinese Exploration Geochemistry Symposium (Guilin, China, October 1986); 2) the South European Symposium on Exploration Geochemistry (Athens, Greece, November 1986); 3) a regional meeting held in Pretoria, South Africa (May 1987); and 4) the 12th IGES in Orléans (April, 1987).

Symposia planned for the next few years include a session on the geochemical exploration for platinum-group metals at the V.M. Goldschmidt conference, Baltimore, May 1988; the 13th IGES in Rio de Janeiro, Brazil (October, 1989); and the 14th IGES in Reno, Nevada (April, 1991).

Colin E. Dunn

2. Canadian Association of Geographers (CAG)

During 1987, the Canadian Association of Geographers saw the implementation of many of the recommendations of the new committee structure of the Association. An increasing realization of the importance of a geographic base for many employment opportunities and concerns about geographic literacy in Canada and the USA has resulted in a number of major initiatives. A programme to demonstrate to employers the skills of geographers has been launched with a skills booklet. Closer liaison with government departments at all levels has been developed and corporate memberships of the Association are being promoted. The latter has seen significant interest from the applied areas such as Geographic Information Systems. The issue of professional status has also received considerable attention, as it has in other areas of the geosciences.

The annual meeting of the CAG in late May was held in conjunction with the Learned Societies Conferences at McMaster University. At this meeting, Dr. Marie Sanderson, University of Windsor, was presented with the Award for Service to the Profession of Geography. Dr. Sanderson, a founding member of the Department of Geography at Windsor, was a major driving force behind, and the first executive director of, the Great Lakes Institute which is an interdisciplinary research institute dedicated to environmental protection. The usual wide range of issues, from resource management to women in society, was discussed at the meeting.

The regional divisions also enjoyed a successful year. The Western Division met in March at Simon Fraser University with considerable participation from the U.S.A. In September, the Prairie Division met at the University of Regina jointly with the Great Lakes/Rocky Mountain Division of the American Association of Geographers and the Ontario Division met at the University of Windsor.

The presidency of the CAG was passed from L.J. King of McMaster University to R.F. Tomlinson of Tomlinson and Associates, Ottawa. Dr. Tomlinson is the first president of the Association to be elected from the ranks of private industry. This is indicative of the increasing professional component of the Association.

The two journals of the CAG are in the process of change with D. Janelle stepping down as the editor of the *Canadian Geographer* in 1988 and E. Limbird having just stepped down as editor of the *Operational Geographer*. A new monograph series edited by Cole Harris has been launched and contracts for the first volumes have been arranged. The monographs will be concentrating on areas where Canadian researchers are at the cutting edge of the discipline.

The 1988 meeting of the Association will be held at St. Mary's University in Halifax.

Peter G. Johnson

3. Canadian Exploration Geophysical Society (KEGS)

No annual report was submitted.

4. Canadian Geophysical Union (CGU)

The Canadian Geophysical Union, with a current membership of just over 300, decided not to hold its own scientific meeting in 1987 in order to encourage Canadian attendance at the XIX General Assembly of the International Union of Geodesy and Geophysics. At the assembly, in Vancouver in August, Canadian participation was evident in the scientific sessions sponsored by the constituent associations of interest to CGU members: geodesy, seismology and physics of the Earth's interior, geomagnetism and aeronomy, and that on the lithosphere.

The CGU held its annual general meeting and banquet during the assembly. At the latter, the J. Tuzo Wilson Medal was awarded to David W. Strangway, president of the University of British Columbia, in recognition of his outstanding contribution to Canadian geophysics. In his acceptance, Dr. Strangway sketched the evolution of Tuzo Wilson's thinking about the Earth; he drew attention to the important attributes (open-mindedness, continuous re-evaluation of ideas, and ability to change one's mind) that exemplify Dr. Wilson's career.

At the annual general meeting, discussion focused on the relationship between CGU and its parent organizations, the Geological Association of Canada (GAC) and the Canadian Association of Physicists (CAP). The members present endorsed the negotiations undertaken by the executive to establish the union as an independent society, able to set its own criteria for membership but affiliated closely with other organizations in the Earth Sciences. In November, the GAC Council for its part approved the dissolution of its joint division with CAP entitled Canadian Geophysical Union and moved to establish in its place its own Geophysical Division whose affairs will in practice be run by a newly-constituted CGU. Negotiations have been started with CAP in search of similar approval from the other parent. The executive is planning a number of initiatives to establish the new Union on a firm footing.

P. Vanicek

5. Canadian Geotechnical Society (CGS)

The 1987 membership of the Canadian Geotechnical Society was 1203 including 194 members of the Rock Mechanics Division and 285 members of the Engineering Geology Division.

- A new definition of membership classes was adopted to allow a truly representative range of professional workers in the geotechnical field to be full members of the Society.
- A manual of administration, awards and honours and conference procedures was published, allowing the Society to standardize procedures and provide guidance to its local sections.
- A separate organization called Geo Contributions was federally incorporated, where Society members or others can make voluntary financial contributions to support technical programs.
- Curricula vitae of members elected to local, national and international offices will be available at the Secretariat.
- The Society held about 120 technical meetings, organized by 14 sections/groups representing 10 identified regions of Canada.
- Two Cross-Canada Lectures were sponsored; Dr. Peter Kaiser from Laurentian University and Professor Zhong-Qi Wong from Beijing, China.
- A new Division of Cold Regions Geotechnology will be formed during the 1987-1988 term, and the chairman will be a voting member of the Executive.
- The Society has established a Robert M. Hardy Award to honour the memory of the late Dr. Hardy. The first recipient was Dr. J. Mollard, of Regina.

The Society held its 40th Conference in Regina in October, 1987 with about 200 attendees. The 1st Canadian Symposium on Microcomputer Applications to Geotechnique was also held in Regina in association with the conference. Both the conference and the symposium were a technical and financial success. The 1988 Conference will be held in Waterloo, October 5-7, 1988.

6. Canadian Institute of Mining and Metallurgy (CIMM)

The Canadian Institute of Mining and Metallurgy is represented on CGC by its Geology Division. Of the total CIMM membership of 11 284, 2545 are members of the Geology Division. Division membership during 1987 was stable with respect to earlier years.

The 89th Annual General Meeting of CIMM was held in Toronto, in May, 1987. The theme of the 1987 annual general meeting was *Canada's Mineral Industry in a Changing World*. District, Regional, and Division meetings are held throughout the year at many locations in Canada and are a major part of the professional life of the Canadian mining and exploration industry.

CIMM publishes the *CIMM Bulletin*, monthly; the *Journal of Canadian Petroleum Technology*, bi-monthly; the *Canadian Metallurgical Quarterly*, quarterly; the *CIMM Directory*, annually; and *CIM Reporter*, four times per year. CIM awards a number of medals each year to honour the contributions of individuals to the Institute through service, leadership, or the publication of outstanding papers in selected fields in the Bulletin.

T. Birkett

7. Canadian National Chapter-International Association of Hydrogeologists (IAH-CNC)

The year 1987 has been a year of change for the IAH-CNC. In January Robert Leech commenced his term as president following Gordon Gabert of the Alberta Research Council. Transition of the administration from Alberta to Ontario went smoothly thanks to Norbert Woerns, the secretary-treasurer.

Water is becoming an increasingly important commodity in Canada. IAH-CNC is becoming more involved as water issues emerge, particularly in respect to the nation's groundwater resources. During the year IAH-CNC took part in a study being carried out by the Science Council of Canada looking at water policy issues for the twenty-first century.

A highlight for IAH-CNC in 1987 was their election to the Canadian Geoscience Council. This took place at the Toronto meeting in early October. Election to the CGC also emphasized the increasing role of hydrogeologists in the geological community and the increased importance attached to groundwater and associated environmental issues.

The IAH-CNC has a current membership of 228 including 41 new members during 1987. The membership is represented in all provinces, with Ontario (75), Alberta (44) and Quebec (34) having the largest regional representations. Each province has a regional representative responsible for arranging local technical meetings and field trips. In 1987 over 20 technical meetings were held across the country with topics ranging from "regional hydrogeology of the Silurian and Ordovician sedimentary rock underlying Niagara Falls, Ontario" by K. Novakowski to "ground water survey of Swaziland" by R.A. Dakin.

In addition to the meetings, IAH-CNC issues a newsletter every two months. The newsletter has been expanded over the past year to include publication of summaries of papers presented or formally published elsewhere by IAH-CNC members. In this way, members are aware of work taking place in their discipline across the country.

During 1987, the Atlantic Provinces were actively preparing for the IAH-CNC international meeting in Halifax from May 1-4, 1988. The two main themes for this conference are *Hydrogeology of cold and temperate climates* and *Hydrogeology of mineralized zones*. To date, response has been good with foreign participants expected from several European countries and from China, U.S.A., and the U.S.S.R.

8. Canadian Quaternary Association (CANQUA)

The Canadian Quaternary Association strives to maintain communications amongst a multi-disciplinary group of some 300 scientists who share a common interest in the Quaternary. Geology and geography are the core disciplines with biology, archaeology, engineering, mining, pedology, climatology and meteorology being well represented. CANQUA is prominent in organizing symposia and excursions to examine major Quaternary problems in Canada. The Association holds biennial meetings independently and/or in association with other scientific organizations. CANQUA is a member society of the Canadian Geoscience Council and is affiliated with the Geological Association of Canada.

