CANADIAN GEOSCIENCE COUNCIL

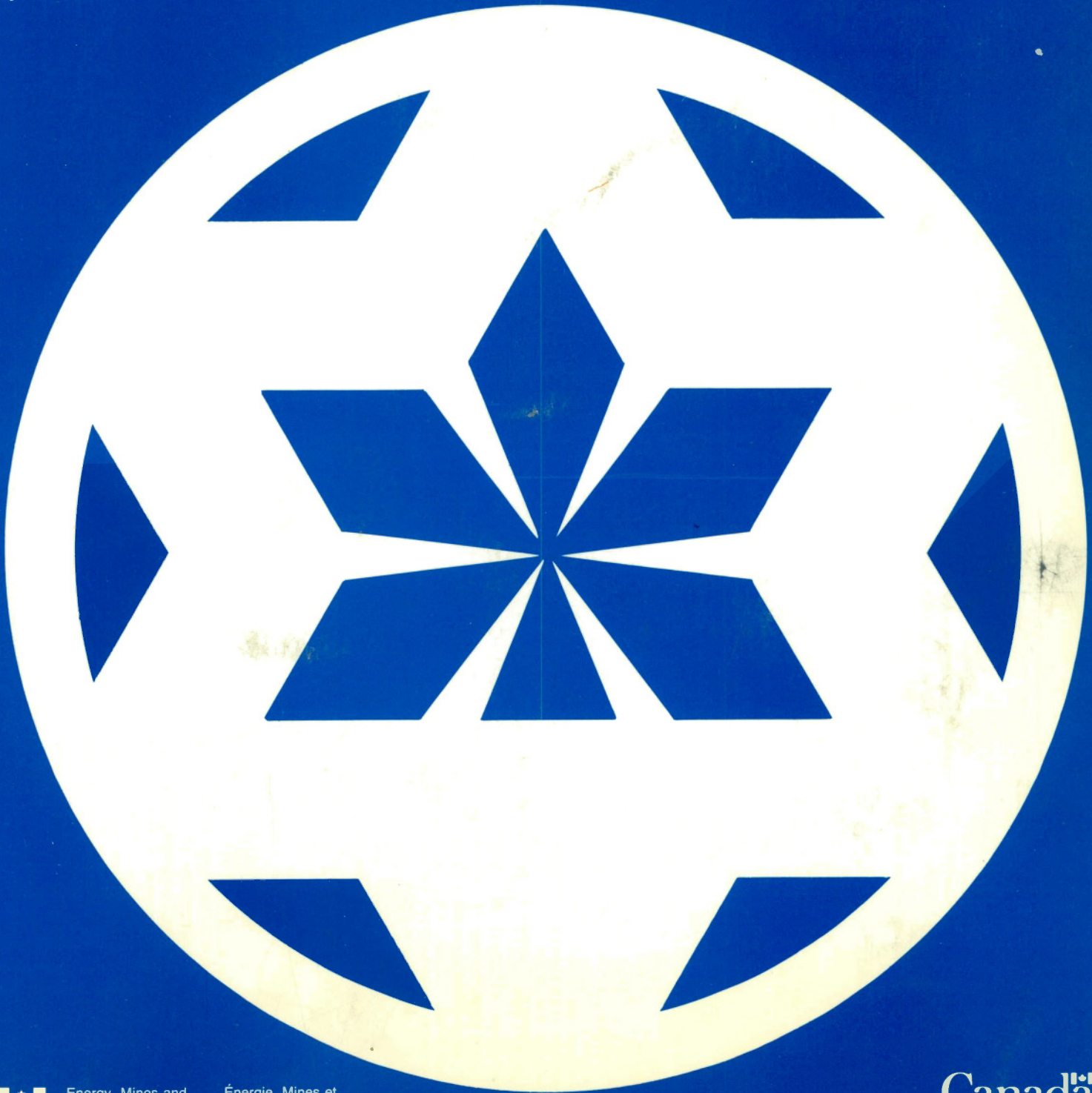
THE GEOSCIENCES IN CANADA, 1988

ANNUAL REPORT

Prepared by
The Canadian Geoscience Council

Published for the Council by the Geological Survey of Canada as Paper 89-6

Edited by Alan V. Morgan



Energy, Mines and Resources Canada
Énergie, Mines et Ressources Canada
Canada

ACRONYMS COMMONLY USED IN THIS REPORT

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

PRESIDENTS OF THE CANADIAN GEOSCIENCE COUNCIL

1972	R.A. Blais	1981	J.O. Wheeler
1973	R.O. Lindseth	1982	A. Sutherland Brown
1974	H.R. Wynne-Edwards	1983	N.R. Morgenstern
1975	R.L. Slavin	1984	C.H. Smith
1976	E.R.W. Neale	1985	D.W. Organ
1977	P.J. Savage	1986	A.F. Laurin
1978	G. Mannard	1987	G.D. Garland
1979	C.R. Barnes	1988	I. Thomson
1980	D.W. Strangway		

EXECUTIVE DIRECTORS OF THE CANADIAN GEOSCIENCE COUNCIL

1972-1979	E.C. Appleyard
1980-1985	J.P. Greenhouse
1986-1987	B.D. Chatterton
1988-	A.V. Morgan

GEOLOGICAL SURVEY OF CANADA
PAPER 89-6

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Vancouver, British Columbia, Canada V6B 1R8

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REPORT OF THE PRESIDENT

Introduction

The Canadian Geoscience Council is the representative body for all professional geoscience organizations in Canada which have, in turn, a membership of some 16,000 persons drawn from industry, the universities and both levels of government. The main objectives of Council are to maintain a forum which will encourage the development of geoscience in the interests of the nation; provide advice to governments on science policy and its implementation; promote science education in Canada, and monitor the status of Canadian geoscience.

In the year after ''black Monday'', the October 19, 1987 collapse of the world money markets, the geoscience community found itself faced with mixed circumstances. Mineral exploration continued at a high level in Canada through the first part of the year buoyed by Flow Through Funding and relatively stable gold prices. Later in the year, strong base metal markets enabled several of the major mining companies to report healthy profits. The oil and gas industry, in contrast, continued to struggle with the problems created by low world prices. Government in Canada remained pre-occupied with expenditures and the need to cut costs. A further factor affecting the geoscience community has been increasing public awareness of the global natural environment, both the dynamic earth and the impact of man, which now increasingly influences government policy and private sector business decisions. Against this background, Council was active in many areas, not least in maintaining strong contacts with the federal and provincial governments to ensure that the concerns and opinions of the geoscience community were known to politicians and senior bureaucrats.

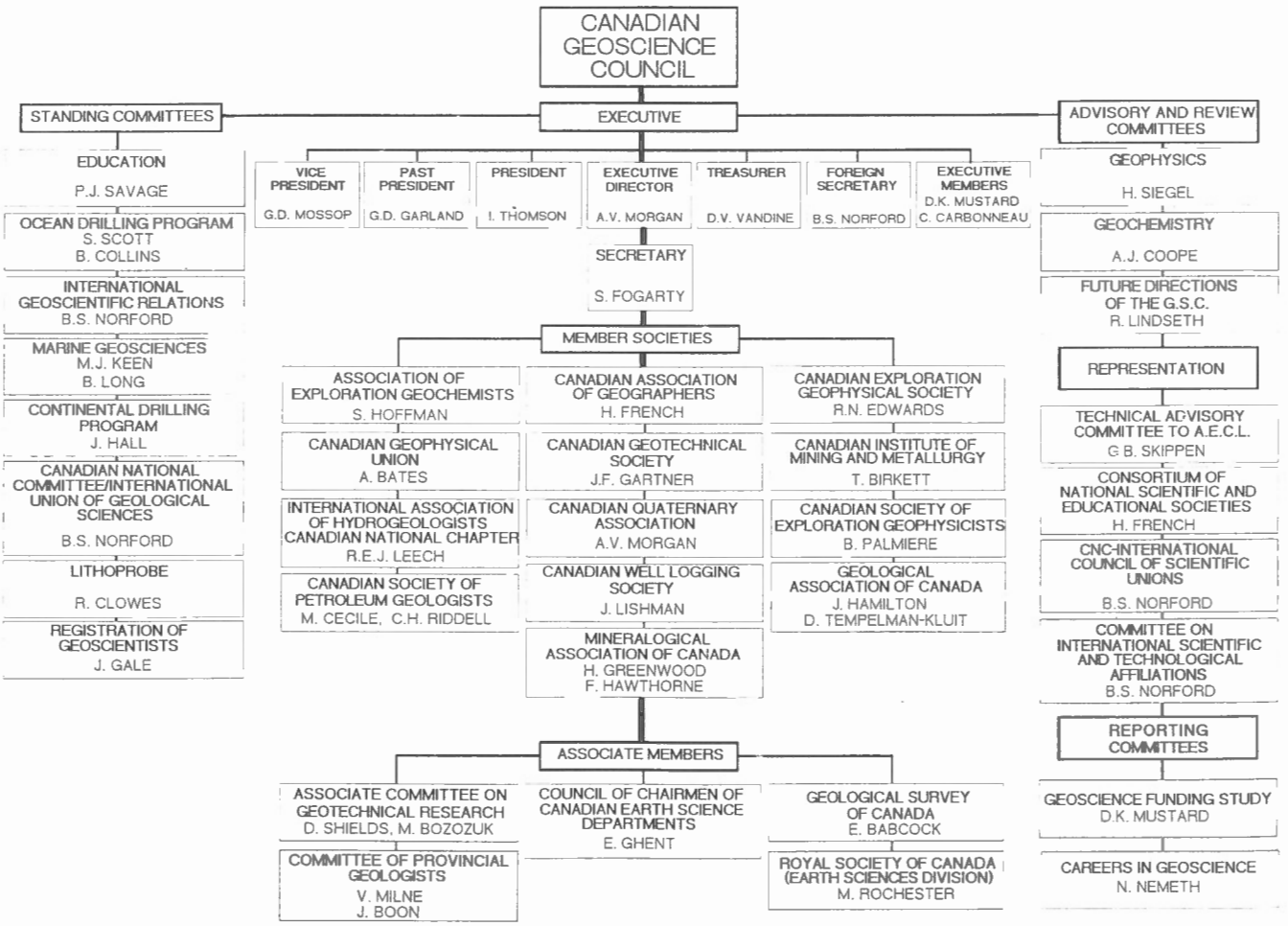

Table 1. Organization Chart and CGC representatives 1988.

Council met four times in 1988: in March, at the University of Waterloo following the Prospectors and Developers Convention; at Memorial University of Newfoundland, St. John's, in May, immediately after the annual GAC/MAC joint meeting; at the University of British Columbia, Vancouver, in September; and in December, in Ottawa, for the annual meeting with senior representatives of Energy, Mines and Resources Canada.

Major Study Completed

A final draft report entitled *Research and Development in the Earth Sciences* was submitted to Council in December. Council had commissioned this investigation as an independent study and contracted the work to the Centre for Resource Studies at Queen's University. The study, which has taken nearly two years to complete, was carried out under the direction of Dr. Margot Wojciechowski and examines the comparative levels of funding for geoscience and other scientific and resource based activities, such as biology, chemistry, physics, engineering, forestry and agriculture, in Canada. It also reports on the funding of research and development in the earth sciences in Australia, Finland, France, Germany, Sweden, the United Kingdom and the United States. The report contains much data that has never been compiled before and will be an analysis of trends and influences which give insight on the current status of funding in Canada with clear implications for the near and mid-term future. The final report will be published early in 1989.

Major Studies In Progress

Council has two major studies in progress of concern to the geoscience community.

1. **Future Directions for the Geological Survey of Canada**. In December, 1987, Council was asked by a senior official of Energy, Mines and Resources Canada, "What do you see as the future role and general direction of the Geological Survey of Canada?" The question provoked much discussion and led to the formation of a committee under the joint chairmanship of Dr. R. Lindseth and Dr. R. Lamarche to study this matter. The committee presented an interim report to Council in December, 1988, which identified a number of future trends and influences which provide both goals and challenges for the Geological Survey. Council expects this study to be of value to the Geological Survey in its ongoing reorganization and to remain a useful document for the foreseeable future. The final report will be submitted in early 1989.

2. **Professional Registration of Geoscientists**. This issue is being studied by a committee of Council which was reorganized in 1988 under the chairmanship of John Gale. Two aspects are under active consideration. First, the committee is liaising with provinces that have, or are contemplating, legislation for the professional registration of geoscientists. The objective is to ensure that there is parity in the legislation and that transferability or reciprocal recognition of qualifications can take place. Second, there is also a longer term goal of examining professional registration on a wider basis, identify who needs it, how groups or disciplines now unable to be registered can gain it, establish common criteria for the recognition of individuals eligible for registration, and address the question of accreditation of university courses and departments. By providing a forum for discussion and interaction at the national level, Council expects the committee to be able to work towards the best scheme for all geoscientists across the country.

Advisory Committees

Council functions as a central body receiving information from a number of committees and providing advice to other groups, principally government. Committee activities during 1988 include:

1. In 1987, at the request of the then Director General of the Geological Survey of Canada, Council appointed an **External Advisory Committee on Geophysics** under the chairmanship of Dr. H.O. Siegel. The committee was asked to examine the geophysical activities of the Geological Survey of Canada, and advise on the scope and effectiveness of the geophysical programs. This study is almost complete with a final report expected in early 1989.

2. At the request of the Assistant Deputy Minister, Geological Survey of Canada Sector, Council appointed an **External Advisory Committee on Geochemistry** under the chairmanship of Dr. A. Coope. The committee has been asked to examine the activities in geochemistry carried out by the Geological Survey of Canada and provide advice on the scope, effectiveness and future development of the geochemical programs. The committee has made rapid progress since starting work in mid-1988 and intends to present a final report by mid-1989.

3. Some years ago, Council played a leading role in establishing a **Technical Advisory Committee to Atomic Energy of Canada Ltd.** for their Nuclear Waste Management Program. The current representatives of Council on this committee are Dr. G.D. Skippen and Dr. P. Williams.