The major activity during 1987 involved preparations for, and hosting of, the XII INQUA Congress in Ottawa, July 31 to August 9. The Congress was jointly sponsored by the NRC, CANQUA and l'Association québécoise pour l'étude du Quaternaire. The registration totalled 1075 delegates from 46 countries, including 372 Canadian and 278 American registrants. The midsummer timing of the Congress made possible several successful Arctic field trips both before and after the Ottawa meeting; numerous excursions throughout the rest of Canada were also held. In addition to the daily poster sessions, some 1000 papers were presented. One of the premier events included the presentation of the first Johnston Medal to Dr. Victor K. Prest at the INQUA banquet. The Johnston Medal is CANQUA's highest award and recognizes outstanding service to the development of Quaternary Geoscience in Canada. Full details of the INQUA Congress will be presented in a *Compte Rendu* under preparation by A. Morgan and C. Schulchter. Canadian geoscientists should take pride in the election of N. Rutter as the President of INQUA for 1987-1991. The XIII INQUA Congress will be held in Beijing in the summer of 1991.

Several important matters were discussed at the biennial meeting of CANQUA during the INQUA Congress. The new executive will investigate the incorporation of the Association as a prime objective. Members of the new executive include: A. Morgan, President; B. Broster and M. Wilson, Vice Presidents; W. Mahaney, Past President; E. Sado, Secretary-Treasurer and J. Driver, Newsletter Editor.

Two newsletters were distributed during 1987 and members received the official journal *Géographie physique et Quaternaire*. The 1989 biennial meeting will be held at the University of Alberta with N. Rutter as the General Chairman. The first CANQUA-AMQUA (American Quaternary Association) meeting will be held at the University of Waterloo in 1990. The General Chairman will be A. Morgan.

E. Sado

9. Canadian Society of Exploration Geophysicists (CSEG)

The Canadian Society of Exploration Geophysicists had a very successful year in 1987 despite the reduction in membership from approximately 2100 to 1800 members. The Society is financially solvent and membership is expected to increase in 1988.

Geophysical activity was low for most of 1987. During the last quarter, activity increased due to the stability of oil prices, the Canadian Exploration and Development Incentive Program (CEDIP), a new financing obtained by flow-through shares.

The CSEG National Convention *Energy in Motion*, was held in May. The "Best Paper Award" was presented to Dan Hampson for his paper *The Discrete Radon Transform*.

Ten technical luncheons were held during the year. Attendance ranged from 500 to 600.

The CSEG Executive and its governmental affairs committee consulted with the federal and provincial governments on several matters of concern to members of the Society.

Social activities were very popular and included golf, tennis, curling and the annual spring ball.

Twenty-four scholarships were awarded to geophysical students. Funding for these is primarily from industry. The CSEG is responsible for co-ordinating the funding and for selecting the students and also contributes to the funding.

Continuing education increased with the Society sponsoring two one-day courses.

One of the highlights of the year was the joint conference on seismic interpretation with the Peoples Republic of China. Eleven geophysicists from Canada attended the conference held in September at Zhuozhou (near Beijing) in China. Fourteen papers were given by the Canadian delegates and fifteen were given by the Chinese. About 70 delegates attended.

Work on the Geophysical Reservoir Atlas is well in progress with publication planned for March 1989.

The CSEG National Convention *Exploring New Horizons* will be held in Calgary from May 3-5, 1988.

R.L. Comer

10. Canadian Society of Petroleum Geologists (CSPG)

The CSPG is a national society of earth scientists with a common interest in petroleum geology. The membership of the society is 3799, which represents a decrease of about 6 per cent from 1986. The decrease in membership is attributed to the severe downturn in the petroleum industry during 1986 and 1987. Our manpower committee estimates that the downturn affected one quarter of our members who either had to change jobs or, in several instances, had to change careers. The enthusiasm of the Society however did not diminish; the almost 100 committees and divisions and their hundreds of volunteers had a very active year.

Without question the highlight of 1987 was the Second International Symposium on the Devonian System. Attended by almost 1400 delegates the Symposium was well run from a technical, organizational, social and financial point of view. Speakers and delegates attended from all corners of the world and everyone attending came away with additional understanding and fresh ideas. The three-volume memoir resulting from the Symposium will be published in about one year and will undoubtedly be the new reference for the Devonian.

The second major event which took place in 1987 was the Canadian Reef Inventory Project (CRIP) which included a Short Course on January 26 and 27, 1987, attended by a capacity crowd of 280 persons and a Reef Research Symposium on January 27-30, 1987 which attracted international participation by 203 delegates from industry, academia and government. The profit realized will, to a large extent, offset the cost of printing the memoir entitled *Reef Case Histories* which is scheduled for publication in late 1988. The CRIP and the Devonian Symposium again placed the CSPG on the international stage and demonstrated the scientific dedication and the organizational skills of the Canadian geological community.

Three publications have come out the past year: *Geology of the Calgary Area*; Memoir 11 — *Shelf Sands and Sandstones* and Memoir 12 — *Sedimentary Basins and Basin-forming Mechanisms*. A new committee, the Publication Review Board was established by the executive to review new publication proposals and monitor the progress of all publications.

The executive committee of the CSPG has spent much time in the last two years getting its financial affairs in order. I am pleased to report that this year the society had an operating surplus of about \$40 000 and the future financial health of the Society appears secure.

The Awards Dinner and Dance, held March 11, 1988, honoured G.G.L. (Gerry) Henderson and J.P. (Jack) Gallagher with Honorary Memberships, J.D. (Jim) Aitken with the R.J.W. Douglas Medal, D.J. (Digby) McLaren, M.E. (Mike) Hriskevich and W.J. (Bill) Haskett with President's Awards, D.A. (Dale) Leckie with the Medal of Merit, D.A.W. Keith with the Link Award, Brian A. Zaitlin with the Ph.D. Thesis and Kathy L. Aulstead with the M.Sc. Thesis Award.

C.H. Riddell

11. Canadian Well Logging Society (CWLS)

The Canadian Well Logging Society had a busy year with the completion of two major projects.

The CWLS 1987 Symposium, under the chairmanship of Mel Blackburn and his committee, became a reality in September. Despite the anticipated concerns of budget restraints throughout the industry, the Symposium was well attended, with approximately 270 delegates. Plans are underway for assembling the 1989 Symposium Committee.

A major achievement was the completion, printing and distribution of the new 1987 RW Catalogue, under the Chairmanship of Case Struyk. This catalogue provides water resistivities for the Western Canadian Basin, East Coast, Yukon and the Arctic. This Project was a culmination of three years of work and commitment. The Canadian Well Logging Society is extremely proud of publishing a book of this calibre. For his dedication and efforts, Case was presented with a Special Service Award (the first of its kind to be given) in October 1987. The enormous task of printing of the RW Catalogue and CWLS Journal was borne by Publications Chairman, Dave Ormon.

In addition to these activities, speakers for the Monthly Technical Luceon Meetings were arranged by Vice President, Dave Pimm.

Membership fell to a low of 500 at the beginning of the year, but has regained its previous level of 700. Corporate memberships have fallen.

The winner of the 1987 *President's Award* for the best paper on formation evaluation was J.W. Minear, for his paper titled *Application of Full Wave Sonic Logging*.

The Executive has nominated Ted Jennings for a Special Service Award for his many years of involvement and contribution to the activities of the CWLS. Ted has been Chairman of the President's Award Committee for several years.

The Society thanks John Lishman who has served as our representative on the Canadian Geoscience Council.

Marie-Ann Turner

12. Geological Association of Canada (GAC)

The Geological Association of Canada took several important steps in 1987 to increase its service to members and to maximize the efficiency of its operations. The Executive and Council met together in St. John's and Saskatoon, and executive meetings also were held in Edmonton and Toronto. At all of the Council meetings, activities of GAC's Divisions, Sections and Committees were reviewed, generally with a representative in attendance.

Membership in the Geological Association of Canada, including all categories, stood at 3000 as of December 31, 1987.

During the Annual Meeting in Saskatoon, G.V. Middleton replaced G.D. Mossop as President, and J.M. Hamilton became Vice-President. Also, the Secretary-Treasurer position was split with J.G. Malpas continuing as Treasurer and R.F. Blackwood becoming the new Secretary.

The Annual Meeting, held in conjunction with the Mineralogical Association of Canada, was hosted by the University of Saskatchewan in Saskatoon. General Chairman Walter Kupsch and his committee are to be commended for a job well done. An important part of the Annual Meeting is the presentation of the Association's medals. Geoscientists honored this year were as follows: Atholl Sutherland Brown — *J. Willis Ambrose Medalist*; Jan Veizer — *Past President's Medalist*; and Digby J. McLaren — *Logan Medalist*. The Duncan R. Derry Medal, selected by the Mineral Deposits Division and awarded by the GAC, went to A.E. Soregaroli. The *Billings Medal* of the Paleontology Division was presented to C.W. Stearn.

A major decision was taken early in 1987 to move GAC's publications-distribution centre from Toronto to GAC Headquarters at Memorial University in St. John's. The move was successfully completed in July and now all volumes are located in our renovated book-storage facility. In conjunction with this move, a permanent staff position was added to Headquarters: the newly created Publications Officer position was filled by Rita Patterson, who joins Assistant Secretary-Treasurer Karen Johnston and Associate Secretary-Treasurer Maureen Penney at Headquarters.

An Advertising Manager was also hired on a part-time contractual basis, to operate out of Headquarters. Bill Collins assumed advertising responsibilities in June and quickly updated publications-related material and the GAC display unit. He is also assisting with ways of increasing GAC's membership, and is circulating publications information nationally and internationally.

Regrettably, Publications Committee Chairman Godfrey Nowlan resigned at the end of the year — he is assuming greater responsibilities with the Geological Survey of Canada, and we wish him well. Bob Baragar, also of the Geological Survey of Canada, is the new Publications Committee Chairman. Under Dr. Nowlan's tutelage, three Special Papers were released in 1987. Although printed late in 1986, Special Paper 31 (The Grenville Province) went on sale in 1987. Special Paper 32 (Turbidite-Hosted Gold Deposits) and Special Paper 33 (Saline Water and Gases in Crystalline Rocks) were the other two volumes. Special Paper 34 (Mafic Dyke Swarms) was printed late in 1987 for distribution in 1988. The Mineral Deposits Division also published another in its guidebook series: the Yellowknife Guidebook was produced by the Yellowknife Geoworkshop Committee. Finally, Number 4 of the GAC — CSPG-sponsored series *Palaeontographica Canadiana*, entitled *Taxonomy and biostratigraphy of schizaealean spores from the Jurassic — Cretaceous boundary beds of the Aklavik Range, District of Mackenzie*, was also published.

Geoscience Canada, under Editor A.D. Miall and Managing Editor M. Gaiswinkler Easton, was published quarterly during 1987. GAC's popular newsletter GEOLOG, produced by Michael Easton and Monica Gaiswinkler Easton, continued to inform and entertain subscribers during the past year.

The Professional Affairs Committee released the results of a survey of GAC members on the registration and certification of earth scientists in Canada, and the accreditation of Canadian universities. A preliminary review of survey results was published in Volume 16 — Part 3 of GEOLOG. Further work and assessment of results are planned.

A milestone was achieved in the late summer of 1987 when the first-ever Geological Association of Canada field conference was held in Yellowknife, Northwest Territories. After months of planning and preparation, a very successful meeting was brought off by the Yellowknife Local Organizing Committee, chaired by Bill Padgham. Pre- and post-meeting field trips were the focus, but two days of stimulating technical sessions were also held. It is hoped that the Yellowknife meeting will become the model for future field conferences.

R.F. Blackwood

13. Mineralogical Association of Canada (MAC)

The year 1987 was an exciting, successful year. The Association's financial position remains strong and the *Canadian Mineralogist* continues to maintain a high standard of scientific publication.

The 32nd Annual Meeting of the MAC was held in conjunction with the Annual Meeting of the Geological Association of Canada at the University of Saskatchewan during May 1987. At the joint GAC/MAC Annual Meeting, MAC sponsored a special symposium entitled *Pressure-Temperature-Time Paths of Metamorphism*, organized by R.R. Parrish and E.D. Ghent, and short course entitled *Stable Isotope Geochemistry of Low-Temperature Fluids*, organized by T.K. Kyser. Both were highly successful and very well attended. At the Annual Meeting, the MAC Annual Luncheon provided the venue for awarding medals and prizes to distinguished scientists. The Hawley Award, for the best paper in the *Canadian Mineralogist*, was presented to Stephen Guggenheim and Tony Eggleton for their paper *Structural Modulations in Minnesotaite*. The first award of the Berry Medal was to Ron Graham for service to mineralogy and MAC, and the Past Presidents' medal was presented to Peter Roeder for his work on the phase petrology of basalt.

Other areas of MAC activity have included completion, with GAC, of a comprehensive guide to the organization of Annual meetings, the institution of regular joint executive meetings with GAC, and creation of a new joint technical program committee. A series of letters has been exchanged between the President of MAC and the Hon. Frank Oberle, Minister of State for Science and Technology on the subject of research funding, suggesting to MOSST that great care must be exercised in the expansion of "matching-funds" programs, lest this be at the expense of fundamental, "pure" science.

H.J. Greenwood

REPORTS OF THE ASSOCIATE MEMBERS

1. *Associate Committee on Geotechnical Research (National Research Council) (ACGR-NRC)*

The Associate Committee on Geotechnical Research was established by the National Research Council in 1946 to coordinate and stimulate research on the engineering and physical aspects of the terrain of Canada. Its objectives are carried out through the following Subcommittees: Marine Geotechnical Engineering; Soil and Rock Engineering; Permafrost; Peatlands; Urban Engineering Terrain Problems; Snow and Ice. These are achieved through the sponsorship of workshops, seminars, and the production of manuals, handbooks and other publications. Most of the publications are issued in the Technical Memorandum series of the ACGR.

Following are some highlights of the ACGR and its Subcommittees during the past year.

- A workshop on *Barrier Aspects of Groundwater*, was held in Montreal on March 31, 1987. This was the first of several to be held in various parts of Canada by the Subcommittee on Soil and Rock Engineering's Task Force on Groundwater Contamination.
- A contract was negotiated for printing the English and French Glossaries on Permafrost and Related Ground Ice Terms.
- The Permafrost Subcommittee held a meeting which included representatives from the USSR, Northwest Territories, Yukon and Quebec, on Construction Problems in Permafrost; a record of the meeting was published.
- In response to an invitation from China the Permafrost Subcommittee sent a five person delegation to visit several locations in China including Tibet. The group included three members of the Canadian Geotechnical Society.
- The Snow and Ice Subcommittee published the Proceedings of two workshops; *Snow Property Measurement*, TM No. 140, and *Extreme Ice Features*, TM No. 141.
- A bulletin on Urban Terrain Problems prepared by the Subcommittee on *Urban Engineering Terrain Problems* has been published and distributed.
- the second French translation of the Peat Testing Manual has been reviewed by the Peatlands Subcommittee and is ready for printing.
- A Task Force of the ACGR is looking into the feasibility of setting up a Canadian Geotechnical Research Association.

M. Bozozuk

2. *Committee of Provincial Geologists (CPG)*

The Committee of Provincial Geologists was formed eleven years ago at the 33rd annual meeting of Provincial Mines Ministers in St. John's, Newfoundland. The Committee comprises the directors, or their equivalents, of the various provincial and territorial geological surveys, and meets twice a year, before the annual Mines Ministers' Conference and in association with the spring meeting of the Prospectors and Developers Association (PDA).

The Committee provides an excellent forum for the discussion of geological affairs between the provinces and territories, and maintains an effective liaison with industry on matters relating to mineral exploration and development. Liaison with the Geological Survey of Canada is accomplished through the National Geological Survey's Committee, and membership in the Canadian Geoscience Council provides an additional avenue for information exchange between the Committee and the geoscience community in Canada.

Committee members maintain close liaison with industry through their representation on the various Mineral Exploration Liaison Committees, which have been established in most provinces and territories, and through their involvement in the Prospectors and Developers Association Convention.

In 1987 the Prospectors and Developers Association Convention featured a Provincial Day in which provincial geological surveys were invited to present papers reviewing the provincial exploration scene. Seven papers were selected for presentation at the "Provincial Activities" session. Titles and authors of these presentations are as follows:

- *Meguna Gold in Nova Scotia: The Best Kept Secret in The Canadian Mining Industry* — D.J. Kotak and P.K. Smith.
- *The Early Proterozoic LaRonge Gold Belt, Saskatchewan* — David J. Thomas and Thomas Sibbald.

- The Geology of Granite-Related Tin-Tungsten Deposits in the Burnthill Area of Central New Brunswick — H.E. McLellan, W.W. Gardiner and R.P. Taylor.
- Exploration Opportunities for Industrial Minerals in British Columbia — Where is the Lustre? — Gilbert McArthur and the Industrial Minerals Staff.
- Controls on gold Mineralization in The Pickle Lake Region, Ontario — Gregg Stott.
- Gold and Associated Trace Elements in Lake Sediments: Their Application to Gold Exploration in Newfoundland — John W. McConnell and P.H. Davenport.
- Gold in the Schefferville Area of Quebec: A Case Study — Marc Belanger.

In addition, all provinces and territories, with the exception of Prince Edward Island, participated in the provincial poster session, which was held for the full three days (March 9-11) of the convention. This session provided the various provincial and territorial surveys with the opportunity to display the results of recent geoscientific work.

During March 1987, Volume 4 of the Provincial Geologist Journal was released. The Journal, published annually, continues to provide up-to-date information on the operations and activities of the provincial and territorial surveys, and is becoming increasingly popular to the many client groups of the various surveys.

This year, the Committee presented a brief at the Mines Ministers' Conference in St. John's, Newfoundland. The Committee recognizes the important role that Mineral Development Agreements have played in this country in finding new mineral deposits, in developing new exploration techniques and technologies, and in discovering new uses for minerals and metals. The Committee recommended that "both levels of Government initiate action to ensure new MDAs are implemented at the conclusion of the current agreements so as to assist the mining industry locate, mine and produce minerals and metals at the lowest possible cost for expanding world markets and for expanding the related manufacturing sectors across Canada".

There have been a number of changes in the membership of the Committee of Provincial Geologists in the last year. Mr. Ivo Tyl (Alberta) and Dr. Jim Christopher (Sask.) have retired and Dr. J. Morin is on temporary leave from the Yukon Survey. The Committee recognizes the valuable contribution that these individuals have made to the Committee over the years and it wishes to take this opportunity to thank them for their efforts.

Wayne MacQuarrie

3. Council of Chairmen of Canadian Earth Science Departments (CCCESD)

Report for 1986-87 on Enrollment and Graduation in Canadian Earth Science Departments. The figures and tables speak for themselves so that this commentary will be very brief.

One or two small departments did not report. For these cases, the previous year's figures for staff numbers have been used because we had complete coverage last year; where non-reporting departments affected enrollment totals, the number used was estimated by pro-rating last year's figures according to the general trend. The non-reporting departments do not have graduate programs so that the lack of data has no effect on graduate enrollment and graduation data; for graduations at the undergraduate level no adjustment could be made so that the numbers shown in the figures and tables will be slightly less (well within the noise level) than shown. Because of these and other difficulties in getting complete numbers, not too much weight should be placed upon small changes. For interpreting the significance of changes, it is suggested that less than 2 per cent is probably within the noise level, a change of 5 per cent is significant and a change of 10 per cent is very significant. This is especially true for the early years (Fig. 1 and 2) where the reporting procedures had not been developed to the level of sophistication and reliability that has been the case for the last 4 or 5 years. In spite of minor errors over the short period, the long-term trends should be reliable.