4. **Lithoprobe**, Canada's earth science mega-project, has developed into an outstanding example of a network centre of excellence with world class science and scientists that involves the universities, industry, and both levels of government. Council receives reports on Lithoprobe activities and nominates three members of the Lithoprobe Board of Directors. The current representatives of Council on the Board are: Mr. D.K. Mustard, Dr. W.S. Fyfe, and Dr. G. Henderson, who is also Chairman of the Board of Directors.

5. The **Canadian Continental Drilling Programme** was adopted into the Canadian Geoscience Councial during 1988, and now has an organizing committee under the chairmanship of Dr. J. Hall, that reports to Council.

6. The **Marine Geoscience Committee** reports to Council on matters related to the marine geosciences in Canada, particularly the interactions of industry, universities and government. A continuing concern of the marine geoscience community is access to ship time, a topic raised by Council with government. During 1988, chairmanship of the Marine Geoscience Committee passed from Dr. M. Keen to Dr. B. Long.

7. Activities of the **Ocean Drilling Program** are reported to Council via the Canadian National Committee (CNC/ODP). The chairman of this committee is Dr. S. Scott. Council also provides advice through representatives who sit on technical and administrative committees of the Ocean Drilling Program. In December, 1987, Council approved the formation of a review committee under the chairmanship of Dr. Ward Neale to evaluate Canadian participation in the Ocean Drilling Program. The report of the committee, which strongly endorses Canadian participation, was presented to Council in mid-1988 and will be published jointly by Council and the Geological Survey of Canada in 1989.

8. Along with other interest groups, Council was invited by Energy, Mines and Resources Canada to participate in the process leading to the appointment of a new Assistant Deputy Minister, Geological Survey of Canada Sector. An *ad hoc* committee of the executive was formed to co-ordinate a response on behalf of Council. There is evidence that the written and oral presentations to Energy, Mines and Resources had a positive effect on the selection process.

Advocacy

Council has found that in order to be effective, on behalf of the geoscience community, it must be proactive and have direct contact with politicians, senior bureaucrats and the leaders of industry. The Executive has aggressively pursued these contacts for Council, and has, on occasion, also joined with other organizations and interest groups in order to present a stronger voice.

During 1988, members of the executive met with the Deputy Prime Minister, the federal Ministers of Finance and Environment, the Secretary of State for External Affairs, the Minister of State for Forestry and Mines, the Minister of State for Science and Technology, the Speaker of the House of Commons, and several back bench Members of Parliament. In addition, meetings were held with senior officials in the Prime Minister's Office, the Privy Council, Energy, Mines and Resources, Environment Canada, Science and Technology Canada and the Natural Sciences and Engineering Research Council of Canada. Correspondence was exchanged with these and other federal agencies. Members of the Executive also met with senior representatives of the provinces of Ontario and British Columbia.

Council presented a brief to the 1988 Mines and Energy Ministers Meeting which was held in Quebec City. Our presentation, which was given by the President and Dr. C. Carbonneau, Executive Member, addressed the theme of the meeting which was "The Environment". This was the third occasion on which Council had appeared at such a meeting and our presentation was very well received.

Council has acted in concert with other groups in The National Consortium of Science and Educational Societies to lobby government and communicate with the media on matters of a more general scientific nature. Similarly, Council is collaborating with the Royal Society of Canada on matters related to science education and the public perception of science.

The Executive has also had extensive contact with industry and liaised with other, industry-based, organisations to recognize and achieve common goals.

Representatives of the media were contacted with a view to developing longer term liaison that would aid dissemination of geoscience information to the general public.

New Scientific Initiatives

Two major, multi-disciplinary programmes which will have a strong geoscience component were in the development phase during 1988. Both address what has become the issue of our time; — the relationship between man and the environment on planet Earth.

The International Geosphere-Biosphere Program, launched in 1986 by the International Council of Scientific Unions, will be one of the great scientific endeavours of the next few decades. The programme will study our planet as a single entity, examine the life-support systems that have nurtured life on Earth for at least a billion years, and study the potential that Man now has to disrupt and destroy these systems. In Canada, this endeavour is known as The Global Change Project. Geoscience is a basic component of this project which will be multi-disciplinary and inter-disciplinary in character involving pure and applied scientists, as well as experts in the social sciences and humanities. Council moved quickly to support the Royal Society of Canada as the co-ordinating agency for this project. It is expected that results from the project will have major implications for every level of society, both nationally and internationally. Solutions to the many problems that will be recognized by this project will require social, economic, legal and political actions based on an understanding of the earth and its processes.

The second program, **The International Decade for Natural Diaster Reduction**, focuses on natural processes of the dynamic Earth which directly, and suddenly, affect life and property such as earthquakes, volcanic eruptions, floods and hurricanes. There is a strong geoscience component to this program and the potential for overlap with the Global Change project. Council has endorsed the role of the Royal Society of Canada and the Canadian Academy of Engineering as the joint co-ordinating body for this programme.

Council is giving strong support to the scientific component of both projects in order to secure the best possible data base on which to make critical decisions which will affect the future of Canada.

Education

Council provides support for the instruction of school teachers in aspects of geoscience through workshops organized by the EdGeo committee. This committee of Council is chaired by Dr. P. Savage. During 1988, four EdGeo workshops were held at Edmonton; and at the Tyrrell Museum in Drumheller, both in Alberta; at Star Lake in Manitoba; and at Bancroft in Ontario.

International Affairs

Council is a sponsoring and participating agency in all major geoscience projects at the national and international level. Dr. B.S. Norford is the Foreign Secretary of Council. Council has the role of the Canadian National Committee for Geology and is the adhering body to the International Union of Geological Sciences (IUGS) and the International Geological Congress. Council is also responsible for Canadian participation in the International Geological Correlation Program (IGCP) and the International Lithosphere Program.

In September 1988, Council formed a Canadian National Committee to the Global Sedimentary Geology Programme (GSGP) under the chairmanship of Dr. D.A. St-Onge. The GSGP was formed by IUGS in 1987 and is similar to the IGCP in being a mechanism for international co-operation on research problems on a global scale.

Administration and Finance

At the beginning of the year, the headquarters of Council were moved from the University of Alberta to the University of Waterloo in Ontario. Dr. A.V. Morgan is the Executive Director of Council.

Funds for the normal activities of Council come from dues paid by the member societies and grants from Energy, Mines and Resources Canada and several of the provinces. Funding for the Advisory Committees to government and other special studies are raised on a project specific basis from government, industry and other sources. The dues have remained unchanged since 1972, the grant from the federal government has increased over the years while total support from the provinces has remained constant. With income basically fixed, the combined effects of inflation and expanded responsibilities that Council has assumed on behalf of the geoscience community, have resulted in a deficit in the current budget.

Council also recognizes the significant contribution made by Mr. D. VanDine who is standing down as Treasurer at the end of 1988, after holding the post since January, 1985. Mr. VanDine will be succeeded by Dr. E. Van der Flier-Keller.

Commentary

For some time, Council has been concerned with the relatively poor perception of geoscience that exists among the general public. This is, unfortunately, part of a wider problem that affects all science and is manifest by a low level of general knowledge about science and a relative decline in interest in science, when compared to other aspects of learning, amongst high school pupils. This should change as a consequence of the growing public concern for the environment and a thirst for knowledge about the forces, both natural and man-made, that threaten our very way of life.

Canada has a large population of geoscientists who are distinguished in various fields, both nationally and internationally. Regrettably, the average Canadian is quite unaware of just how good and important the science and scientists in their midst really are.

With the Global Change Project clearly in mind, there emerged the idea that the time is right for the institution of a major international award with the status and prestige of a Nobel Prize, which would bring public attention to earth and environmental science. However, the Nobel Foundation regards itself bound by the terms of Alfred Nobel's will and therefore unable to consider creating a prize in any new category.

It is thus quite appropriate for Canada to take action on this matter and, as President, I am proud to have been part of the development of an initiative by Council to create an international award in earth and environmental science to be called "The Canada Prize". The initiative has gained the support of the Canadian Environmental Advisory Committee and has been adopted by the Royal Society of Canada. A considerable part of my time as President has been committed to developing and promoting this proposal, which will require substantial funding and the active involvement of the Canadian government.

As a geoscientist working in mineral exploration, I believe that the Brundtland objective of "environmentally sustainable economic development" is both a challenge and a responsibility. Furthermore, Canada has a special responsibility because of its vast, diverse and sensitive landmass, its extensive coastline, its natural resources and its prominence in global scientific co-operation. The time is right for Canada to assert international leadership and there has never been greater need for good science on which to base the enormous political decisions that will be required if the current predictions of man's ability to accelerate the natural processes of global change are proven correct.

Acknowledgements

It is with pleasure that I acknowledge the considerable support, advice and encouragement that I have received from the Executive. Particular thanks are due to the Executive Director, Dr. A.V. Morgan, and the Treasurer, Mr. D. VanDine, who carry most of the work load involved with the business of Council. I am also grateful to the past presidents, Dr. G.D. Garland, Dr. A.F. Laurin, and Dr. D. Organ for their valuable advice. Dr. C. Carbonneau, Executive Member, and Dr. G. Mossop, Vice-President, were instrumental in developing terms of reference for the study on Future Directions for the Geological Survey of Canada, and setting up the review committee. Dr. B.S. Norford, Foreign Secretary, and Mr. D.K. Mustard, Executive Member, conceived the idea of "The Canada Prize", and have supplied much of the effort in pursuit of this initiative.

The members of Council provide a considerable body of knowledge, experience and opinion. It has been a stimulating and productive experience to work closely with them. I am most appreciative of the guidance that I have received from Council and their strong support on many of the complex issues that have come before us.

I wish to record my appreciation for encouragement, tolerance and assistance from my colleauges with Pan Orvana Resources, particulary at those times when calls on behalf of Council coincided with Company activities.

Ian Thomson

REPORT OF THE EXECUTIVE DIRECTOR

Early in 1988 the office of the Canadian Geoscience Council was moved from the University of Alberta to the University of Waterloo, and is again housed in the Department of Earth Sciences. Linda McAndrews acted as Secretary during most of of 1988, and was replaced by the current Secretary, Sandra Foggerty, in late September.

In March the Department of Earth Sciences acted as the host of the "Toronto" Council Meeting, and members of Council had the opportunity of renewing acquaintances with two earlier Executive Directors of CGC, Ted Appleyard and John Greenhouse.

Most of the Council's most popular publications (the two "Careers" booklets, and other promotional materials) were in need of revision during 1988, and, despite lengthy discussions, work on renewing the subject matter did not commence until near year-end. I am confident that the promotional pamphlets, booklets, and other "profile-raising" endeavours will be completed during 1989.

Much of the office work revolved around clarification of the different representatives for the thirteen Member Societies and the Associate Members of CGC (Table 1). The organisation of the five meetings of the Directors (one by conference call) as well as Council meetings at Waterloo (64th) in March, St. John's (65th) in May, Vancouver (66th) in September and Ottawa (67th) in December also consumed much office time. The normal heavy mail load continued throughout the year.

Council discussions covered a number of subjects during the course of the year. Regular presentations were provided by the President, the Executive Director, the Treasurer and the Foreign Secretary on the state of Council affairs, the Council's finances, and certain international matters. Council members were regularly kept informed of GSC activities by reports from R. Price, E. Babcock, C. Findlay and R. Riddihough. Other reports were given on an irregular basis. A summary of topics reported in the Minutes of the respective Council meetings is presented below. Reports presented during 1988 include: R. & D. funding for the Earth Sciences in Canada (64-67); Technical Advisory Committee to AECL (64-67); Marine Geosciences and ODP (64-67); Lithoprobe (64-67); Canadian Continental Drilling Program (64,65,67); EdGeo (64,65,67); Advisory Committee to the GSC on Geochemistry (64,67); Advisory Committee to the GSC on Physics (67); Advisory Committee to the GSC on the Role and Future Direction of the GSC (67); Public Awareness of Science (64); Professional Registration (65,67); Canadian Mining Hall of Fame (65); NSERC Strategic Plan (65); Dues Increase (66,67); American Geological Institute (67). Copies of the Minutes may be obtained from the Executive Director.

In closing I would like to thank my predecessor, B.D.E. Chatterton (University of Alberta) for explaining the activities of CGC and in helping the smooth transition of office from Edmonton to Waterloo. I would also like to thank all members of Council, and particularly the Directors (Plate 1), for their understanding and patience while I struggled with the new role in the Council.

Alan V. Morgan

Plate 1.

Canadian Geoscience Council Executive, 1988

Back row (from left to right): D.K. Mustard (Executive Member), D. VanDine (Treasurer), B.S. Norford (Foreign Secretary), A.V. Morgan (Executive Director). Front row (from left to right): C. Carbonneau (Executive Member), G.D. Mossop (Vice President), I. Thomson (President), G. Garland (Past President).

REPORT OF THE TREASURER

CANADIAN GEOSCIENCE COUNCIL

A Non-Profit Organization Chartered under the Provisions
of Part II of the Canada Corporation Act

Table 2. Approved budget for 1 October 1987 to 30 September 1988, (Approved at the December 3, 1987 meeting)

1. OPERATING ACCOUNT	Approved 87-88
Revenue	
EMR: Operating Grant	$11,000.00
: CNC/IUGS	3,000.00
: Inter. Geol. Congress Grant	3,000.00
Provincial Grants	6,000.00
Society Dues	5,000.00
Publications	2,500.00
Interest	7,000.00
EdGeo Grants	0.00
Total revenue	$37,500.00
Expenses	
CNC/IUGS	$3,000.00
Inter. Geol. Congress	3,000.00
Quaternary Research Study	1,500.00
Marine Geoscience Ctte.	7,000.00
Registration Ctte.	2,000.00
Continental Drilling Ctte.	2,000.00
EdGeo	10,000.00
Office Expenses	5,000.00
Secretarial/Bookkeeper	6,000.00
Office Moving	1,000.00
Printing CGC Flyers	2,500.00
Printing Careers Booklet	19,426.09
Executive Travel	15,000.00
Council Meetings	3,500.00
Memberships	300.00
Miscellaneous	500.00
Total Expenses	$81,726.09
Revenue less expenses	($44,226.09)
2. GEOSCIENCE FUNDING STUDY — TRUST ACCOUNT	
Revenue	
Grants	$20,500.00
Interest	1,000.00
Total revenue	$21,500.00
Expenses	
Queen's Centre for Resource Studies	$46,000.00
D.K. Mustard Travel	1,600.00
Miscellaneous	5,000.00
Total expenses	$52,600.00
$ Not yet allocated	($31,100.00)

D.F. VanDine
Treasurer, Canadian Geoscience Council
4 December 1987

CANADIAN GEOSCIENCE COUNCIL

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Table 3. Statement of Revenue and Expenses, 1 October 1987 to 30 September 1988

REVENUE	**87-88**	**86-87**
Energy, Mines and Resources		
Operating Grant	$11,000.00	$11,000.00
Inter. Geol. Congress Grant	3,000.00	3,000.00
CNC/IUGS Grant	3,000.00	3,000.00
Provincial Grants	8,000.00	5,500.00
Membership Fees	5,037.43	6,683.74
Interest	6,868.39	6,683.74
Publication Sales	---	70.00
Total revenue	$36,905.82	$34,261.49
EXPENSES		
Inter. Geol. Congress	$3,000.00	$3,000.00
CNC/IUGS	3,000.00	3,000.00
EdGeo Workshops	10,000.00	5,600.00
Marine Geoscience Committee	2,239.30	---
Cont. Drilling Committee	438.72	---
Office Expenses and Services	10,112.61	9,283.57
Office Move	1,053.82	---
Printing of Flyers and Booklets	---	3,450.00
Council Meetings	2,021.34	980.45
Executive Travel	15,974.11	8,075.87
YSF, AGID and AASC Memberships	200.00	300.00
Miscellaneous	293.43	571.60
Total expenses	$48,333.33	$34,261.49
Excess of revenue over expenses	($11,427.51)	NIL

CANADIAN GEOSCIENCE COUNCIL

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Table 4. Balance Sheet, 30 September 1988

ASSETS	**87-88**	**86-87**
Victoria		
Current Account	$(911.91)	$2,155.32
Savings Account	1,418.88	5,749.80
Term Deposits	92,044.57	97,345.26
University of Waterloo		
Operating Account	1,322.38	(220.41)
Accounts Receivable	---	---
Total assets	$93,873.92	$105,029.97
LIABILITIES		
Accounts Payable	$5,845.37	$5,573.91
Total liabilities	$5,845.37	$5,573.91
Funds not yet allocated	$88,028.55	$99,456.06

D.F. VanDine
Treasurer,
Canadian Geoscience Council
18 November 1988

CANADIAN GEOSCIENCE COUNCIL

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Table 5. Statement of Revenue and Expenses, Geoscience Funding Study (Funds held in trust), 1 October 1987 to 30 September 1988

REVENUE	**87-88**	**86-87**
Grants	$16,500.00	$54,500.00
Interest	617.27	742.41
Total revenue	$17,117.27	$55,242.41
EXPENSES		
Queen's Centre for Resource Studies	$40,621.46	$29,378.54
D.K. Mustard Expenses	705.25	1,588.11
Total expenses	$41,338.71	$30,966.65
Funds not yet allocated	($24,221.44)	$24,275.76

CANADIAN GEOSCIENCE COUNCIL

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Table 6. Balance Sheet, Geoscience Funding Study (Funds held in trust), 30 September 1988

ASSETS	**87-88**	**86-87**
Victoria		
Current Account (Trust)	$539.42	$3,877.24
Term Deposits	4,056.71	20,398.52
Accounts Receivable	---	---
Total assets	$4,596.13	$24,275.76
LIABILITIES		
Accounts Payable	$4,541.81	---
Total liabilities	$4,541.81	---
Funds not yet allocated	$54.32	$24,275.76

D.F. VanDine
Treasurer,
Canadian Geoscience Council
18 November 1988

18 November 1988

TO: MEMBERS OF THE CANADIAN GEOSCIENCE COUNCIL

RE: Examination of 1987-1988 fiscal year-end statements of the 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 1988.

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 date 18 November 1988.

This report is not to be considered an audit, but rather an examination of its records by the undersigned as directed by the Council.

C.J. Yorath,
Member, GAC, CSPG

C. Peter Lewis
Member, GAC

CANADIAN GEOSCIENCE COUNCIL

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Table 7. Accounts held in trust by the Foreign Secretary, 30 September 1988

CNC/IUGS ACCOUNT -- STATEMENT OF ACCOUNTS		
Funds not yet allocated (1 October 1987)		$9,743.84
Revenue	$3,486.36	
Expenses	1,654.45	
Excess of revenue over expenses		1,831.91
Funds not yet allocated (30 September 1988)		$11,575.75
INTERNATIONAL GEOLOGICAL CONGRESS ACCOUNT STATEMENT OF ACCOUNTS		
Funds not yet allocated (1 October 1987)		$9,394.54
Revenue	$3,545.46	
Expenses	---	
Excess of revenue over expenses		3,545.46
Funds not yet allocated (30 September 1988)		$12,940.00

D.F. VanDine
Treasurer,
Canadian Geoscience Council
18 November 1988

REPORT OF THE FOREIGN SECRETARY

The Foreign Secretary acts as a link between the Canadian Geoscience Council and international non-governmental organisations with geoscientific activities that involve Canada. This liasion 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, December 7, 1988, 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 1988 meeting was attended by 20 representatives from most of the relevant earth science associations. Others sent written submissions.

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

Three regional meetings were held in 1988: a lithogeochemistry meeting in Randburg, South Africa; a symposium on integrated methods of geochemical exploration and a special short course on soil geochemistry at Spokane, U.S.A.; and symposia on geochemical exploration for the platinum group of metals and on world geochemical mapping (IGCP Project 259) in Baltimore, U.S.A. The 13th International Geochemical Exploration Symposium is scheduled for Rio de Janeiro, Brazil (October 1989), to be followed by similar meetings in Prague, Czecholovakia (1990), Reno, U.S.A. (1991), and possibly Beijing, China (1992). 1988 saw the compilation of a new bibliography on exploration geochemistry and a directory of geochemical services.

2. Association of Geoscientists for International Development (S.M. Barr)

Fourteen years after it was founded in St. John's, Newfoundland, AGID continues to be an active and effective international organization, providing a non-political and non-profit international forum for earth scientists concerned with the application of geosciences to international development.

A new executive was elected in September that included Wang Sijing (China) as President, Sandra M. Barr (Acadia University, Wolfville) as Vice-President (Developed Countries), and Jon Rau (Bangkok via UBC) as Secretary-Treasurer. In addition, Tony Berger, Head, International Relations Office, Geological Survey of Canada, continued to be involved in AGID in Trieste in October, to develop mechanisms for distributing useful scientific books and journals to less developed countries.

Main thrusts of AGID activities in 1988 were in the areas of small-scale mining, groundwater resources, natural hazards mitigation, and education. A significant proportion of direct funding continues to be provided by CIDA, but other countries and organizations give substantial direct and indirect support. AGID was co-organiser, together with the Geological Society of London, the Institution of Geologists and the Institution of Mining and Metallurgy, of an international conference on "Geoscience in Development", held at Nottingham (England), in September, and attended by more than 200 delegates from about 38 countries.

At the initiative of AGID, and with funding from the International Development Research Centre, Small Mining International has now established an office in Montreal at Ecole Polytechnique. This new organization will act as a global network to provide support for the small mining sector.

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

Canada is responsible for nine volumes. Technical editing has been completed and drafting illustrations and translation into French are well advanced for the volumes on *The Quaternary Geology of Canada and Greenland*, *The Continental Margin of Eastern Canada*, and *The Innuitian Orogen and Arctic Platform of Canada and Greenland*. Pubication of the first two volumes is expected about April 1989. The volumes on *The Cordilleran Orogen: Canada* and *The Sedimentary Cover of the Craton: Canada*, have been reviewed scientifically and are undergoing technical editing. Drafting of illustrations is well underway. Manuscripts for the volumes on *The Appalachian Orogen: Canada and Greenland* and *The Mineral Deposits of Canada*, are expected to be finished about mid-1989. The manuscript for *The Geology of the Precambrian Craton in Canada and Greenland* will be completed at the end of 1989. The summary volume has not yet been started.

North American gravity anomaly and magnetic anomaly maps at 1:5 million scale, were published in 1987. Regional geological maps at 1:5 million scale have been compiled for the Appalachian, Cordilleran, and Innuitian Orogens, the Cratonic Cover of Canada, and the Superior and Grenville Provinces of the Canadian Shield. The remainder of the Shield will be finished in January 1989, after which the Geological Map of Canada will be assembled. Regional tectonic maps at 1:5 million scale have been compiled for the Superior Province and the Appalachian Orogen and are being prepared for the Cordilleran and Innuitian Orogens.

4. International Association on the Genesis of Ore Deposits (L.M. Cumming)

The 8th Symposium of the International Association on the Genesis of Ore Deposits will be held at Carleton University, Ottawa, August 12-18, 1990. Drs. Bob Boyle (GSC emeritus, Ottawa) and Ian Jonasson (GSC, Ottawa) head an organizing committee with members from the Geological Survey of Canada, Carleton and Ottawa Universities. It is anticipated that 800 geologists will attend. Circular No. 2 will be distributed early in 1989 and will contain details of 10 to 12 field trips to various mineral belts in eastern, central, western, and northern Canada.

5. International Association of Hydrologists (R. Leech)

In May, the Canadian National Chapter held its second international conference at the Halifax Convention Centre, with major themes of the Hydrogeology of Cold and Temperate Climates and the Hydrogeology of Mineralized Zones. The conference was attended by hydrogeologists from Asia, Europe and North America. A month later, the French National Chapter held a symposium on Radioactive and Hazardous Waste in Orleans. The program was divided into four main sessions dealing with the following topics: (i) water balance in surface repositories according to the properties of the cover and the host rock, (ii) methods of hydrological exploration and site assessment, (iii) predictive hydrogeology in the medium and very long term. The final international meeting in 1988 was the 21st Congress of IAH held in Guilin, China, in October, with the theme of Hydrogeology of Karst Environments. Many exceptional papers were presented and many participants attended the field excursions to the spectacular, scenic karst areas in the Guilin region.

During 1988, four IAH Commissions were active: Hydrogeological Maps, Hydrology of Karst, Mineral and Thermal Waters, and Hazardous Wastes. The Commission on Hydrogeological Maps reported on a number of new developments in hydrogeological mapping around the world. Sheet E2 of the European map is now produced, as is the 1:5 million hydrogeological map of Australia. Progress is also being made on the UNESCO sponsored *Guidebook on Hydrogeological Maps* being prepared by the Commission. The prime initiative of the Commission on the Hydrogeology of Karst is a memoir on the *Hydrogeology of Selected Karst Regions*, which should be ready for publication in 1989. Also, a 4th volume of the *Karst Bibliography* will be available in early 1989. The Commission of Mineral and Thermal Waters held a meeting in Ladek Zdroj, Poland, in September, and will meet in Clermont Ferrand, France, in 1989. The Hazardous Waste Commission met in Czechoslovakia in May. The principal project of the Commission is a memoir on *Deep Waste Disposal Practice*, now in final draft.

IAH Council decided to perpetuate the memory of David Burdon by naming the new IAH Developing Countries Commission in his honour. The Commission includes both hydrogeologists from developing countries and also those actively working in such countries on aid and development programs. After initial meetings, its mandate was divided into two. First, the use of ground water for small-scale irrigation, and second, the hydrogeological effects due to urbanization in developing countries. One of the Commission's first undertakings will be to complete a monograph entitled *Prospecting and Exploration of Ground Water for Distributed Water Supply in Arid and Semi-arid Areas.*

Planning now has begun for the 4th Phase of the International Hydrological Program which will run from 1990 to 1995. IAH has submitted a number of proposals for work to be included in the 4th Phase. A number of meetings have been arranged for 1989: "Contaminant Transport in Ground Water" (Stuttgart, F.R.G.); "Symposium on Hydrogeological Maps - A Tool for Economic and Social Development" (Hanover, F.R.G.); and "International Symposium on Ground Water Management — Quantity and Quality" (Valencia, Spain).

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

IFPS is a federation of 24 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 only a quarter of IFP's palynologists are geologists.

Canadians on the 28-person Council are Colin McGregor, (GSC, Ottawa) Past-President, and David Jarzen (National Museum, Ottawa) Councillor, representing the Canadian Association of Palynologists. Another Canadian, R.A. Fensome, (GAC, Dartmouth) compiled the *World Directory of Palynologists* published in 1988 with financial support from EMR, IUGS and other sources. It contains data on more than 4,000 scientists.

The 7th International Palynological Congress was held in Brisbane, Australia, in August 1988, and 350 delegates participated from 27 countries. It included 39 symposia, and 9 multi-day excursions in Australia and New Zealand. The next Congress will be held in Aix-en-Provence, France.

7. International Geographical Union (H.M. French)

The Canadian committee has considerable input into national and international programmes dealing with global change. The committee has particular concerns for human response to global change and on the effects of our society accelerating global change. R.F. Tomlinson (consultant, Ottawa), organized an international conference on global databases held in May, in London, England. The Canadian Association of Geographers has formed a special committee to focus the association's interests and to provide effective communication with the Canadian contributions to the International Geosphere-Biosphere Programs that are led by the Royal Society of Canada.

A delegation of twenty geographers represented Canada at the 20th Congress of the International Geographical Union held in Sydney, Australia. L. Kosinski (University of Alberta) continues as IGU's Secretary General.

8. International Geological Correlation Program (A.J. Naldrett and D.G. Benson)

IGCP-CNC acts as a peer review group whose actions serve to stimulate participation in international geoscience and whose grants serve largely as seed money for new and ongoing projects. Requests for funding totalling $39,000 were received for 16 of the 27 projects with active Canadian participation. Grants totalling $15,100 were awarded, mainly toward travel costs for Canadians to attend foreign meetings and to help defray costs of Canadian meetings and workshops.

There are some 52 ongoing IGCP projects. During 1988, Canadian participation has included several noteworthy events. Newsletter 15 (January 1989) provides full details, including the following projects of special interest to Canadian geoscientists.