There is a small, but nevertheless encouraging, increase in the numbers of support staff as well as in faculty. This occurs at a time when the undergraduate registrations have declined significantly. The large enrollments from 1981 to 1985, which caused severe overcrowding in classrooms and laboratories and extraordinary wear and tear on facilities, were probably anomalous and the system may be settling down to a period of reasonable stability with B.Sc. registrations in the 2500-3000 range. From Table 8 it appears that the number of adjunct professors is increasing rapidly, especially at universities close to centres of government — for example, 8 at Ottawa, 10 at Carleton, 13 at Waterloo. There is considerable uncertainty as to the meaning of the numbers. Many adjunct professors receive no compensation from the university; some may be supervising graduate students while

others may give an undergraduate course or part of a course. What is certain is that few are full time and it is difficult to obtain a reliable weighting factor that could be used to estimate their contribution to the academic aspects of the university in terms of full time faculty. However, it is a sign of the growing interdependence between universities, government and industry.

This year the activities in Oceanography were more finely divided and an attempt was made to collect data from those groups in Geography departments covering the discipline areas serviced by the Earth Sciences Grants Selection Committee of NSERC. Some of the changes from last year in the line titles of the reporting sheet and the tables reflect the attempt to collect that information.

The reporting sheet was sent to all geography departments but it will probably take a year or two to straighten out the teething problems typical of a new venture; the response was poor and the reporting inconsistent. Some geography departments had obviously put down the total complement of the faculty of the department, and not just those involved in the subdisciplines of interest; similar comments apply to the numbers put down for undergraduate registrations with some departments clearly including registrations in programs of urban geography, demography, etc. However, the data for graduate student enrollments and graduations were reasonably pure and they are therefore summarized in Table 14.

A.E. Beck

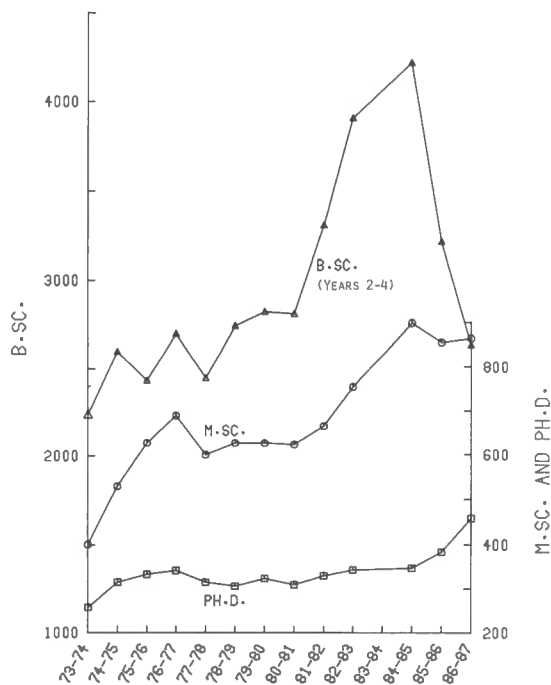


Figure 1. Student registrations in Canadian Earth Science Departments.

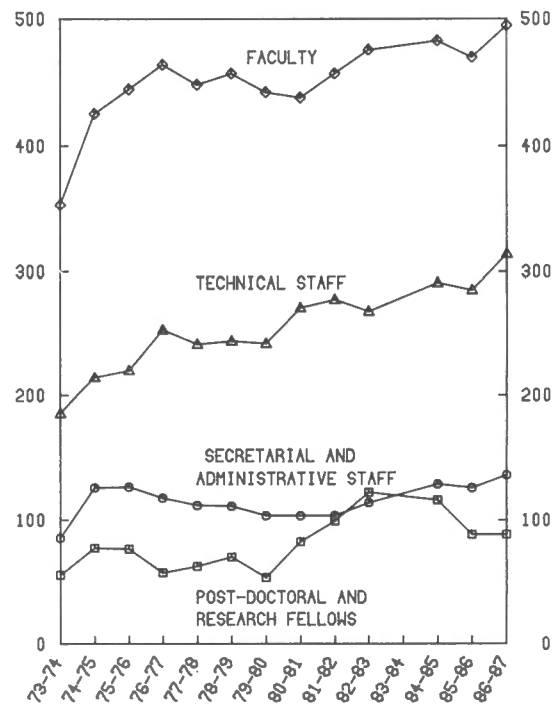


Figure 2. Staff members in Canadian Earth Science Departments.

Table 8. Student and staff numbers in Canadian and Earth Science Departments, 1982-1987. For 1985-1987 data, second figure of a pair is % female.

Group	Year	Atl.	Que.	Ont.	West	Total
All students taking 1st year courses and service courses	84-85	685	73	3343	2969	7061
	85-86	1363	335	3095	2109	6902
	86-87	1291	66	3171	2476	7004
2nd year majors: Arts & Science & Engineers	84-85	156	259	427	422	1458
	85-86	151 20	230 26	300 23	323 18	1004 20
	86-87	92 30	156 23	282 23	253 22	783 23
3rd year majors: Arts & Science & Engineers	84-85	147	234	469	434	1274
	85-86	116 21	189 27	339 22	341 18	985 21
	86-87	100 18	130 33	321 22	288 17	839 21
		8 0	94 26	38 26	1 0	141 24~
4th year majors: Arts & Science & Engineers	84-85	186	252	518	533	1486
	85-86	122 20	169 24	358 24	451 14	1100 19
	86-87	112 20	70 16	313 26	380 17	875 21
H.Sc.(full-time & part-time)	84-85	97	222	378	202	899
	85-86	99 25	175 21	340 24	242 22	856 24
	86-87	103 30	195 24	333 24	234 24	865 25
Ph.D.(full-time & part-time)	84-85	42	41	174	91	348
	85-86	46 22	58 14	175 21	105 14	384 18
	86-87	50 26	76 14	198 19	134 9	458 16
PDF & Research Associates	84-85	4/13	6/14	6/45	1/27	17/99*
	85-86	3/08	4/20	4/34	6/09	17/71
	86-87	1/17	5/15	2/31	4/15	12/76
Faculty, full-time	84-85	96/3	84/2	185	118	483/9*
	85-86	82/3	79/1	178/1	128/0	470/5
	86-87	83/2	85/0	190/1	143/4	495/6
URF's	85-86	2	2	7	1	12
	86-87	3	5	5	3	16
Faculty, part-time	84-85	12	6	34/6	6/4	58/10*
Adjuncts	85-86	15	2	36	2	62
	86-87	8	13	55	24	100
Secretaries & Admin.Assts.	84-85	20/13	21/1	36/14	29/5	106/23*
	85-86	17/03	24/2	37/09	31/3	109/17
	86-87	17/03	26/3	34/10	39/5	116/20
Technicians	84-85	38/39	28/09	63/41	41/32	170/121*
	85-86	32/27	25/14	60/53	48/26	165/120
	86-87	35/26	27/24	68/43	59/32	189/125
Instructors & Demon.	84-85	9	6	11	12(8)	34
	85-86	6	12/1	7	9	34/1
	86-87	4	10	22	13	49

Each year one or more departments fail to report, but rarely is it the same department from year to year; therefore, when this occurs the figures from the previous year are used in the totals currently at the university (but not for graduations) to allow a more realistic assessment of trends.

* - Divided into University funded and non-university funded positions respectively.
~ - Three year B.Sc. - Final year.

Table 9. Summary of student data for 1986 by program, gender, region and Visa or non-Visa.

Region	B.Sc.		M.Sc.		Ph.D.		M.Sc. + Ph.D.		
(a) <u>Enrolled (1986-87)</u>	All	%F*	All	%F	All	%F	All	%F	%Visa [~]
Atlantic Region	312	20	103	30	50	26	153	29	28
Quebec	450	25	195	24	76	15	271	21	14
Ontario	954	23	333	24	198	19	531	22	18
Western Canada	922	19	234	24	134	9	368	19	24*
Total	2638	22	865	25	458	16	1323	22	20
(b) <u>Graduated (1985-86)</u>	All	%F	All	%F	All	%F	All	%F	%Visa
Atlantic Region	131	30	16	6	7	29	23	13	35
Quebec	177	31	66	20	9	0	75	17	16
Ontario	361	20	94	20	28	25	122	21	20
Western Canada	367	16	56	20	28	18	84	19	23
Total	1036	21	232	19	72	19	304	19	21
* Years 2-4 only for B.Sc. enrollments. ~ Graduate Students only									

Table 10. Summary of B.Sc. registration (Years 2-4) and graduations for 1986 by discipline area, region and gender.

Discipline area	Atlantic		Quebec		Ontario		West		Total	
(a) <u>Registered (1986-87)</u>	All	%F	All	%F	All	%F	All	%F	All	%F
Geology	235	23	331	27	606	24	618	21	1805	23
Geophysics	15	7	10	0	79	15	169	13	268	13
Geological Engineering	60	10	80	25	159	18	112	13	411	17
Other	2	50	29	16	110	35	23	26	154	31
Total	312	20	450	25	954	23	922	19	2638	22
(b) <u>Graduated (1985-86)</u>	All	%F	All	%F	All	%F	All	%F	All	%F
Geology	120	24	122	36	247	23	245	18	734	24
Geophysics	5	20	9	0	34	26	39	13	87	17
Geological Engineering	6	0	34	21	74	9	77	8	191	14
Other	0	0	12	33	6	17	6	33	24	29
Total	131	30	177	31	361	20	367	16	1036	21

Table 12. Graduate students currently enrolled by subdiscipline.