156 Phosphorites (*Phosphate Deposits*, vol. 2, to be published in 1989)
157 Early organic evolution and mineral and energy resources (final meeting held in 1988, conference report to be published in *Episodes*)
158 Paleohydrology of the Temperate Zone during the last 15,000 years (CJES to publish a portfolio of Canadian contributions in 1989)
196 Calibration of the Phanerozoic time scale
197 Metallogeny of ophiolites
199 Rare events in geology (Canadians participated in sessions held in Austria and USA)
215 Proterozoic fold belts
216 Global biological events in earth history (sponsored the 3rd International Conference on Global Bioevents, Boulder, USA, in May 1988, and co-sponsored the 5th International Symposium on the Ordovician System, St. John's, August 1988)

217 Proterozoic geochemistry (co-sponsored a symposium on the Middle Proterozoic, St. John's, May 1988; a conference on the tectonic setting of Proterozoic volcanism and related mineral deposits, Sweden and Finland, August 1988; a conference on Proterozoic mobile belts, China, September 1988)
219 Comparative lacustrine sedimentology through space and time (Canadians participated in conferences in China and Spain)
220 Correlation and resource evolution of tin and tungstein granites in South-East Asia and the western Pacific region (J.A. Roddick contributed a keynote paper at the final symposium, Japan, October 1988)
226 Correlation of manganese deposits to paleoenvironments (A Canadian participated in a symposium in China, August 1988)
233 Terranes in the Circum-Atlantic orogens (A Canadian participated in a conference in France)
245 Non-marine Cretaceous correlations
247 Precambrian ore deposits related to tectonic styles
250 Regional crusted stability and geological hazards (Canadians participated in meetings in Thailand)
254 Metalliferous black shales (a Canadian participated in meetings in China; comparative studies are underway on Pb-Zn deposits in Canada and China)
257 Precambrian dyke swarms (Canadians participated in meetings in Sweden)
260 The Earth's glacial history. Organized into three subgroups, one (Facies Models and Structural Settings) jointly led by Canadians (N. Eyles, Scarborough College, and G.M. Young, University of Western Ontario). Canadians participated in 1988 meetings in Brazil and U.S.A.
261 Stromatolites (Canadians attended a field workshop in Mauritania dealing with Precambrian forms)
264 Remote Sensing Spectral Properties (Canadians participated in meetings in Japan)

Eleven new projects were approved by IGCP in 1988:

256 Ophiolite genesis and evolution of oceanic lithosphere
259 International geochemical mapping (leader A.G. Darnley, GSC, Ottawa) Canadian plans (chairman, Peter Davenport, Newfoundland, Department Mines and Energy) were formulated at the GAC annual meeting in St. John's and Canadians were appointed to 3 of 5 committees established at the Goldschmidt Conference in Baltimore, U.S.A. A meeting in Helsinki discussed future plans with regional chairmen from USSR and Europe, and Arthur Darnley made a presentation on the project to the meeting of the International Geosphere-Biosphere Program in Sweden)
269 A global data base in sedimentary petrology
270 Lower Paleozoic events for the Gondwana genesis in Latin America
271 South American Paleozoic conodontology
272 Late Paleozoic and Early Mesozoic Circum-Pacific events
273 Archean cratonic rocks of Kasai
274 Coastal evolution in the Quaternary (A Canadian participated in the inaugural meeting in Amsterdam)
276 Paleozoic geodynamic domains and their Alpidic evolution in the Tethys
277 Phanerozoic oolitic limestones
279 Terranes in Latin America
280 The oldest rocks on earth

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

Activity continued amongst the various IMA commissions and Working Groups. The Commission on New Mineral Names is chaired by Joseph Mandarino (Royal Ontario Museum, Toronto), and the Commission of Applied Mineralogy by Tony Naldrett, (University of Toronto). Preliminary arrangements are being made for the 15th General Meeting which will be held in Beijing (China), June 28-July 3rd, 1990, and the 16th to be held in Italy in 1994. The Commission on Ore Mineralogy co-sponsored a Symposium on Gold Geology and Exploration in July (Shenyand, China). The Commission on Gem Materials is compiling the *Atlas of Gem Materials*.

Although IUGS has increased its financial contribution, IMA activities continue to be severely hampered by a lack of operating funds and various means of improving the situation are under continuing study.

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

IPA was active during 1988 in the collecting of data for the 5th Edition of the *Directory of Paleontologists of the World*, edited by Rex Doescher; and the *Directory of Paleontological Collections*, 1st Edition. These should both be published before the next International Geological Congress in Washington, July 1989. The organization also provided sponsorship and financial support for conferences held during 1988, and to be held in the future, including: the Third International Conference on Global Bio-Events: Abrupt Changes in the Global Biota (Boulder, Colorado, May 1988); the First International Conference on Rudists (Belgrade, October 1988); and the 8th International Bryozoology Conference (Paris, July 1989). During 1988, four new national organizations joined the association, Bolivia, Brazil, Korea and Spain, bringing the number of countries represented to 18.

11. International Permafrost Association (J.A. Heginbottom)

CNC-IPA is the Canadian Adhering Body to IPA which was established in 1983 by USA, Canada, USSR, and China; - the "Big Four" of permafrost. Today there are 16 members including Denmark, France, Germany, Switzerland, Japan, Netherlands, Italy, and the UK.

The V International Conference on Permafrost was held in Trondheim, Norway, in August 1988. Canadian participation comprised 51 delegates who gave some 50 oral and about 12 poster presentations.

At the conference, a new executive committee was elected: T.L. Péwé, USA, President; V.P. Melnikov, USSR, and Cheng Gurdong, China, Vice-Presidents; and J.R. Mackay, Canada, continuing as Secretary-General. NRCC is continuing to provide financial support for the Secretariat. Six Working Groups were established to cover the following topics:

1. Mountain Permafrost
2. Permafrost terminology
3. Foundations for structures in and on permafrost
4. Climatic change and permafrost
5. Periglacial environments
6. Permafrost data

Canadians have been nominated to all six working groups and R.O. van Everdingen, Calgary, and A.S. Judge, Ottawa, are chairman of WG2 and secretary of WG4 respectively. Finally, the issue of affiliation with international science and engineering organizations has been resolved. Formal applications have been submitted for simultaneous affiliation with IUGS and WFEO (World Federation of Engineering Organizations) in 1989.

The V Canadian Permafrost Conference is being organized at Québec City in June 1990, and will include the next meeting of the IPA Council. The VI International Conference on Permafrost will be in 1993 in China, at a location yet to be announced. The VII International Conference on Permafrost in 1998, may take place in Canada. An official invitation is being prepared for presentation at the meetings in China in 1993. The Permafrost Subcommittee of ACGR and the Cold Regions Geotechnology Division of Canadian Geotechnical Society have indicated they are prepared to co-operate in the organization of this important conference. In preparation, the membership of the CNC/IPA will be adjusted over the next five years, so that it can function as the Organizing Committee for the Conference.

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

The Canadian Geotechnical Society is a federally incorporated organization with close working relationships to the Engineering Institute of Canada and to the International Society of Soil Mechanics and Foundation Engineering. Internationally, the Society participated in symposia on landslides (Lausanne, Switzerland), on permafrost (Trondheim, Norway), and on engineering geology (Athens, Greece), and a workshop for young engineers (Rio de Janiero, Brazil). Canadians are active on 20 Technical Committees of the International Society and chair two of these. 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. CGS is strongly involved in the Canadian contributions to the International Decade for Reduction of Natural Hazards (1990-2000) sponsored by the United Nations.

13. International Tunnelling Association

Canada will host the 1989 Congress to be held under the auspices of ITA in Toronto, in September 1989. Co-hosts of the conference are the Tunnelling Association of Canada and the National Research Council. The organizing committee is chaired by J.A. Ramsey, Vice-President (East) of TAC.

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

Three Canadians participated in IUGG's Working Group on Global Change. D.E. Smyllie (York University) is a panel member of the International Study of the Earth's Deep Interior, 1987-1995, and several projects have been proposed by Canada within the study. R.A.F. Grieve (GSC, Ottawa) and W.R. Peltier (University of Toronto), were nominated to five-year terms on the CNC for the International Lithosphere Program. Gordon McBean (U.B.C.) serves on the Bureau of IUGG until the 1991 General Assembly in Vienna. China has offered to host the 1991 General Assembly in Beijing.

15. International Union of Geological Sciences

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

The 19th Lunar and Planetary Science Conference in Houston (U.S.A.) was co-sponsored by the Commission and was attended by 770 scientists from 19 countries. This annual conference is the premier international conference in planetary studies. The Commission organized small symposia on results and plans for exploration of Mars and Venus (Providence, U.S.A.) and on comparative planetology (Moscow, U.S.S.R.). A programme was initiated for collaboration and exchange of samples between Canadian, Soviet and American laboratories involved in studies of impact melt rocks, their ages, and contamination by projectiles. This programme focusses especially on impacts near contemporary to the Cretaceous-Tertiary Boundary and the question of periodicity in the record of craters on the Earth's surface. Several symposia will be co-sponsored at the International Geological Congress (Washington, U.S.A.), in July 1989.

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

The chief accomplishments in 1988 were the organization and sponsorship of three symposia: the "Second Symposium on Experimental Mineralogy, Petrology and Geochemistry" (Bochum, F.R.G.); a symposium "Composition and Processes of Deep-seated Zones of Continental Lithosphere", in honour of V.S. Sobolev (Novosibirsk, U.S.S.R.); and a symposium "Experimental Petrology Applied to Fluid Systems and Fluid-rock Interaction", at the International Congress of Geochemistry and Cosmoschemistry (Paris, France). Reports of the first and last of these symposia have been published in *Episodes*.

The Commission is organizing two symposia in conjunction with the July 1989 International Geological Congress (Washington, U.S.A.). These are "Metamorphism under Extreme Conditions" and "Physical and Chemical Process in Layered Intrusions."

15c. IUGS Commission for the Global Sedimentary Geology Program (D.A. St-Onge)

This IUGS Commission was established in 1987 and the Canadian Committee for the Programme in 1988 (Chairperson D.A. St-Onge, GSC, Ottawa), with the principal purposes of facilitating communication and co-operation between the Programme and Canadian scientists interested in the global aspects of sedimentology and stratigraphy. The Programme is in the process of establishing its major projects and at its initial meeting, CC/GSGP reviewed in detail, the Cretaceous Resources Events and Rhythms, the first project formally adopted by CSPG. To plan the co-ordinated research that is needed, CRER has established five working groups and two co-ordinating committees.

WG-1 - Sequence stratigraphy and sea level changes;
WG-2 - Sedimentation in oxygen deficient oceans;
WG-3 - Cyclostratigraphy;
WG-4 - Development and demise of carbonate platforms;
WG-5 - Paleogeography, paleoclimatology and sediment flux;
CC-1 - Geochronology
CC-2 - Data Management

The Canadian Committee reviewed these working groups in order to identify which parts of these ongoing projects are relevant to Canadian scientists. The Committee also identified Canadian scientists who would be alerted to the Program, and eventually, whose names should be forwarded to the international body for consideration as members or corresponding members of each working group and co-ordinating committee.

The Committee also decided to submit proposals for two new programmes for consideration by GSGP:

Architecture of non-marine basins
Permian sedimentary geology

The Committee will publicise its activities at the GAC 1989 meeting in Montreal and will attempt to organise a special session or symposium at GAC 1990, Vancouver. CC/GSGP also recognises the responsibilities of the Canadian Geoscience Community to share its expertise with sedimentologists in developing countries. In 1989, the Committee plans to formulate a specific proposal in this area with the co-operation of other interested scientists.

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. Nat Rutter (University of Alberta) continues as President of INQUA.

INQUA activities during 1988 have centred on the launching of a new journal - *Quaternary International*, which will be the ''official'' journal of INQUA. The plan is to publish four theme volumes a year, based on symposia and sessions of INQUA Congresses and meetings of various INQUA Commissions, Subcommissions and Working Groups. In addition, results of projects of other groups, such as IGCP, will be considered for publication in the Journal. The first two issues will deal with age dating methods and global change, respectively.

Another activity this past year has been involvement in the International Geosphere-Biosphere Program: a study of global change. INQUA is co-operating with the IUGS in outlining appropriate programmes for geologists and others to be involved during the duration of the program. In addition, INQUA has worked closely with the Special Committee on Global Change appointed by ICSU. Executives of INQUA have participated in global change meetings and workshops in Samedan, Switzerland, Beijing, China and Stockholm, Sweden.

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)

ILP's and CANDEL's impressive activities include:

Lithoprobe (which recently has launched a periodic news-letter)
Ocean Drilling Program
World Stress Map
Digital Broad Band Seismic Network
Canadian Continental Drilling Program (established under the leadership of Malcolm Drury, GSC, Ottawa)
Very Long Baseline Interferometry
Global Geoscience Transects Program
Global Change Project
Symposium on Thermal Regime and Tectonic Styles During the Precambrian (IGC, Washington, 1989; Co-chairman Euan Nisbet)

18. National Research Council's Commission for International Scientific and Technological Association

Topics dealt with at CISTA's August meeting included: Canadian participation in the International Geosphere-Biosphere Program for which The Royal Society of Canada has been assigned a leadership role; Canadian participation in the United Nation's International Decade for Natural Disaster Reduction; and the possibility of ICSU establishing a committee on science and ethics.

The 22nd General Assembly of the International Council of Scientific Unions met in September, in Beijing, China. A report was tabled from ICSU's Standing Committee on the Free Circulation of Scientists, emphasizing the international nature of science and the necessity for open exchange of data and the removal of obstacles to travel by scientists. Each ICSU country was asked to nominate a national correspondent for communication with the Standing Committee. A new Standing Committee on the Ethical Problems of Science was established. The goals of the International Decade for Natural Disaster were discussed and participation encouraged. Gordon McBean (U.B.C.) presented a review of climatic change and the global water cycle to a forum on the International Geosphere-Biosphere Program.

19. United Nations Educational, Scientific and Cultural Organization

Discussions took place to co-ordinate Canadian participation in the drafting of the Natural Science components of UNESCO's Third Medium-Term Plan. Canada has particular interests in the International Geosphere-Biosphere Program, the Decade for Natural Hazard Reduction as well as in the scientific components of educational programs.

20. Canadian National Committee for the International Union of Geological Sciences

Dr. Umberto Cordani of Brazil was elected as President of IUGS. Elections were underway for a new Executive Committee to serve 1989-1992 and CNC-IUGS participated in the nomination process for these. CNC-IUGS forwarded a motion to IUGS requesting that its Commission on Stratigraphy consider a re-examination of the subject of the Ordovician-Silurian Boundary CNC-IUGS, acting with delegated authority from the Canadian Geoscience Council, appointed the formal Canadian Delegation to the 1989 meetings of the International Geological Congress and of the Council of the International Union of Geological Siences. CNC-IUGS also formally congratulated Tony Berger on the high standards achieved by *Episodes*, the official journal of IUGS, under his editorship which concludes in 1989.

B.S. Norford

REPORTS OF THE MEMBER SOCIETIES

1. Association of Exploration Geochemists (AEG)

In 1988, membership increased by more than 10 % to a total of 1020. The AEG is represented in 53 countries, with Canadian residents comprising 30 percent of the membership.

Activity with respect to publications produced by the Association is summarized as follows:

a) *The Journal of Geochemical Exploration* is the official publication of the Association. Following negotiations with the publisher, Elsevier, the number of pages published annually is increased by approximately 25 percent to 1200, at no extra cost to the Association or its members.

b) *Explore* - the new bi-monthly 'glossy' format of the Association's newsletter has been widely distributed and very well received. Ten thousand copies of the November issue were published for distribution at appropriate meetings worldwide.

c) A new Membership Listing and Directory of Geochemical Services was published in September.

d) A new *Exploration Geochemistry Bibliography* was produced, which adds papers published from 1984-1987 to the previous bibliography.

Three regional meetings were sponsored by AEG in 1988:

- Baltimore - two of the 13 symposia constituting the V.M. Goldschmidt Conference were organized and sponsored by the AEG. Topics were i) Platinum Group Element Geochemistry; and ii) World Geochemical Mapping. Proceedings of both will be published in the Journal in 1989.
- Spokane, Washington - a symposium on integrated methods of geochemical exploration and a 'Soil Geochemistry' short course were organized and sponsored by the Association in conjunction with the Northwest Mining Association Annual Meeting. The symposium was well attended, and the 'Soils' course generated considerable interest amongst the many registrants.
- Randberg, South Africa - a regional meeting on lithogeochemistry was held in October.

Future International meetings are planned for:

- Brazil (Rio de Janiero) - 13th International Geochemical Exploration Symposium (IGES), to be held in conjunction with the Second Brazilian Geochemical Congress in October, 1989.
- Czechoslovakia (Prague) - 14th IGES and 5th Symposium on Methods of Geochemical Prospecting (a joint meeting of AEG and IAGC), August, 1990.
- United States (Reno, Nevada) - 15th IGES, April, 1991.
- Discussions are under way for siting of the 16th IGES in 1992, which will probably be held in China (Beijing).
- In addition, regional meetings will be held each year at sites yet to be arranged.

Regretfully, two regional Councillors died during the year - G. Louis Coetzee (South Africa), and R.W. Lewis (Brazil). Paul Taufen is the new Councillor for Brazil, but no new appointment to the South African position has yet been made. Australia is now represented by two regional Councillors (Brad Farrell and Graham Taylor). Alf Bjorklund remains Councillor for Northern Countries, and Etienne Wilhelm is the European Councillor.

Plans are in hand to establish a mechanism for donating issues of the Journal to Third World Countries.

Colin E. Dunn

2. *Canadian Association of Geographers (CAG)*

The annual meeting of the CAG was held in late May at St. Mary's University, Halifax. There were 360 registrants and a wide range of papers, in both physical and human geography, were presented. The CAG Award for Scholarly Distinction was made to Professor David Ley, University of British Columbia, for his work in urban social geography. Two awards were made for Services to the Profession: to Mr. G. Matthews, chief cartographer and lecturer at the University of Toronto, and to Professor R.W. Packer, University of Western Ontario. A new Executive was elected at the St. Mary's meeting. Dr. E.W. Manning, Environment Canada, Ottawa, was elected President for 1988-89, and Professor T. McGee, Institute of Asian Research, University of British Columbia, was elected Vice-President for 1988-89. Among several committees struck was one on the Professional Status of geographers, chaired by Professor I. Wallace, Carleton University.

The regional divisions of the CAG were also active in 1988. The Prairie Division met September 23-25 at the Rayner Centre, Lake Diefenbaker, Saskatchewan, and the theme of the meeting was "Prairies Geography in the 1890's." The Southern Ontario Division met at the University of Western Ontario, October 15-16. Four sessions devoted to permafrost studies were organized by Dr. C. Burn (UWO). At the St. Mary's meeting, a new regional division - the Atlantic Division, was founded.

The two journals of the CAG continue to function well. Editorship of the *Canadian Geographer* changed from Dr. D. Jannelle (UWO), to Dr. B. Barr (Calgary), and that of the *Operational Geographer* from A. Limbird (Calgary) to M. Bardecki and T. Lea (Ryerson). The CAG monograph series is now well advanced. The first volume, entitled *Canada's Cold Environments*, and edited by H.M. French and O. Slaymaker, will be finalized in 1989. Contracts have been signed with McGill-Queen's Press for publication of the series.

The 26th International Geographical Congress was held in Sydney, Australia, in August. There were 79 registrants from Canada, the third largest national group. Two geomorphology commissions were established, one on "Frost Action Environments" and the other entitled "Theory and Measurements in Geomorphology". Both have Canadian representatives (H.M. French, R. Bryan).

The 1989 annual meeting of the Association will be in Chicoutimi, Québec, May 27-June 2, 1989.

Hugh M. French

3. *Canadian Exploration Geophysical Society (KEGS)*

The Canadian Exploration Geophysics Society had, in 1988, a membership of just over 170. Principal activities consisted of once-a-month meetings at the Engineers' Club, Toronto, where matters of interest to exploration geophysicists (non-hydrocarbon) are aired.

Each meeting included a speaker of note:

Speaker	*Topic*
A. Spector	Confessions of an aeromagnetic interpreter
V. Singhroy	Remote sensing in a geophysical perspective
M. Berry	Geophysics at the G.S.C.
H. Seigel	The Scintrex Genie
T. Urquhart	Magnetic anomalies and geological processes
E. Schiller	Geophysics and gemology
E. Spooner	Shear-zone and stock-hosted Archean gold mineralization
J. Hanneson	Interpretation of IP/resistivity data

Allan Spector

4. *Canadian Geophysical Union (CGU)*

The Canadian Geophysical Union, with a membership of about 300, provides a focus for geophysicists in Canadian universities and government departments who study the composition and processes of the whole Earth, or of regions of it, through subdisciplines such as geodesy, seismology, geothermics, geomagnetism, gravity and geodynamics. Its members are not primarily interested in petroleum or mineral exploration as are those of its sister associations, the Canadian Society of Exploration Geophysicists of Calgary and the Canadian Exploration Geophysics Society of Toronto, respectively.

1988 was a banner year for the Union. It marked the unveiling of a new constitution that established the Union as an independent society which has retained strong ties with its former parents, the Canadian Association of Physicists and the Geological Association of Canada. Bylaws to the constitution allow members of these two societies to become associate members of CGU with the same privileges as those who join directly. Identical associate memberships are available to members of the Canadian Institute of Surveying and Mapping, the Canadian Meteorological and Oceanographic Society and the American Geophysical Union. A program of Founding Memberships was well subscribed.

CGU's annual meeting in Saskatoon was a great success. Technical sessions covered such topics as: Study of the Earth's Deep Interior, Lithoprobe, electrical methods, special processing of seismic data, the Williston Basin and general geophysics. The Williston Basin workshop focused a wide variety of subdisciplines on the planning for a (Lithoprobe?) transect of the region. CGU's J. Tuzo Wilson Medal for 1988 was awarded to E.R. Kanasewich for his outstanding contributions to crustal seismology. CGU also made its first award of a $500 prize for the best paper given at the meeting by a student, to J.M. Kendall of Queen's University. An anonymous donor provided the funds to allow the prize to be given at this and subsequent annual meetings.

P. Vanicek

5. Canadian Geotechnical Society (CGS)

The Canadian Geotechnical Society has, during the past few years, matured into a strong, independent Society. During 1988, the CGS had a membership of 1,268, the largest number in its history.

The Society is organized into four Divisions: the Soil Mechanics and Foundations Division (this Division will be officially active early in 1989), the Engineering Geology Division, the Rock Mechanics Division, and the Cold Regions Geotechnology Division. The CGS is a member of the Engineering Institute of Canada as well as the International Society for Soil Mechanics and Foundation Engineering and the International Association of Engineering Geology. The Society has been very active during the year and some highlights are listed below:

- Dr. J.I. Clark, Director, C-Core, Memorial University is the new Editor of the *Canadian Geotechnical Journal*.
- Mr. A.G. Stermac is the new Editor of the *Canadian News*.
- Plans are underway for the Third Revision to the *Canadian Foundation Engineering Manual*.
- Prof. A. Barcos, University of Manitoba, is studying the possibility of establishing a CGS Mentors Program as a technical program for our retired senior members.
- Geo Contributions is a separate, independent organization which was formed to support technical programs such as awards, scholarships, etc., for Geotechniques in Canada.
- The Society sponsored or co-sponsored seven national conferences, culminating in the 41st CGS Conference in Waterloo, Ontario, in October, 1988.
- International conferences included the 5th International Symposium on Landslides in Lausanne, Switzerland; the 5th International Conference on Permafrost in Trondheim, Norway; the International Association of Engineering Geology Conference in Athens, Greece, and the Young Engineers Workshop in Rio de Janeiro, Brazil.
- Dr. Mike Bozozuk represented the CGS at the Ottawa meeting of the Royal Society of Canada, called to develop plans for Canada's involvement in the International Decade for Natural Hazard Reduction.
- The Society presented a number of awards to its members. The R.F. Legget Award was won by Bill Trow, the CGS Prize for best paper in the Journal was won by R.M. Quigley, *et al*, the Roger J.E. Brown Award was won by J.F. Nixon, the Thomas Roy Award was won by Robert W. Gillham. In addition, the R.M. Hardy Keynote Address was given by John Cherry, and the CGS Colloquium was delivered by Peter Kaiser. An Undergraduate Student Thesis Award was presented to Walter Harapiak.
- Dr. N.R. Morgenstern is the new President of the Society.

John F. Gartner.

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 some 10,100, about 2,500 are members of the Geology Division. Division membership during 1988 was not greatly changed with respect to 1987.

The CIMM Annual General Meeting for 1988 was held in Edmonton, Alberta, from May 8 to May 12. The theme of the meeting was "The 1990's - Formulas for Success." The meeting included technical and plenary sessions, the trade show, and field trips. District, Regional, and Divisional meetings of CIMM are held throughout the year across Canada, and maintain the CIMM's place as the major professional geoscientific organization of the country. These meetings are an important part of the professional life of the Canadian mining and exploration industries because they are organized and held at the local level.

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

Tyson C. Birkett

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

It has been another active year for IAH-CNC on both the local and national scene. Our 20 local meetings held at various centres across the country were successful due to the large effort made by the regional representatives. Nationally, IAH-CNC membership has grown from 234 to 273 members over 1988. Five newsletters have been published by the national chapter over the year, and have been partially successful in publicizing on-going hydrogeological research carried out by Canadians in both the public and private sectors.

In May, IAH-CNC held an international symposium on the "Hydrogeology of Mineralized Zones" in Halifax. The symposium was held in conjunction with the Canadian Water Well Association. The meeting was most successful, with over 700 attending the joint meeting and about 100 attending the technical sessions arranged by IAH-CNC. Participants came from some eight countries in Europe and the far east. Planning is now underway for our next meeting which will be held in Calgary, (April 17 to 19, 1990), with a technical theme of "Subsurface contamination by immiscible fluids: investigation techniques and mitigation."

During 1988, "water" started to emerge as a significant political issue. To this end, IAH-CNC initiated several steps to ensure that groundwater was not forgotten in the water resources debate. Contacts were made with provincial and federal agencies to promote the use of IAH-CNC members to assist in policy development and review processes. As well, the association also contacted all Canadian universities to promote joint ventures towards increasing the awareness of groundwater issues and education.

R. Leech

8. Canadian Quaternary Association (CANQUA)

The Canadian Quaternary Association underwent a year of re-consolidation following the successful conclusion of the XIIth INQUA Congress in Ottawa. At the time of the Ottawa meeting membership in the Association was about 150, but by year end 1988 membership was up to 260. In March the Association became formally incorporated under Federal charter. In April the President became co-chairman of the Proxy Data Resource Group under the Royal Society of Canada's initiative on Global Change. The Association will be gathering data on all Quaternary workers interested in contributing to the Canadian portion of IGBP. In May presentations were given at the Royal Society's Global Change Symposium at St.John's, and talks began with GAC about the possibility of using a GAC Nuna Conference as a vehicle to discuss proxy data in Canada.

In June members of CANQUA Council met with AMQUA Council at Amherst, Massachusetts, to discuss the final arrangements for the 1990 joint CANQUA/AMQUA Meeting to be held at Waterloo. This process was finalised by a further meeting with AMQUA at the November meeting of GSA in Denver.

The *CANQUA Newsletter/Bulletin* was produced in April and September under the Editorship of Jon Driver at Simon Fraser University, and members continued to receive three issues of *Géographie physique et Quaternaire*, the Association's official journal. Ed Sado, the Secretary-Treasurer, has been gradually organising CANQUA membership and financial affairs on D-Base, and this has allowed an increase in efficiency in the Association. In September Council members met with the Executive of AQQUA (the Québec Quaternary Association) in Rimouski, and I hope that this meeting will encourage further contacts between the two Quaternary Associations.