SUBDISCIPLINE	Atlantic			Quebec			Ontario			West			TOTAL	
	M	F	TOTAL	M	F	TOTAL	M	F	TOTAL	M	F	TOTAL	M.Sc.	Ph.D.
Biogeography														
Climatology	1						3	1	3				4	4
Coal Geology	14	4	9	1	24	8	10	1	44	10	31	9	22	5
Economic Geology									7	2	3	1	9	2
Exploration Geophysics	1				7	2	3	1	15	7	1	9	2	2
General & Regional Geology					9	1	7	1	7	2	7	2	1	1
Geochemistry - Exploration					6		2		4				3	1
- Physical									16	3	15	6	8	1
- Organic	2	1	1						1	5				3
- Other	1				2	2	1		7	10	11	4		9
Geochronology														22
Geodesy	1				5	1	5		2	3				4
Geodynamics	1	1	1						2					12
Geological Engineering	3	1	2						2				1	2
Geomagnetism & Paleomagnetism					10	2	3		12				2	1
Geomathematics					1	1			2	1			6	2
Geomorphology					4	1	3		4	3			1	9
Geothermal					3	1	1		1				1	1
Glaciology									1	2			4	1
Gravity					1				1	1			2	5
Hydrogeology														4
Hydrology					4	2	2		15	14	9	3	10	4
Limnology														6
Marine Chemistry/Geochemistry	1													1
Marine Geology	4	3											2	1
Marine Geophysics	2	1	1						1	1			1	4
Mineralogy & Crystallography									6	2	1	2	2	4
Paleontology	5	3	5	2	1	3			13	3	6	1	3	4
Palynology	3								1	2			3	1
Pedology					2	1			2	2			3	7
Petroleum Geology														
Petrology	1	2							3				7	2
Physical Oceanography	14	9	1	7	10	5	7	4	18	7	5		11	10
Quaternary Geology									6	4	5	3	5	6
Remote Sensing									3	1			1	1
Sedimentology	10	4	6	1	13	4	5	1	25	6	18	4	19	11
Seismology									10				17	3
Stratigraphy	1								6	1	2	8	4	1
Structural Geology & Tectonics	5	1	7	1	13	4	10	1	19	2	9	2	9	5
Volcanology	2								2	1	1		1	1
Other: Specify 102,51	1				12	2	3		3	1	4		10	2
Number Canadian Students	110				136	40	49	9	215	75	120	29	144	48
Number Visa Students	43				13	6	16	2	38	7	41	8	33	9
TOTAL NUMBER STUDENTS	72	31	37	13	149	46	65	11	253	80	161	37	177	57
														122
														12
														865
														25%
														458
														16%

* Visa and non-visa students not separated into M.Sc. and Ph.D. (or M and F) for Atlantic provinces; figures in Total column found by pro rating according to ratio for rest of Canada.

Table 13. Summary of support staff/faculty ratios for two years.

First value is for Faculty only, second value includes URF's and Research Associates in Faculty complement. All* = Technical + Clerical + Demonstrators.

A. 1986 - 1987

(i) University Funded

Region	Tech/Fac		Clerical/Fac		All/Fac*	
Atlantic	0.42	0.40	0.21	0.20	0.68	0.64
Quebec	0.32	0.28	0.31	0.27	0.74	0.66
Ontario	0.36	0.34	0.18	0.17	0.65	0.63
Western Canada	0.41	0.39	0.27	0.26	0.77	0.74
National	0.38	0.36	0.23	0.22	0.71	0.67

(ii) All Sources

Atlantic Canada	0.72	0.58	0.24	0.19	1.00	0.80
Quebec	0.59	0.46	0.34	0.26	1.06	0.82
Ontario	0.58	0.49	0.23	0.21	0.93	0.78
Western Canada	0.63	0.65	0.30	0.26	1.01	0.88
National	0.62	0.51	0.27	0.22	0.98	0.82

B. 1985 - 1986

(i) University Funded

Region	Tech/Fac		Clerical/Fac		All/Fac*	
Atlantic	0.38	0.36	0.20	0.19	0.65	0.59
Quebec	0.32	0.30	0.30	0.29	0.77	0.73
Ontario	0.34	0.33	0.21	0.20	0.54	0.57
Western Canada	0.37	0.36	0.24	0.23	0.69	0.66
National	0.35	0.34	0.23	0.22	0.66	0.63

(b) All Sources

Atlantic Canada	0.67	0.58	0.23	0.20	0.96	0.84
Quebec	0.49	0.37	0.33	0.25	0.98	0.74
Ontario	0.62	0.50	0.25	0.21	0.91	0.74
Western Canada	0.58	0.51	0.27	0.24	0.91	0.81
National	0.60	0.50	0.27	0.22	0.94	0.78

Table 14. Graduate student summary-Geography departments.

	In Progress				Completed				
	Masters		Ph.D.		Masters		Ph.D.		
	M	F	M	F	M	F	M	F	
Biogeography	4	9	2	2	3	2		2	
Climatology	10	3	5	2	4	3		2	
Geomorphology	28	11	10	6	6	4		1	
Glaciology	1	2							
Hydrology	8	5	4	1	1			2	
Paleontology	1					1			
Palynology	5	3				1			
Remote Sensing	12	3	7		3	1		1	
Other: Specify	5	6	5	3	1	2		1	
<hr/>									
Total CANADIAN STUDENTS	66	40	25	10	15	13		6	2
<hr/>									
Total VISA STUDENTS 13% V	8	2	8	4	3	1		1	
<hr/>									
TOTAL STUDENTS	74	42	33	14	18	14		7	2
<hr/>									
	163	34% F			41	39% F			

Reporting departments: Manitoba, Victoria, McGill, UQAC, UWO, Ottawa, York, Toronto, Waterloo, Queens, McMaster, Guelph.

4. Geological Survey of Canada (GSC)

Following a restructuring in April 1987 of the Minerals and Earth Sciences Program of the Department of Energy, Mines and Resources (EMR), the Survey was established as a separate sector within the Department. This reorganization resulted partly from the need to give the Survey a higher profile and stronger voice within EMR.

The Survey's objectives and its commitment to its clients remain unchanged: to ensure timely and comprehensive geological, geophysical and geochemical knowledge, technology and expertise concerning the Canadian landmass and offshore areas, including the mineral and energy resources and conditions affecting land and seabed use as required for effective exploitation of mineral and energy resources, estimation of the resource base of Canada, land use, public safety and security, and formulation of policies.

The Survey's new organizational framework brings together the former divisions of the Survey under four new branches; each headed by a Director-General:

- The *Program, Planning and Services Branch and Office of the Chief Scientist* carries out planning, coordination and evaluation of the Survey's scientific programs to ensure that research is conducted effectively and economically; coordinates cooperative work with the provinces and the territories under the Mineral Development Agreements; manages special, cross-sectoral activities such as the Frontier Geoscience Program and international relations; coordinates the departmental Research Agreements Program; provides central administrative services; and, through the Geoscience Information Division, manages the Survey's publishing and communications programs and the library.

- The *Sedimentary and Marine Geoscience Branch* ensures the availability of geological, geochemical and geophysical knowledge pertaining to the sedimentary basins of Western and Arctic Canada, the Cordillera, and offshore regions of the East and West Coasts and of the Arctic. The Branch is responsible for oil and gas resource assessments and for marine geoscience programs at both the national and international levels. It comprises three divisions: the Atlantic Geoscience Centre (Dartmouth, N.S.), the Cordilleran and Pacific Geoscience Division (with offices at Vancouver and at Sidney, north of Victoria) and the Institute of Sedimentary and Petroleum Geology (Calgary).
- The *Continental Geoscience and Mineral Resources Branch* is responsible for maintaining a national geoscience knowledge base, as well as expertise and technology on the nature, magnitude and distribution, onshore and offshore, of Canada's mineral resources, on the Canadian Shield and on the "deep" geology and geophysics of the Canadian landmass. Its two Ottawa-based divisions are the Mineral Resources Division and the Lithosphere and Canadian Shield Division.
- The *Geophysics and Terrain Sciences Branch* provides knowledge and expertise relating to geophysics, geotechnical studies and terrain mapping and analysis, with special reference to the operation of national networks and surveys and to the study of unconsolidated deposits and engineering and other associated studies related to terrain use and hazards. Headquarters and research facilities for its two divisions, the Terrain Sciences Division and the Geophysics Division, are located in Ottawa; observation facilities for the national seismological, geomagnetic and geodynamic networks are found throughout Canada.

Last year's report on the composition, responsibilities and organization of the divisions of the new branches remains current should more detailed information be desired.

Joining the Survey is the Polar Continental Shelf Project (PCSP) which provides logistics support and advice to scientific research groups working in the Arctic (232 field parties in 1987) and keeps the scientific community and Arctic residents informed of ongoing scientific operations. PCSP headquarters are located in Ottawa, with base camps at Tuktoyaktuk and Resolute, N.W.T. PCSP also maintains a permanent research station on an ice island in the Arctic Ocean. The PCSP Director, and the Directors-General of the new branches report to the Assistant Deputy Minister.

The Geological Survey continues to be responsible for, or a key player in, a number of important collaborative programs, both national and international in scope. Some highlights for 1987 include:

Frontier Geoscience Program (FGP): An external independent evaluation of the program based on feedback from its users — oil and gas companies, government agencies, universities — concluded that the FGP is producing useful and necessary information about the geology and reserve potential of Canada's frontier areas. Survey management is using the report to adjust the programs' objectives in light of industry priorities and to plan the data output phase. The program continues to benefit from joint ventures and information-sharing with industry. Some milestones of the scientific program include: completion of the compilation for the *Labrador Sea Basin Atlas* which is now nearing publication; the release of maps related to thermal maturity studies in the Arctic Islands and Western Arctic; completion of gravity coverage of the Yukon from the coast down to 64°N; and the presentation at a forum in Vancouver of the preliminary interpretation of an integrated geological/geophysical seismic survey of the Queen Charlotte Basin.

Ocean Drilling Program (ODP): New strategic objectives for the 1990's were set as the ODP moved away from a phase of global exploration to one focussed on specific problems, many of direct interest to Canada: technological development, earthquake monitoring from boreholes in the seafloor and investigations relating to seafloor metallic deposits (research proposals for drilling in Canadian waters on the Juan de Fuca Ridge and off Vancouver Island are now under consideration for the 1990-1991 scientific program).

Mineral Development Agreements with the Provinces and the Territories: A Mineral Development Agreement (MDA) with the Northwest Territories was signed in July, and collaborative work continued under the eight other MDA's and under a federal program the Survey is coordinating in Quebec: the Gaspé and St. Lawrence Initiative. Another federal project, the Asbestos Initiative in Quebec's Eastern Townships, was completed in March. MDA output (maps, publications and presentations) has been instrumental in stimulating exploration activity.

Lithoprobe: Approval by Cabinet and funding for the five-year, \$25 million Lithoprobe project was announced in January at a press conference in Ottawa at the Survey's annual Current Activities Forum. Professor R.M. Clowes, Director of the project, has set up the Lithoprobe Secretariat at the University of British Columbia. The Survey will play an active role in Lithoprobe providing staff, expertise and equipment.

Canada/USSR Arctic Science Agreement: Canadian and Soviet delegations met in Ottawa in February to evaluate work completed under the agreement, signed in 1984, and agreed to renew it for an additional two years. Under the geoscience component, the agreement includes an expanded menu of projects on gas hydrates and a new project on comparative studies of geological methods for identifying prospective areas of oil and natural gas fields in the North. Exchange visits to date have been highly successful, allowing Canadian scientists and their Soviet hosts to conduct field work in areas of the USSR which were previously very difficult to access. The resulting correlation charts, rock sample analyses and joint publications have led to an improved knowledge about Arctic geology.

Nuclear Fuel Waste Management Program: The publication, in October, of a series of reports marked the completion of the Survey's formal involvement with Atomic Energy of Canada Limited (AECL) in this cooperative program of geoscience research aimed at developing the concept of subsurface disposal of high-level nuclear fuel waste.

Other highlights of the Survey's scientific program include:

Atlantic Geoscience: The basin atlas concept is being used to present all Frontier Geoscience Program results. In 1987 the *Labrador Sea Basin Atlas* neared publication, and compilation for the Grand Banks, Scotian Shelf and Gulf of St. Lawrence atlases proceeded rapidly: 800 km of deep seismic reflection line were shot along the Grand Banks margin, Jeanne d'Arc and Orphan basins, and deep refraction studies and two major aeromagnetic surveys in the Grand Banks area were completed successfully. Work on the basin atlases continued to benefit tremendously from industry's participation and willingness to contribute data from their files. The Survey also initiated its own borehole program on the Grand Banks providing the first opportunity to sample stratigraphic units previously defined only on the basis of seismic data. In the North, processing of Hudson Bay seismic data acquired in 1986 was completed (interpretation of the data may proceed jointly with petroleum companies) and participation in the Quaternary and refraction studies from the Ice Island research station continued. Methods developed for the estimation of temporal and spatial distribution of iceberg scours on the Grand Banks will be useful for future ice scour risk analyses, and work to build a digital database pertaining to seabed stability off the East Coast progressed.

Cordilleran and Pacific Margin: Under the Frontier Geoscience Program, a massive new project including land and marine geological and geophysical studies, which is to assess the hydrocarbon potential of the Queen Charlotte Basin, was initiated. Systematic regional mapping, started in 1977, of the Yukon's lead-zinc rich Selwyn Basin was completed, as was regional gravity coverage of the Cordilleran over 64 °N; aeromagnetic data of the Queen Charlotte Islands and continental margin was published as 77 geophysical maps. Eleven cruises were undertaken including continued studies on the Juan de Fuca Ridge and in the Queen Charlotte Sound. In April, the Survey completed its first deep drill hole (367 m) in the Fraser Delta as part of a continuing subsurface mapping program to improve earthquake risk assessment. Fifty-one seismograph stations now monitor earthquake activity in Western Canada, and analysis of data from the 1986 earthquake near Prince George, B.C., was completed.

Sedimentary and Petroleum Geology: Of particular note, two major studies neared publication: *Conventional Oil Resources of Western Canada (Light and Medium)* and *Coal Resources of Canada*. Some 40 projects were active in the Western Arctic and Arctic Islands under the Frontier Geoscience Program; highlights for 1987 include a summary of the petroleum potential of the Arctic Ocean, completion of geological mapping of Prince Patrick and Eglinton islands at the 1:250 000 scale, and new mapping and field studies in the northern Yukon and Beaufort-Mackenzie area. A national program of coal geoscience continued with Survey scientists working closely with counterparts in provincial agencies, coal companies and universities to set national standards for assessing and reporting coal resource potential, to conduct focussed research studies and to develop comprehensive computerized databases and syntheses of national coal geoscience information. Three major cooperative projects to assess resource potential of the Western Canada Sedimentary Basin were in progress: the Peace River Arch project (formalized in April 1987 by a Memorandum of Understanding with the Alberta Geological Survey), the Williston Basin project, and a new natural gas assessment project. The new Gas-chromatography — mass spectrometry (gc-ms) facility carried out signal work on oil-oil and oil-source correlations in the Williston Basin project and in a number of frontier area projects.

Lithosphere and Canadian Shield: Close to 100 projects were active, of note were the preparation of a synthesis of geological/geochronological data documenting the Early Proterozoic of Laurentia and the discovery of previously unknown Cretaceous deposits and various deeply subsided sub-basins in the Hudson Bay Basin. Continuing studies of major tectonic zones focussed on the southern extension of the Thelon Tectonic Zone and central Slave Province; 1:250 000 mapping was completed in the Chesterfield Inlet area and detailed structural mapping along the southern margin of the Piling Group in Central Baffin Island was started; field work in the eastern half of the Cape Smith belt was completed; and re-mapping the north shore of Georgian Bay was undertaken to follow up new results from the joint Canada/USA Great Lakes Seismic Project (GLIMPCE). Published for the first time, *Radiogenic Age and Isotopic Studies* is an annual collection which presents analytical results generated by the Survey's geochronology unit. Two commercial successes resulting from technology transfer to industry, included a receiver capable of multichannel data collection for audiomagnetotelluric, magnetotelluric and controlled EM measurements and a portable seismic refraction instrument. Survey scientists were active in the new Canadian Continental Drilling Program announced in May 1987.

Mineral Resources: The development of mineral deposit models and signatures for use in exploration proceeded on several fronts (platinum group elements, massive sulphide deposits and gold); results of 1986 regional surveys released as 11 Open File reports (292 geochemical maps) early in 1987 produced a 62% increase in staking activity; and joint work with the provinces and territories, totalling some 65 projects, under the Mineral Development Agreements ranged from regional geochemistry to mineral deposit studies. Survey scientists continued to participate in the International Strategic Minerals Inventory (producing the ISMI report on tungsten) and provided technical assistance to CIDA projects in Jamaica, Thailand and Zimbabwe, and to the International Atomic Energy Agency. Other highlights include the release on Open File of a major report on Platinum Group Element environments; the first recorded Canadian occurrence of four rare earth minerals in the Strange Lake Alkalic Complex; and the completion of the Calgary borehole calibration facility. The Survey's index to Canadian mineral deposits, CANMINDEX, was adapted to microcomputers making the data more accessible, and reducing the cost, to users. Geophysical equipment in the Skyvan aircraft was upgraded, and a detailed survey flown over Maniwaki, Quebec, as part of a study of radioactivity in soils and radon in houses being conducted jointly with the Department of Health and Welfare.

Geophysics: In seismology, 1468 earthquakes in or near Canada, 35 of them felt, were documented — information on seismic events is immediately available from the Survey's seismicity database; seismic data exchange with other countries (notably Sweden, U.S.A., U.K. and U.S.S.R.) was carried out in support of Canada's role in the global seismicity network which monitors earthquakes and nuclear explosions; and the modernization of seismological facilities at Yellowknife continued on schedule. In geomagnetism, ten "alerts" of major geomagnetic activity were issued by the Survey — the earth is now entering the upswing phase of the 11-year solar cycle of geomagnetic activity. Gravity coverage was completed of the entire Polar Continental Shelf from the Mackenzie Delta to Ellesmere Island; data from other surveys off the East and West Coasts, and the Great Lakes was added to the National Gravity Data Base. In geodynamics, results from twelve years of intensive monitoring of tilt, strain, well levels and gravity variations of the Charlevoix seismic region have been compiled. An aeromagnetic survey covering all of Lake Superior completed mapping of the Great Lakes, and magnetic anomaly maps at the 1:5 million scale of Canada (fifth edition) and of North America (in collaboration with the U.S. Geological Survey) were published.

Terrain Sciences: Glacial deposits studies in the High Arctic focussed on collecting datable materials with the aim of gaining information about climatic change. Field tests, with support from the Department of Indian and Northern Affairs, were carried out to monitor the interaction between the Norman Wells pipeline and its surrounding permafrost soils. Work continued in Southern British Columbia to assess landslide risk, and studies of the massive rock slide triggered by the Nahanni earthquake of 1985 were completed. Four national synthesis maps were published portraying the retreat of the Laurentide Ice Sheet and the paleogeography of northern North America from 18,000 to 5,000 years ago, and two major publications are nearing completion: the multi-volume *Beaufort Sea Atlas* of value for the planning of hydrocarbon exploration and assessment of environmental impact, and an atlas showing sea level changes throughout the coastal regions of Canada during post-glacial times. Applications of sedimentological research to practical problems in mineral exploration, environmental geochemistry and seismic hazard research were of prime concern and work continued on the establishment of a national database of glacial sediments. Survey scientists played an active role on the Organizing Committee and in the scientific program of INQUA's successful XIIth International Congress held in Ottawa, July 31 — August 9, 1987, and are becoming increasingly involved in many aspects of the new Global Change Program.

Geoscience Information: A key function of the Survey is ensuring that results of its scientific programs are made available, as maps or reports, in a timely and cost-effective manner. In 1987, about 5800 pages of new scientific text, as well as some 1000 pages of general texts (e.g. popular booklets, open file reports) were published. The Survey is coordinating production of the Canadian contribution to the Decade of North American Geology (DNAG) project and during the year considerable effort was focussed on planning and putting in place adequate staff and facilities to handle the 9 DNAG volumes that will comprise *Geology of Canada*. Two volumes, *Quaternary Geology* and *East Coast Canada*, are slated for publication by 1988-89. In the library, a major reorganization of the stacks created badly needed space for its holdings, and close to 80% of the map collection was catalogued for the GEOCAT database.