Approaching year end the Association made informal contacts with DEUQUA, the German Quaternary Association, about a field trip to the classical alpine sections. Informal talks were also initiated with the Canadian Geological Foundation about the possibility of directing CANQUA donations and endowments to CGF. Over the longer term CANQUA is preparing for the 1991 XIIIth INQUA Meeting in Beijing through the auspices of CNC-INQUA. In the near future CANQUA members are looking forward to the 1989 biennial Meeting to be held in Edmonton, and to revitalised efforts in Quaternary affairs through the initiatives of Global Change and the International Decade for Natural Hazard Reduction.

Alan V. Morgan

9. The Canadian Society of Exploration Geophysicists (CSEG)

The Canadian Society of Exploration Geophysicists had an active year, in which membership rose to 1850 members, up from 1800 the previous year. Geophysical activity slumped during the last quarter due to lower oil prices and the commencement of the phasing out of the CEDIP program.

The CSEG National Convention "Exploring New Horizons", was a success, with 1500 delegates in attendance. The convention, held May 3-5, featured two days of papers, short courses, and a highly informative exhibits floor.

During the year, ten technical luncheons were held, with attendance averaging 500. The CSEG best paper award was presented to the speaker at one of the technical luncheons: John Pierce, of Petro-Canada, Calgary, for "Seismic Stratigraphy in a Pelagic Environment: ODP Drilling on Broken Ridge (Indian Ocean)."

The CSEG executive, together with its governmental affairs committee, continued to consult with the Federal and Provincial governments on legislation proposals and the ongoing CEDIP programs.

The Canadian Journal of Geophysics, the society's scientific publication, for the first time, published two issues. In addition, the "*Geophysical Atlas or Western Canadian Hydrocarbon Pools*" neared completion, with publication due in May, 1989.

The CSEG was represented at the European Association of Exploration Geophysicists annual meeting at the Hague by both the executive and by several members who delivered papers. The SEG Annual meeting in Anaheim, California, was attended not only by the four CSEG members appointed to the SEG council, but by a large number of authors, exhibitors and delegates.

The scholarship committee awarded 33 scholarships to students of geophysics at universities and technical institutes across Canada. In addition, two scholarships were awarded to students in India. This program, administered by the CSEG, is funded through corporate donations from exploration companies, the service industry, and the CSEG.

R.M. Lundberg

10. Canadian Society of Petroleum Geologists (CSPG)

The Canadian Society of Petroleum Geologists is a national society with common interest in sedimentary and petroleum geology. In 1988, the CSPG completed its 60th successful year in existence. The society has 3800 members, an increase of 5 % over 1987, despite a continuing severe downturn in the petroleum industry.

Each year, the society publishes four issues of its journal, the *CSPG Bulletin*, and eleven issues of its newsletter, the *Reservoir*. With the exception of two paid staff members, the society's activities are carried out by a group of more than 400 volunteers, organized into more than ninety committees, divisions, and liaisons. The society continued with its outstanding financial management in tough times. Through the efforts of many volunteers, we were able to show a surplus of $50,000 over the year.

In 1988, the CSPG was involved in several conferences with strong international participation - an expanded core conference on ''Sequence Stratigraphy'', a conference on ''Geology and Petroleum Markets'', and a symposium on Extensional Tectonics in the North Atlantic, part of the GAC/MAC/CSPG Joint Conference, St. John's, Newfoundland.

During 1988, the society completed Memoir 13 - *Canadian Reef Inventory*, Memoir 14 - *Devonian of the World*, and Memoir 15 - *Sequences, Stratigraphy, Sedimentology: Surface and Subsurface*, and with the Geological Association of Canada and the Palaeontographics members, another volume of *Palaeontographica Canadiana*.

Society activities include promoting science and technology, both to geoscientists and to the general public. The society supports education through funding and prizes at Youth Science Fairs, awards at student conferences, awards for best theses in sedimentary and petroleum geology, graduate student scholarships, national circulation of geoscience displays, a variety of national lecture tours and a public science address. In addition, each year the society brings a third-year geology student from every university across Canada to Calgary for a week-long student-industry field trip.

This year, the CSPG awarded its prestigious R.J.W. Douglas Medal to Bruce V. Sanford of the Geological Survey of Canada. Honorary Membership went to Bernard P. Tissot of the Institut Francais du Peirole. The Link Award for the best luncheon speaker went to Hans Machel, University of Alberta, and the Medal of Merit, for the best Canadian Petroleum Geology paper, went to Federico Krause, University of Calgary, and co-authors H. Collins, D. Nelson, S. Machemer, and P. French. President's awards for outstanding service to the society and its objectives, went to Tony Tankard of Petrocanada, Dale Leckie of the Geological Survey of Canada, and David James of Esso Resources, and a special President's award went to Horst Heise of the Calgary Herald. Best Ph.D. thesis award went to Iain Muir, University of Ottawa, with honourable mention to Benoit Beauchamp, University of Calgary, and the best M.Sc. thesis award went to Eric LeGresley, Queen's University.

M. Cecile

11. Canadian Well Logging Society (CWLS)

Despite the slump in our industry, the Canadian Well Logging Society had an interesting year under the direction of an enthusiastic Executive headed by President Don Zver.

Patti Shannon in her capacity as Vice-President set us up with some excellent (and occasionally refreshingly unusual) luncheon meetings. These included a higher number of talks by oil and gas company representatives instead of the more familiar service company speeches, which added variety. The best Technical Luncheon Presentation Award was made to Ms. Sandra Kerford, with Esso Resources Canada, for her talk on ''The Application of Time-Series Analysis to Wireline Logs.''

A special Service Award was presented to Dave Curwen in recognition of his efforts in representing the Society's views on the APEGGA/CWLS Liaison Committee. His time on that committee culminated in a decision which represented the opinion of the majority of the CWLS's membership and thus may be considered a success.

Two new committees were formed during the year to address the needs of the 12th Formation Evaluation Symposium (September 25th-28th, 1989), and to set up a standard floppy disc format for storing well data. These committees are functioning very well under the respective chairmanships of Harold Kowalchuk and Case Struyk.

At year end, our total membership stood at 626, plus 51 corporate members - little change from the previous year.

Finally, the Society's thanks go out once again to John Lishman for his services as the CWLS representative on the Canadian Geoscience Council.

Richard J. Bishop

12. Geological Association of Canada (GAC)

The Geological Association of Canada had a progressive year during 1988, benefiting from several initiatives taken in 1987, e.g., moving of publications - distribution centre and contracting an Advertising Manager. Deliberations on the affairs of the Association were carried out at joint meetings of Executive and Council at Montreal (twice) and St. John's, and separate Executive meetings were held in Drumheller and Toronto. At all of the Council meetings, activities of GAC's Committees, Divisions, Sections and Associated Societies were reviewed, generally with a representative in attendance.

Membership in the Geological Association of Canada, including all categories, stood at 3002 as of December 31, 1988.

During the Annual Meeting in St. John's, J.M. Hamilton replaced G.V. Middleton as President, and D.J. Tempelman Kluit became Vice-President. J.G. Malpas and R.F. Blackwood continued as Treasurer and Secretary respectively.

The Annual Meeting, which is normally held in conjunction with the Mineralogical Association of Canada, was a tripartite affair this year, as it included the first joint meeting with the Canadian Society of Petroleum Geologists. The GAC-MAC-CSPG Joint Annual Meeting was hosted by the Newfoundland Section of the Geological Association of Canada in St. John's. General Chairmen, John M. Fleming (GAC) and A.J. Tankard (CSPG) and their committee are to be congratulated on a well-attended, highly successful meeting. At the St. John's meeting, GAC honoured several geoscientists with the presentation of the Association's medals. Receiving the awards this year were: Harold Williams - LOGAN MEDALIST; Ronald M. Clowes - PAST PRESIDENT'S MEDALIST; John G. Fyles- J. WILLIS AMBROSE MEDALIST. The DUNCAN R. DERRY MEDAL, selected by the Mineral Deposits Division and awarded by GAC, went to Eric A. Swanson.

The Publications Committee, under Chairman Bob Baragar, co-ordinates all of GAC's publications. A new Special Paper became available in 1988, having been printed late in 1987: *Mafic Dyke Swarms* (Special Paper 34) was edited by H.C. Halls and W.F. Fahrig. Typesetting was completed on Special Paper 35 - *Quaternary Evolution of the Champlain Sea Basin* - by the end of 1988; it will be printed early in 1989. *Ore Deposits Models*, Number 3 of GAC's Geoscience Canada Reprint Series, was published in May and released at the Annual Meeting in St. John's; it was edited by R.G. Roberts and P.A. Sheahan. Number 4 in the series, *Diagenesis*, is currently in production. One issue of the GAC - CSPG-sponsored *Palaeontographica Canadiana* was published in 1988. Number 5 in the series, entitled *Early Ordovician (Arenig) Graptolites of the Cow Head Group, Western Newfoundland, Canada*, was written by S.H. Williams and R.K. Stevens.

The eminently popular *Geoscience Canada* was published quarterly during 1988 under Editor Andrew Miall and Managing Editor Monica Gaiswinkler Easton. GAC's celebrated newsletter, *GEOLOG*, edited by Michael Easton and Monica G. Easton, had Winter, Spring, Summer and Fall issues during the past year.

A slight change was made in GAC's Executive Committee structure with the addition to the Committee of the Chairperson of the Program Committee. This, of course, will facilitate communications in the important area of scientific programs. The other Executive Committee members are the Past-President, President, Vice-President, Secretary, Treasurer, Chairman of the Finance Committee and Chairman of the Publications Committee.

During the past year, a new term-life insurance plan was negotiated for members. It offers improved rates and coverage over the old plan, but members may continue with their existing policies if they so desire.

The Canadian Geophysical Union has been independent of GAC since November, 1987. Following this, GAC Council thought it necessary to form a new Geophysics Division in order to maintain a strong geophysical component to GAC's program. At a meeting of interested people on May 25 (at the St. John's '88 Annual Meeting), a motion was passed, and later endorsed by GAC Council, that a survey be undertaken by an appointed committee to determine the views of GAC geophysicists on the proposed constitution and related matters of the new Geophysics Division. Survey questions have been compiled and will be circulated in 1989.

A major initiative taken by Council during the past year was the instituting of research conferences. A comprehensive set of guidelines has been drawn up by the Program Committee to ensure every possible chance for scientific and organizational success in this very important new GAC venture. The conferences will be known officially as "GAC NUNA Research Conferences." (The word NUNA is Inuktitut for "earth", and it was proposed by Godfrey Nowlan). At the May Council meeting in St. John's, approval was given to a proposal by J.D. Aitken for the first GAC NUNA Research Conference, entitled "Late Proterozoic Rifting, Glaciation and Eustasy", to be held September 9-14, 1990, at Invermere, British Columbia. All involved are working hard to make this another GAC success story.

R.J. Blackwood

13. Mineralogical Association of Canada (MAC)

The Mineralogical Association of Canada has had a successful year and continues to maintain a sound financial footing and an active scientific program.

The 33rd annual meeting of MAC was held May 23-25th, 1988, at the Memorial University of Newfoundland in St. John's, in conjunction with the annual meetings of the Geological Association of Canada and the Canadian Society of Petroleum Geologists. Prior to the meeting was the 14th MAC Short Course: Heat Flow, Metamorphism and Tectonics, organized by Euan Nisbet and Gary Quinlan. This course provided an introduction to the study of heat transfer in the crust and upper mantle as it is recorded in rocks accessible to the geologist, and the material was published in the Short Course Notes series of the Association. MAC also sponsored two symposia at the meeting: "Progress in Analysis by ICP-MS", organized by Dave Strong, provided a state-of-the-art overview of this promising technique in the earth sciences; "Incompatible-element Enriched High-level Felsic Rocks", organized by Randy Miller, provided a vehicle for the discussion of this fast-moving and economically significant field. Preceding the annual luncheon, retiring President Hugh Greenwood gave the Presidential Address, a thought-provoking presentation on models and modelling. Following the luncheon, the awards of the Association were presented. The Past-President's Medal, the highest award of the Association, was presented to Steve Scott of the University of Toronto, in recognition of his record of outstanding research on the mineralogy and geology of base-metal sulphide deposits. The Leonard G. Barry medal, inaugurated last year to recognize distinguished service to the Association, was awarded to E.W. Nuffield, formerly of the University of Toronto, in recognition of the pivotal role he played in the founding of our Association. The Hawley Medal is given each year to the author of the paper judged to be the best of those published in the preceding year's volume of the Canadian Mineralogist. This year, it was won by David O'Hanley of the University of Minnesota (currently at the ROM in Toronto) for his paper on "The construction of phase diagrams by means of dual networks."

The Canadian Mineralogist is the quarterly journal of the Association, and continues to expand its coverage of all the fields of mineralogy. A notable feature of this year's volume was a special issue on seafloor hydrothermal mineralization; this resulted from the symposium on this topic held in Montreal in 1987 under the sponsorship of IREM/MERI. The Association has also initiated a Visiting Lecturers Program, whereby distinguished scientists present a synthesis of some topic of current interest, aimed at senior undergraduate and graduate students at universities across Canada.

Frank C. Hawthorne

REPORTS OF THE ASSOCIATE MEMBERS

1. Associate Committee on Geotechnical Research of the National Research Council of Canada (ACGR-NRC)

The Associate Committee on Geotechnical Research was established in 1945 to coordinate and stimulate research on the engineering and physical aspects of the terrain of Canada, and to advise the President of the National Research Council of Canada on research needs of national concern. The objectives are carried out through subcommittees on Marine Geotechnical Engineering, Permafrost, Snow and Ice, Urban Engineering Terrain Problems, and a Task Force on Soil Barriers. In order to achieve its objectives, the ACGR organizes workshops and seminars, and produces manuals, handbooks and other publications. Most of the publications are issued in the Technical Memorandum series of the ACGR.

Due to financial constraints and changes in its priorities, the ACGR revised its Subcommittee on Soil and Rock into a Task Force on Soil Barriers, and disbanded its Subcommittee on Peatlands. A Task Force established to prepare a ''Wetlands Engineering Handbook'' was also disbanded.