C.E. Vodden

5. Royal Society of Canada (EarthSciences Division) (RSC)

Through the Royal Society of Canada, Canada has taken a leading role in planning the study of Global Change, the International Geosphere-Biosphere Program (IGBP) adopted by the International Council of Scientific Unions (ICSU) in 1986. Bill Fyfe (University of Western Ontario) chairs the Canadian part of the Program, which has set up a number of Working and Technical/Resource Groups to focus on various scientific aspects of Global Change, and sponsored a symposium at the 1987 Annual Meeting of the Royal Society at McMaster University.

Besides their involvement in the Global Change Program, earth scientists play a central role in the affairs of the Society. Digby McLaren is serving as President of the Royal Society of Canada (1987-90) and Michael Dence has been appointed its Executive Secretary (1987-). Both are heavily committed to working to strengthen the Society's financial base and to raise its public profile. C.R. Barnes (GSC, Ottawa) is Vice-President (1987-88) of the Academy of Sciences, and presides over the committee charged with planning the scientific program of the Society's Annual Meeting (University of Windsor, 1988).

The 1987 Willet G. Miller Medal was presented to Harold Williams (Memorial University) for outstanding research in geology. The award was made at the Annual Meeting, where Earth scientists inducted as new Fellows of the Royal Society were Drs. R.O. Lindseth (Teknica Resource Development, Calgary) and R.N. Yong (McGill University).

Officers of the Earth Sciences Division for 1987-89 are: Michael Rochester (Memorial University), convenor; Steve Scott (University of Toronto), rapporteur; and Roy Lindseth, executive member.

M.G. Rochester

REPORTS OF THE STANDING COMMITTEES

1. Education Committee (EdGeo)

Edgeo 1987 saw successful programs at Winnipeg with 36 participants and an Edmonton-organized week at the Tyrrell Museum in Drumheller. Attendance at the latter was restricted to 30, with better than twice that many applicants. Waterloo failed to get underway but would like to try again next year.

The Edmonton Edgeo's are aimed at the whole province with attendees this year from Lethbridge to Grand Prairie. Plans are underway for an equally successful venture in 1988.

In Winnipeg the Department of Education is dropping its support on the grounds that the University of Manitoba will pick the program up as a credit course. There is some doubt that this will happen in time to provide the needed replacement of supplies and worn out equipment.

To quote our Past President, Dave Organ, "When a person obtains a knowledge of geology his view of the world is forever changed. The less worldly pronouncements of the political activist become proportionately less persuasive, but none-the-less still dangerous to the ill informed." To create a more knowledgeable public is one of the principal aims of the Edgeo program. In those few areas where it has caught on, it has done great things for the earth science profession. The Winnipeg and Edmonton examples are such that should the Council wish to extend the process to other parts of the country I would suggest that a program of finding a catalyst in the target area and sending that person to the Edgeo's in Winnipeg and Edmonton would be the best way to spread the message. The location of the catalyst could be expedited by sending someone from one of these programs on a speaking tour.

P.J. Savage

2. Marine Geoscience Committee

No annual report was submitted

3. Registration of Geoscientists Committee

The committee made no significant progress during the year, although numerous opinions and points of view were presented in various society publications regarding the benefits and downfalls of national accreditation and registration programs.

J.B. Maher

4. Lithoprobe

LITHOPROBE is a new Canadian earth sciences research program which integrates geophysical, geological and geochemical investigations in a collaborative effort among scientists from universities, government and industry to extend and relate surface geology to structures at depth. The LITHOPROBE Secretariat is now established at the University of British Columbia. With committed long-term funding from NSERC and the Geological Survey of Canada, all organizational and scientific aspects of the Phase II program are in operation.

The Board of Directors was established shortly after the announcement in January 1987, by the ministers responsible for NSERC and EMR, that funding was committed. The Board met in April to select the Director and the host university for the Secretariat, and to approve the 1987-88 budget. They met again in August to hear the first report from the Director and discuss other matters. The Scientific Committee met in May and again in November. Three active subcommittees — Geology and Geochemistry, EM and Other Geophysics, and Seismology and Lithoprobe Seismic Processing Facility (LSPF) — were established. Each has met at least once during 1987. Early in October, LITHOPROBE EAST held a successful transect meeting at Dalhousie University. Later in the month at the Université de Montréal, an Abitibi-Grenville transect meeting helped to define and reshape the transect program. At the time of this writing (February 1988), an active Kapuskasing transect meeting has just been completed.

A competition for University Supporting Geoscience grants was held early in 1987 and adjudicated in May. Twenty-three awards totalling almost \$440 000 were made for fiscal 1987-88. A similar competition for funds for 1988-89 was announced in October 1987 with a deadline date of December 18 for receipt of applications. Fifty-three applications from 51 scientists requesting a total of about \$1 300 000 for the one year were received. The applications have been distributed to the University Supporting Geoscience Projects subcommittee for evaluation. This will take place in March 1988. The budget amount to be awarded is \$650 000.

The LITHOPROBE Seismic Processing Facility (LSPF), with Dr. Fred Cook as Director, is now installed at the University of Calgary. Following a summer of negotiations and discussions, the hardware proposal made by Control Data Canada Limited coupled with the software proposal prepared by CogniSeis Development, Inc. of Houston, Texas were accepted by LITHOPROBE. The principal components of the hardware are a CDC Cyber 835 computer with 16 Mbytes of central memory and a MAP V array processor which operates at 100 Mflops. The array processor is memory coupled with the CPU thereby avoiding any 'traffic problem' associated with transfer of data between the CPU and AP. Four tape drives, 3 gigabytes of disc storage, a 36" black/white electrostatic plotter and other related devices complete the hardware installation. The Cyber 835 operates under the NOS/VE operating system and includes Unix and VAX-VMS shells for users more familiar with these operating systems. The seismic processing software consists of a complete set of DISCO packages.

In addition to representing the state-of-the-art seismic processing capability, the choice of the Control Data/CogniSeis combination was facilitated by a major donation (representing about \$3 million) of much of the hardware by Control Data Canada and a major reduction (amounting to more than 50 per cent) in the price of the seismic software packages from CogniSeis Development. The generous donation from CDC has enabled LITHOPROBE to access the full \$700 000 set aside by NSERC Council under a budget line item in the University-Industry program. These funds plus \$710 000 available for LSPF capital/operations expenditures from the 1987-88 NSERC Collaborative Research Initiative grant of \$2.5 million ensured that the full facility was up and running early in 1988.

Access to the LSPF by the Canadian research community will be available through remote site connections. Procedures for such access and the hardware/software that will be necessary for its implementation are presently in the formative stages and are being established by the Lithoprobe Subcommittee on Seismology and the LSPF.

Following Phase I LITHOPROBE on Vancouver Island and in Kapuskasing, continuing funding from the GSC in 1985 and 1986 enabled the acquisition of seismic reflection data along the eastern portion of the Southern Cordillera Transect, from the Rocky Mountains west to the Arrow Lakes; and collaboration by LITHOPROBE in the Great Lakes International Multidisciplinary Program on Crustal Evolution (GLIMPCE). The transect has enabled a "glimpse" of the mid-continent crust by recording marine reflection data in the Great Lakes. In the Appalachian transect (LITHOPROBE EAST) about 3000 km of marine crustal reflection data have been acquired around Newfoundland with funds made available through the GSC's Frontier Geoscience Program.

The seismic deep reflection program in the Kapuskasing Transect was completed in December. Following competitive bids from a number of companies, Veritas Geophysical Ltd. and Veritas Seismic Ltd. of Calgary were awarded the contracts for seismic acquisition and processing, respectively. A 240-channel system with 50-m station spacing (instead of 100-m) and 100-m source intervals (instead of 200-m) was used. Approximately 340 km of regional deep reflection data and 20 km of 'high resolution' data (20-m station spacing, 40-m source interval and a higher sweep range) over the Ivanhoe Lake Cataclastic Zone in the Chapeau block were recorded.

Through the favorable bids and financial input to the seismic acquisition program from the Ontario Geological Survey and the Ministère de l'Énergie et Ressources du Québec, a large-scale preliminary program of seismic profiles also was recorded in the Abitibi subprovince as a prelude to the Abitibi-Grenville Transect. In the Ontario section, about 80 km of regional profiling and 30 km of high resolution profiling, concentrating on the Porcupine-Destor-Duparquet fault zone, were carried out. In the Quebec section, about 50 km of regional profiling and 35 km of high resolution profiling, with emphasis on the Cadillac-Larder shear zone, were run.

The first year of LITHOPROBE has been an auspicious and eventful one. We expect to maintain the momentum in the future.

R.M. Clowes

5. Ocean Drilling Program

Six cruises were completed in 1987 and 13 Canadians participated in them, with one serving as a Co-Chief Scientist.

Three Canadians accepted invitations to serve as Co-Chiefs on cruises scheduled for 1988: John Peirce (Petro-Canada) for Leg 121 to Broken Ridge and Ninety East Ridge, and Felix Gradstein (GSC) and John Ludden (Université de Montréal) will be Co-Chiefs for Leg 123 to the Argo Abyssal Plain and Exmouth Plateau. This is the first time in the history of Canada's involvement in ODP for a leg to have to Canadian Co-Chiefs.

The Canadian National Committee met twice in 1987 — in April at the Geological Survey in Ottawa and in November at Dalhousie University. An important item at the April meeting was discussion of two successful workshops, which were held early in the year for mining geologists. One was held in Vancouver in February with the cooperation of the Geological Association of Canada, Cordilleran Section and the Mineral Exploration Group. The second one was held in Toronto in April in cooperation with the Toronto Geological Discussion Group. The two workshops were organized by Steve Scott (University of Toronto), Dick Chase (UBC) and Paul Robinson (Dalhousie University). In addition to explaining the opportunities of ODP to the groups, emphasis was placed on recent work being done on hydrothermal systems and seafloor sulphides. In all, about 85 people attended these two sessions and similar workshops may be held in the future.