In co-operation with the Canadian Geotechnical Society, the Committee co-sponsored two cross-Canada lecture tours by Dr. F.H. Kulhawy, Cornell University, USA, and Dr. R. Frank, Paris, France.

The Committee witheld a decision to organize a Canadian Geotechnical Research Association because there was little justification to establish one at this time.

Work is in progress to translate the *Peat Testing Manual* (TM 125) into French.

The Task Force on Soil Barriers published the Proceedings of a Workshop on Ground Water Contamination (TM 143).

The Subcommittee on Urban Engineering Terrain Problems started preparing two technical manuals: ''*Snow Removal and Ice Control in Urban Areas*'', and ''*The Trench Reinstatement (Backfilling) Manual.*''

The ''*Urban Terrain Problems*'' bulletin was published and mailed to all municipal government offices in Canada.

The Subcommittee on Snow and Ice presented a graduate course on ''Remote Sensing'' at York University. It was so successful that it will be run every two years.

This Subcommittee prepared research proposals on the prediction of avalanches and the development of a monograph on the engineering aspects of ice.

A workshop on ice forces, co-sponsored with C-core was held in St. John's. About 60 people attended.

The Subcommittee on Marine Geotechnical Engineering organized a workshop to compare the predicted with the measured performance of Gulf's Molikpaq, a sand-filled steel drilling caisson founded on a subsea berm in the Beaufort Sea, which was subjected to an extreme ice loading event in April, 1986. Several Canadian and American organizations participated in the study, which was funded by the Department of Supply and Services, and the National Science Foundation of the USA.

A program was initiated to survey the marine geotechnical research activity in Canada.

The Permafrost Subcommittee published the ''*Glossary of Permafrost and Related Ground Ice Terms*'' in English and French (TM 142 and TM 142F).

Work on preparing the manual for testing permafrost soils was continued.

A Task Force was established to consider revising the book ''*Permafrost, Design and Construction*'', edited by G.H. Johnston.

ACGR-NRC co-sponsored with the US Permafrost Committee, the workshop ''Climate Change and its Impact on Permafrost'', in St. Paul, Minnesota.

Michael Bozozuk

2. Committee of Provincial Geologists (CPG)

The Committee consists of the chief geologists, or their equivalents, of the provincial and territorial geological surveys in Canada. During 1988, the Committee met twice; during the Prospectors and Developers Association of Canada (PDAC) Convention that was held in Toronto in March, and in August during the Mines Ministers' Conference in Quebec City.

The Committee provides a 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.

Volume five of the *Provincial Geologists Journal* was published. The Journal is a prime source for provincial and territorial geoscience organization charts, geological survey expenditures, geological program highlights, hard rock drillcore programs and other provincial geoscience information.

The Committee organized the provincial Activities Session at the Prospectors and Developers Association of Canada Convention, where member representatives presented the papers listed below.

- Gold Mineralization in Newfoundland - J. Tuach, Government of Newfoundland and Labrador, Department of Mines.
- Vegetation Geochemistry and Gold Exploration in Manitoba - M.A.F. Fedikow, Geological Services Branch, Minerals Division.
- Gold Skarns in British Columbia and the Global Gold Rush - G.E. Ray (speaker), A. Ettlinger and G.L. Dawson, B.C. Ministry of Energy, Mines and Petroleum Resources.
- Recent Developments in Precious Metal Exploration in New Québec - T. Clark, M. Belanger (speaker),D. MaMothe, L. Kish and P. Marcoux, Ministère de l'Energie et des Ressources.
- Gold Deposition Related to Crustal Thickening along Major Tectonic Boundaries in New Brunswick -A.A. Ruitenberg (speaker), and L.R. Fyffe, N.B. Department of Natural Resources and Energy.
- The Role of Geology in Assisting Archean Gold Exploration in Ontario - A.C. Colvine (speaker) and Staff, Ontario Geological Survey.
- Uranium-Gold-Platinum Metal Mineralization in the Beaverlodge District, Saskatchewan - T. Sibbald, Saskatchewan Department of Energy and Mines.

The committee reviewed its terms of references and submitted an updated version to the Mines Ministers for their approval.

Liaison was maintained with the Prospectors and Developers Association of Canada, with the Canadian Geoscience Council and the Geological Survey of Canada, the latter through the National Geological Surveys Committee (NGSC). Suggestions made to the Committee of Provincial Geologists by the PDAC led the NGSC to establish two technical subcommittees: one on *Aeromagnetic Contract Survey Standards* and one on *Aeromagnetic Data Base Standards*. Through the NGSC, the Committee is contributing to the standardization of map symbols and hopes to publish a list of symbols common to all provinces and the GSC and lists of symbols unique to each province in the *Provincial Geologists Journal*, and to update these lists yearly. In its brief to the Mines Ministers Conference, the Committee drew attention to the impact of the advent of GeoScience Information Systems (GSIS) on the future of geoscience activities. Through the NGSC, the Committee participated in a GSIS workshop at which national co-ordination of GIS development and implementation was discussed.

During 1988, Dr. Andre Laurin, who represented Quebec on the Committee, resigned. The Committee expresses its gratitude to Andre for his constructive contributions over the many years that he was a member.

Jan Boon

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

This section provides a report for enrollment and graduation in Canadian Earth Science Departments for 1987-1988. The data are presented in Tables 8-13 and Figures 1 and 2. Data from 16 Geography Departments have been collected by P.G. Johnson and are presented in Tables 14-19. These latter data have not been plotted in Figures 1 and 2.

Methods of reporting and calculation are presented as footnotes to the tables. Where Departments did not report, last year's figures are used to provide a better estimate of totals.

There are significant drops in undergraduate graduations and enrollment, but some increases are noted. For example, B.Sc.'s, graduated in Geology dropped 29 % (1986-87), but B.Sc.'s graduated in Geophysics were up 11 % (Table 3). Graduate students showed mixed results, but PDF's and Research Associates are up 32 %.

Full-time faculty have shown a slight increase from 508 to 531 (Table 8, Figure 2). URF's increased from 16 to 19 and Adjunct Professors increased from 100 to 103. Secretaries and administrative assistants, technicians, instructors and demonstrators showed slight decreases.

Data from Geography Departments are reported separately and are presently difficult to integrate with data from other earth science departments. Twelve departments reported in 1986-87 and there is a slight increase in numbers reporting this year. Several large departments have still not reported.

A.E. Beck received a communication from P. Vanicek of the Department of Surveying Engineering at U.N.B.. He suggested that data from Survey Engineering should be included in the survey and that Universities of Laval, Toronto and Calgary should be contacted. I will make an attempt to send the questionnaire to these Departments next year.

I wish to thank Mrs. Beverly Cridland for her assistance in compiling these figures.

E.D. Ghent

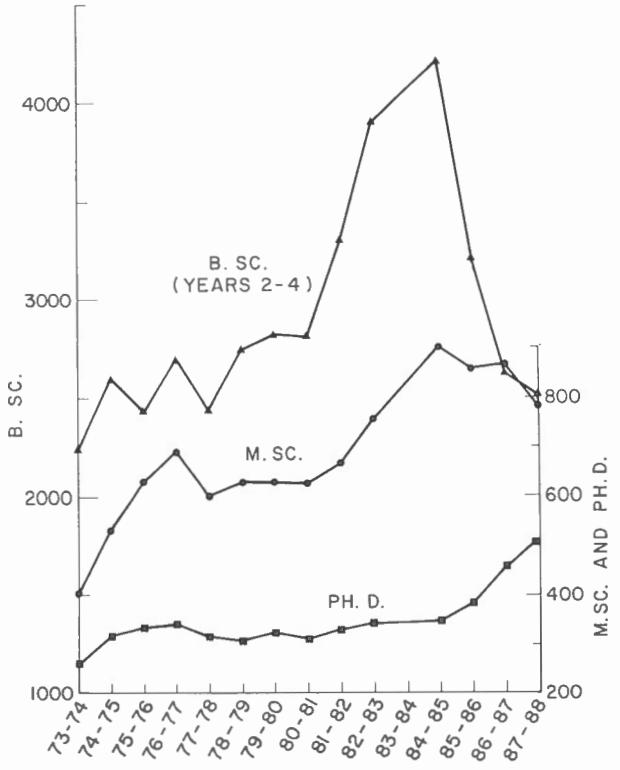

Figure 1. Student registration in Canadian Earth Science Departments.

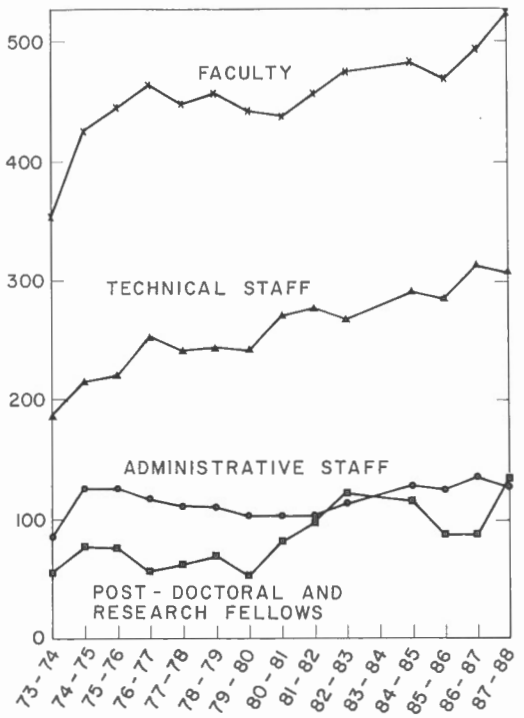

Figure 2. Staff numbers in Canadian Earth Science Departments.

Table 8. Student and staff numbers in Canadian Earth Science Departments, 1985-1988.

Group	Year	Atlantic	Quebec	Ontario	Western	Total
All students taking	85-86	1363	335	3095	2109	6902
1st year courses and	86-87	1291	667	3171	2476	7004
service courses	87-88	909	300	2946	2360	6515
		%F	%F	%F	%F	%F
2nd year majors:	85-86	151 20%	230 26%	300 23%	323 18%	1004 20%
Arts & Science	86-87	92 30%	156 23%	282 23%	253 22%	783 23%
and Engineering	87-88	111 22%	141 28%	209 26%	190 23%	651 33%
3rd year majors:	85-86	116 21%	189 27%	339 22%	341 18%	985 21%
Arts & Science		*0	*48 24%	*65 27%	*15 20%	*128 25%
and Engineering	86-87	100 18%	130 33%	321 22%	288 17%	839 21%
		*8 0%	*94 26%	*38 26%	*1 0%	*141 24%
	87-88	84 31%	62 29%	224 23%	319 24%	689 24%
		*0	*133 16%	*10 5%	*2 0%	*153 15%
4th year majors:	85-86	122 20%	169 24%	358 24%	451 14%	1100 19%
Arts & Science	86-87	112 20%	70 16%	313 26%	380 17%	875 21%
and Engineering	87-88	107 14%	75 19%	262 18%	219 13%	663 16%
M.Sc. (full-time	85-86	99 25%	175 21%	340 24%	242 22%	856 24%
and part-time)	86-87	103 30%	195 24%	333 24%	234 24%	865 25%
	87-88	121 29%	188 22%	318 21%	136 24%	763 23%
Ph.D. (full-time	85-86	46 22%	58 14%	175 21%	105 14%	384 18%
and part-time	86-87	50 26%	76 14%	198 19%	134 9%	458 16%
	87-88	87 18%	76 12%	208 18%	109 13%	480 16%
PDF and Research	85-86	3/8	4/20	4/34	6/9	17/71
Associates* *	86-87	1/17	5/15	2/31	4/15	12/78
	87-88	16/20	10/13	3/45	6/20	35/98
Faculty, full-time* *	85-6	82/3	79/1	178/1	128/0	467/5
	86-87	83/2	85/0	190/1	143/4	501/7
	87-88	93/11	82/0	210/17	127/0	503/28
URF's* *	85-86	2	2	7	1	12
	86-87	3	5	5	3	16
	87-88	4/0	1/5	3/4	1/1	9/10
Adjuncts* *	85-86	15	2	36	2	55
	86-87	8	13	55	24	100
	87-88	5/6	7/9	44/3	21/8	77/26
Secretaries and	85-86	17/3	24/2	37/9	31/3	109/17
Administrative	86-87	17/3	26/3	34/10	39/5	116/21
Assistants* *	87-88	17/3	28/1	39/11	28/3	112/18
Technicians* *	85-86	32/27	25/14	60/53	48/26	165/120
	86-87	35/26	27/24	68/43	59/32	189/125
	87-88	37/27	29/6	82/34	45/36	193/117
Instructors and	85-86	6/0	12/1	7/0	9/0	34/1
Demonstrators* *	86-87	4/0	10/0	22/0	13/0	49/0
	87-88	10/0	11/0	9/2	8/0	38/2

* Three year B.Sc. - final year
* * Divided into Univesity funded and non-university funded positions, respectively
%F Second figure for majors and graduate students is % female

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 ralistic assessment of trends.

When majors and graduate students were not separated into male and female, an average value from across Canada of 23% female was used.

UNIVERSITY EARTH SCIENCE DEPARTMENTS RESPONDING TO POLL

Atlantic
Acadia
Cape Breton
Dalhousie
Memorial
Mt. Allison
New Brunswick (Fredericton)
New Brunswick (St. John)
St. Francis Xavier
St. Mary's

Ontario
Brock
Carleton
Guelph
Lakehead
McMaster
Ottawa
Queen's
Toronto
Waterloo
Western Ontario
Windsor
York

Quebec
Concordia
Ecole Polytechnique
Laval
Laurentian
McGill
Montreal
Quebec a Chicoutimi
Quebec a Montreal

Western Canada
Alberta
Brandon
British Columbia
Calgary
Manitoba
Regina
Victoria

Table 9. Summary of student data for 1987-1988, by program, gender, region and VISA or NON-VISA.