Paul Robinson and Steve Scott are organizers of a Special Session at the GAC-MAC-CSPG '88 in St. John's on "*The Ocean Drilling Program: The First Four Years.*" A poster publicizing the session was produced and distributed by the Secretariat.

A major item at the second CNC meeting was the review of proposals for the next location of the Secretariat, which will rotate to a new institution when Paul Robinson steps down as Director on March 31, 1988. Other items addressed included Canadian representatives on JOIDES panels and committees, CNC structure and membership, and distribution of ODP Initial Reports in Canada.

Volumes of Proposals resulting from the 1986 National ODP Workshop in Montreal were published and distributed by the Secretariat.

The Canadian Council for ODP also met twice in 1987 — in April at the Geological Survey in Ottawa and in November at Dalhousie University. The ODP community was saddened by the death of the Council's first Chairman, W.W. Hutchison in July 1987. He was succeeded by R.A. Price. In April, Council undertook to organize, through CGC, an evaluation of ODP in Canada and by November, a Committee had been set up. This Committee, chaired by Ward Neale, will review scientific benefits of membership, technological developments, and structure and management of the Program within Canada. Council also successfully nominated Mr. Dan Motyka, Vice-President of Production, Gulf Canada Resources Ltd., to an International Evaluation Committee of JOIDES. Elaine Isabelle of NSERC was nominated for the non-U.S. staff position at the JOIDES office, which will be moving to Hawaii in October 1988. However, at its December meeting, the JOIDES Planning Committee accepted a nominee from France. Also, in November the Council reviewed the proposals for the next location of the Secretariat. After a careful evaluation, Council selected Memorial University as the institution to host the Secretariat for the next three years, with John Malpas serving as the Secretariat Director.

Numerous Canadians attended the Second Conference on Scientific Ocean Drilling held in Strasbourg in July. Four Canadians served on Working Groups (J. Malpas, E. Davis, B. Bornhold, and G. Stockmal) and R.A. Price was on the Steering Committee. An NSERC grant assisted with travel to the Conference for R. Hesse, L. Mayer, J. Malpas, and P. Robinson.

The Secretariat continued to maintain records on all aspects of Canadian operations and provided information to interested persons. Canadian scientific involvement continued to increase in 1987, and the mailing list topped 650 persons. Newsletters were distributed in February, May, and November. The display was taken to the IREM-MERI Symposium on *Seafloor Hydrothermal Systems* at McGill University in February, to the Workshop for the mining industry in Toronto in April, and it was updated and taken to the GAC-MAC'87 in Saskatoon in May. P. Robinson gave a talk on ODP at the GAC meeting. Funding to maintain the Secretariat and support Canadian representatives from universities travelling to JOIDES, CNC, and CGC meetings was received from NSERC (Infrastructure award of \$124 000) and Petro-Canada (\$10 000).

Canadian representatives on JOIDES Panels attended approximately 36 meetings in various member countries, including one in Canada. The Western Pacific Panel was hosted by R. Hyndman in Sidney, British Columbia in June. Matt Salisbury (Dalhousie University) completed his term as Chairman of the Downhole Measurements Panel. Larry Mayer (Dalhousie University) and John Peirce (Petro-Canada) continued to serve as Chairmen of Sediments and Ocean History Panel and Site Survey Panel, respectively.

1987 continued to be a year of growth for ODP in Canada and with the "JOIDES Resolution" soon to be entering the Pacific Ocean, ongoing expansion is anticipated.

P. Robinson

LEG	MAIN LOCATION	DEPARTURE	ARRIVAL	CANADIAN PARTICIPANTS
113	Weddell Sea	87/01/05 Punta Arenas	87/03/11 Port Stanley	E. Schandl, U. of Toronto C. Pereira, MUN
114	Southern South Atlantic	87/03/14 Port Stanley	87/05/13 Mauritius	D. Nobes, U. of Waterloo J. Mwenifumbo, GSC
115	Carbonate Dissolution and Mascarene plateau	87/05/19 Mauritius	87/07/02 Colombo	J. Greenough, St. Mary's Univ. G. Vilks, GSC
116	Intraplaque Deformation	87/07/07 Colombo	87/08/19 Colombo	I. Kacsmarska, Mt. Allison, Univ. G. Leger, Dalhousie Univ.
117	Neogene Package	87/08/23 Colombo	87/10/18 Mauritius	T. Pedersen, UBC R. Bilak, U. of Waterloo
118	Southwest Indian Ridge	87/10/23 Mauritius	87/12/14 Mauritius	P. Robinson, co-chief, Dalhousie Univ. R. Herbert, Université Laval D. Kassenaar, Université de Waterloo

6. Canadian Continental Drilling Program (CCDP)

The Canadian Continental Drilling Program has been in the first year of a two-year planning phase in 1987. A Planning Office was opened at Carleton University. With financial support from the Canadian Geological Foundation and INCO Ltd., personnel support from the Geological Survey of Canada in the form of the secondment part-time of Malcolm Drury, and logistic support from the Department of Earth Sciences at Carleton University. The program was widely announced together with a call for proposals, in May. Twenty-nine preliminary proposals were received, most with a strong component of economic interest. The next stage in the planning process — holding open thematic workshops at which proposals will be presented in detail — was begun.

Discussion were initiated by members of the Steering Committee with NSERC officials regarding future funding requirements for the operating phases of the program and immediate funding assistance for the workshops.

The program was represented at meetings both national and international. M.J. Drury addressed meetings in Edmonton and Victoria, and also presented an invited paper at the Third International Symposium on Deep Drilling in Crystalline Rock in Sweden. J.M. Hall (Chairman of the Steering Committee) attended a meeting in West Germany on the German continental drilling program.

M.J. Drury

7. International Geoscientif Relations

See Report of the Foreign Secretary

8. Canadian National Committee, International Union of Geological Sciences

See Report of the Foreign Secretary.

REPORTS OF THE REPORT COMMITTEES

1. Comparative Study on Funding of Earth Sciences in Canada

A contract was executed with The Queen's University, Centre for Resource Studies, for the study which is being carried out under the direction of Margot J. Wojciechowski, Deputy Director of the Centre.

Cost for the study was established at \$69 500 with some additional expenditures for meetings of the R&D Committee and for review and data verification purposes.

Funds were raised, equally, from three sources, Federal Government, Provincial Governments and Industry and Industry related Associations. The Federal share was derived from Energy, Mines and Resources. Almost all Provinces contributed to the Provincial share. The Canadian Petroleum Association, on behalf of the Canadian oil industry, provided \$15 000 of the industry funds. Special thanks are due to The Charles Camsell Society in Yellowknife for their financial contribution and to the British Columbia and Yukon Chamber of Mines for support services supplied during fund raising. Contributions will be acknowledged in the final publication.

At the September meeting of the CGC, a preliminary draft of Canadian data was presented. It was anticipated that there would be some delays in overseas data collection. Additional material would become available because of a parallel comparative study being carried out by CANMET.

It is anticipated that the study will be completed within budget. A final report on Canadian data should be ready in the spring of 1988 and the overseas material by the fall, with a final published report slated to be available for the Annual Meeting in Ottawa, in December.

The study is an independent one, but a Verification Committee has been struck to review the accuracy of statistical data.

D.K. Mustard

2. Careers in Geoscience Booklet

Work continued, principally by Naomi Nemeth, on the revisions to the Careers in Geoscience booklet. Photographs are actively being sought for the completion of the new edition.

N.J. Allman

REPORTS OF THE ADVISORY AND REVIEW COMMITTEE

1. Advisory Committee to the Geological Survey of Canada on Geophysics

The purpose of the Committee is to advise the Geological Survey of Canada Sector of the Department of Energy, Mines and Resources, on the scope and effectiveness of its geophysical activities, including observatory networks, national surveys, exploration geophysics, terrain geophysics and other fields of applied geophysics, international liaison, geophysical instrumentation and technology development.

The Committee is examining: the products or outputs of the geophysical activities of the Geological Survey of Canada, both published information and internal reports; the research facilities at Dartmouth, Nova Scotia; Ottawa, Ontario; Calgary, Alberta; Vancouver and Sidney, B.C., and some of the other observatory facilities; the program planning and management system for the geophysical activities in the Geological Survey as a whole; and the human resources development plans and practices.

The Committee consists of 8 members, 3 representing Canadian industry, 2 representing Canadian university, 2 representing the international geophysical community, and 1 representing provincial government agencies. The members of the Committee, including its Chairman, were nominated by the Canadian Geoscience Council and appointed by the Assistant Deputy Minister of the Geological Survey of Canada. The Membership is Dr. H.O. Seigel (Chairman), Mr. R. Barlow, Dr. R. Clowes, Mr. W. Davitt, Mr. C. Jobin, Dr. W. Knala, Mr. J-C. Mareschal and Dr. J. Oliver.

All members of the committee convened for an introductory meeting in Ottawa on December 1 and 2, 1987. The first day and half the second were devoted to an overview of the geophysical activities of the GSC. Dr. Ray Price, arranged for presentations by the Directors of the various GSC divisions on their geophysical activities.

The final half day was spent in a closed meeting of the Committee, at which the future program of the Committee was agreed upon:

January 1988 — June 1988 — visits to the various GSC establishments in Calgary (ISPG), Vancouver (CPGD), Sidney, B.C. (PGC) and Dartmouth (AGC), as well as a return visit to Ottawa;
September 1988 — April 1989 — preparation of report;
May 31, 1989 — submission of final report to ADM (GSC) and to the president of the CGC.

Harold O. Seigel