Region	B.Sc.*		M.Sc.		Ph.D.		M.Sc. + Ph.D.		
(a) Enrolled (1987-1988)	All	%F	All	%F	All	%F	All	%F	%Visa**
Atlantic Region	311	24%	147	29%	103	17%	250	24%	31%
Quebec	287	22%	188	23%	76	12%	264	20%	20%
Ontario	719	22%	320	21%	213	18%	533	20%	15%
Western Canada	1086	23%	134	24%	111	13%	245	19%	25%
Total	2503	23%	789	23%	503	16%	1292	20%	21%
(b) Graduated (1986-1987)									
Atlantic Region	102	19%	14	50%	8	38%	22	45%	14%
Quebec	170	27%	77	17%	19	5%	96	14%	12%
Ontario	280	25%	95	26%	16	12%	102	25%	20%
Western Canada	219	24%	65	23%	22	14%	87	21%	31%
Total	771	24%	251	24%	65	14%	316	22%	20%

* Years 2-4 only for B.Sc. enrollments
** Graduate students only

Where graduate students were not separated into visa and non-visa, an average Canadian value of 21% visa was used.

Table 10. Summary of B.Sc. registration (Years 2-4) and graduations for 1987 by discipline area, region and gender.

Discipline Area	Atlantic		Quebec		Ontario		Western		Total	
(a) Registered (1987-1988)	All	%F	All	%F	All	%F	All	%F	All	%F
Geology	204	23%	339	27%	447	24%	293	20%	1283	24%
Geophysics	26	23%	6	33%	101	17%	148	12%	281	15%
Geological Engineer	34	9%	83	29%	144	19%	29	3%	252	17%
Other	16	31%	55	25%	34	44%	280	27%	353	29%
Total	280	22%	483	27%	726	23%	750	20%	2037	23%
(b) Graduated (1986-1987)										
Geology	82	22%	150	25%	174	26%	115	21%	521	24%
Geophysics	6	17%	2	0%	46	22%	44	25%	98	23%
Geological Engineer	14	0%	31	23%	65	18%	17	12%	127	17%
Other	14	7%	7	15%	16	31%	43	35%	80	27%
Total	116	17%	190	24%	301	24%	219	24%	826	23%

Table 11. Graduate students graduated 1986-1987 by subdiscipline.

Subdiscipline	Atlantic				Quebec				Ontario				Western				Total	
	M.Sc.		Ph.D.		M.Sc.		Ph.D.		M.Sc.		Ph.D.		M.Sc.		Ph.D.		M.Sc.	Ph.D.
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F		
Biogeography													1				1	
Climatology													1				1	
Coal Geology											1							1
Economic Geology		1	2		20	2	2		18	3		1	4	2	1		50	6
Exploration Geophysics					5				5		2		2	1			13	2
General & Regional Geology					4				2		1						6	1
Geochemistry-Exploration					3					1							4	
Geochemistry-Physical						1	1		5	2	1						8	2
Geochemistry-Organic										1							1	
Geochemistry-Other					3					2	2						5	2
Geochronology			1		1					1							2	1
Geodesy																		
Geodynamics									2								2	
Geological Engineering	1	1			3				3				1				8	1
Geomagnetism & Paelomagnetism									2	1			1	1	1	1	5	2
Geomathematics					1	1	1						2		1		4	2
Geomorphology					2												2	
Geothermal											1							1
Glaciology													1				1	
Gravity										1							1	
Hydrogeology					2	1			4	5	2		3	1	1		16	3
Hydrology																		
Limnology																		
Marine Chemistry/Geochemistry															2			2
Marine Geology		1															1	
Marine Geophysics																		
Mineralogy & Chrystallography						1			1				1		2		3	2
Paelontology	1	1		1	1		1		2		1		4	1			10	2
Palynology									1	1			3				5	
Pedology																		
Petroleum Geology		1											1				2	
Petrology	1	1		1	4	1	1		5	1			3		2		16	4
Physical Oceanography													3		3		8	16
Quaternary Geology			2		2		1				1			2			4	2
Remote Sensing													1				1	
Sedimentology	1	1	1	1	6	3	1		4	1	1		3	3	2		22	6
Seismology											1		7		1	1	7	3
Stratigraphy					2		1		1				1		1	1	4	3
Structural Geology & Tectonics	2	1			4	2	4	1	4	1	2		6	1	1		21	9
Volcanology					1												1	
Other	7	5	20	4					10	5	4	1	1	2			30	29
Total Canadian Students Total Visa Students	13 4	9 4	20 17	4 4	54 10	13 0	12 1	0 1	58 11	22 3	10 10	1 1	35 15	10 4	13 5	2 2	221 51	61 41
TOTAL NUMBER STUDENTS	17	13	37	8	64	13	13	1	69	25	20	2	50	14	18	4	272	102

Where graduate students were not broken down into subdisciplines, their numbers are only accounted for in the total number of students.

Table 12. Graduate students currently enrolled by subdiscipline.

Subdiscipline	Atlantic				Quebec				Ontario				Western				Total	
	M.Sc.		Ph.D.		M.Sc.		Ph.D.		M.Sc.		Ph.D.		M.Sc.		Ph.D.		M.Sc.	Ph.D.
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F		
Biogeography													1		2		1	2
Climatology													1				1	
Coal Geology			1										2		1		2	2
Economic Geology	15	3	2	1	36	9	13	1	37	9	32	5	5	1	1		115	55
Exploration Geophysics	3		1		8	2	2	1	11	2	4		12	2	5	2	40	15
General & Regional Geology	1				4		2		1		1						6	3
Geochemistry-Exploration					8		1		3	2	3		3		2	1	16	7
Geochemistry-Physical			1		3	2	4		20	7	17	12	1	1			34	34
Geochemistry-Organic	2	1		1					2			1	1				6	2
Geochemistry-Other	1				1	1	1		3	2	1	1		1	1	2	7	6
Geochronology	1				5	2			5	2	1	2			3		15	6
Geodesy					2	1											3	
Geodynamics	1	1			1				1	1	5						5	5
Geological Engineering	5	1	3		8	2	3		12		6				2		28	14
Geomagnetism & Paelomagnetism					1	1	1		3	1	5		7		2		13	8
Geomathematics					2		2		2		2				2		4	6
Geomorphology					2			1			1	1	2			1	4	4
Geothermal									1	1	1	1	1				3	2
Glaciology													1		1		1	1
Gravity																		
Hydrogeology					6	1	4		32	9	12	4	4		3		52	23
Hydrology													1				1	
Limnology											1							1
Marine Chemistry/Geochemistry					1						3	2	3	2			6	5
Marine Geology	5	4			1	1	1				1						11	2
Marine Geophysics	2	1	2	2										1	1		4	5
Mineralogy & Chrystallography							1		4	4	2	2	1	1	2		10	7
Paelontology	4	2	6	1	1	1	2	1	7		5	1		2	7		17	23
Palynology	3		1							1	1						4	2
Pedology					2	1											3	
Petroleum Geology	1				1				3				16	4	4		25	4
Petrology	17	11	6	3	9	6	5	2	14	6	10	1	4	3	4		70	31
Physical Oceanography	4	1	12	1									4		13	2	9	28
Quaternary Geology					19	4	1		8	6	2		3	1	5		41	8
Remote Sensing					1						1				2		1	3
Sedimentology	10	3	5	3	4	4	8	3	21	3	23	2	2	5	3		52	47
Seismology					1		2		7		5	1	8	1	17	1	17	26
Stratigraphy	1				4		3		5		2		2				12	5
Structural Geology & Tectonics	5		7	1	12	6	11	1	19	2	14	3	6	4	4	1	54	42
Volcanology	1	1	1						1	2	2	1	1		1	1	6	6
Other	7	6	20	4					27	7	14		11	4	1	1	62	40
Total Canadian Students Total Visa Students	70 19	26 9	36 32	7 10	128 13	39 4	51 16	7 3	214 37	62 6	129 48	32 8	82 21	30 3	53 36	10 2	648 115	323 157
TOTAL NUMBER STUDENTS	89	35	68	17	141	43	67	10	251	68	177	40	103	33	89	12	763	480

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

A. 1987-1988

(a) University Funded

Region	Technical/Fac.		Clerical/Fac.		All/Fac.*	
Atlantic	0.50	0.39	0.19	0.15	0.68	0.53
Quebec	0.39	0.32	0.32	0.26	0.79	0.64
Ontario	0.46	0.38	0.20	0.16	0.66	0.54
Western Canada	0.38	0.32	0.22	0.19	0.60	0.50
National	0.43	0.35	0.22	0.18	0.66	0.54

(b) All sources

Region						
Atlantic	0.76	0.46	0.22	0.13	0.97	0.59
Quebec	0.63	0.50	0.43	0.34	1.01	0.79
Ontario	0.75	0.61	0.21	0.18	0.98	0.80
Western Canada	0.75	0.50	0.27	0.18	1.01	0.67
National	0.73	0.53	0.24	0.18	0.99	0.72

B. 1986-1987

(a) University Funded

Region	Technical/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

(b) All sources

Region						
Atlantic	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

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

Table 14. Student and staff numbers in Canadian geography departments, 1988.

Group	Quebec		Ontario		Western		Total	
		%F		%F		%F		%F
All students taking 1st year and service courses	240	45%	1274	49%	2078	45%	3592	47%
2nd year majors			356	45%	604	36%	960	39%
3rd year majors			184 *97	39% 44%	89 *214	44% 30%	273 *311	40% 35%
4th year majors			112	44%	93	41%	205	42%
M.Sc. (full-time and part-time)			69	36%	57	31%	126	34%
Ph.D.(full-time and part-time)			19	37%	35	17%	54	24%
PDF and Research Associates			* *2/0		* *0/2		* *2/2	
Faculty, full-time	* *7/5		* *96/0		* *69/1		* *172/6	
URF's								
Adjuncts			* *11/0		* *3/0		* *14/0	
Secretaries and Administrative Assistants			* *20/0		* *16/0		* *36/0	
Technicians	* *1/0		* *17/0		* *17/0		* *35/0	
Instructors and Demonstrators			* *3/1		* *3/0		* *6/1	

* Three year B.Sc. - final year
** Divided into University funded/non-university funded respectively
%F Percent female

Where students were not divided into male and female, an average value of 42% female from Geography departments across Canada was used.

UNIVERSITY GEOGRAPHY DEPARTMENTS RESPONDING TO POLL

Quebec

Concordia University

Ontario
Carleton University
Guelph University
McMaster University
Queen's University
Trent University
University of Ottawa
University of Windsor
Wilfrid Laurier University
York University

Western Canada

Brandon University
Simon Fraser University
University of Alberta
University of British Columbia
University of Manitoba
University of Victoria

Table 15. Summary of student data from Canadian geography departments by program, gender, region and VISA or NON-VISA.

	Region	B.Sc.*		M.Sc.		Ph.D.		M.Sc. + Ph.D.		
(a)	**Enrolled (1987-1988)**	All	%F	All	%F	All	%F	All	%F	%Visa**
	Quebec			2	0%			2	0%	0%
	Ontario	749	43%	80	36%	21	37%	101	36%	11%
	Western Canada	1000	36%	57	31%	35	17%	92	26%	29%
	Total	1749	39%	139	34%	56	24%	195	31%	20%
(b)	**Graduated (1986-1987)**									
	Quebec									
	Ontario	145	45%	11	45%	2	100%	13	54%	0%
	Western Canada	141	33%	9	12%	3	33%	12	17%	17%
	Total	286	39%	20	35%	5	40%	25	36%	8%

* Years 2-4 only for B.Sc. enrollments
** Graduate students only

Table 16. Summary of B.Sc. registration (Years 2-4) and graduations for 1987 by discipline area, region and gender.

Discipline Area	Quebec		Ontario		Western		Total	
(a) Registered (1987-1988)	All	%F	All	%F	All	%F	All	%F
Geomorphology			218	40%	233	30%	451	35%
Pedology			92	52%			92	52%
Climatology			100	33%	241	35%	341	35%
Other			339	45%	538	40%	877	42%
Total			749	43%	1012	37%	1761	39%
(b) Graduated (1986-1987)								
Geomorphology			20	45%	25	36%	45	40%
Pedology			6	50%			6	50%
Climatology			10	40%	17	41%	27	41%
Other			109	46%	97	32%	206	39%
Total			145	45%	139	34%	284	40%

Table 17. Graduate geography students enrolled by subdiscipline, 1987-1988.

Subdiscipline	Quebec				Ontario				Western				Total	
	M.Sc.		Ph.D.		M.Sc.		Ph.D.		M.Sc.		Ph.D.		M.Sc.	Ph.D.
	M	F	M	F	M	F	M	F	M	F	M	F		
Biogeography					4	4	1	1	3	4	4		15	6
Climatology					8	1	3		2	1	4	2	12	9
Geomorphology					21	11	5	3	7	6	10	3	45	21
Glaciology	1				1		1						2	1
Hydrology					5	1		1	2	1	1		9	2
Hydrogeology					1	1	2						2	2
Meteorology									19		4	1	19	5
Paleontology														
Palynology						2							2	
Pedology					1	4	1						5	1
Remote Sensing					7	2			6	6	1		21	1
Other	1				4	2		3			5		7	8
Total Canadian Students	2				49	26	11	7	29	15	19	2	121	39
Total Visa Students	0				3	2	2	1	10	3	10	4	18	17
TOTAL NUMBER STUDENTS	2				52	28	13	8	39	18	29	6	139	56

Table 18. Graduate geography students graduated 1987-1988 by subdiscipline.

Subdiscipline	Quebec				Ontario				Western				Total	
	M.Sc.		Ph.D.		M.Sc.		Ph.D.		M.Sc.		Ph.D.		M.Sc.	Ph.D.
	M	F	M	F	M	F	M	F	M	F	M	F		
Biogeography						1			3	1			5	
Climatology					2				2			1	4	1
Geomorphology					3	3		1	1				7	1
Glaciology						1		1					1	1
Hydrology									1				1	
Hydrogeology														
Meteorology														
Paleontology														
Palynology														
Pedology					1								1	
Remote Sensing									1		1		1	1
Other											1			1
Total Canadian Students					6	5	0	2	7	1	1	0	19	3
Total Visa Students					0	0	0	0	1	0	1	1	1	2
TOTAL NUMBER STUDENTS					6	5	0	2	8	1	2	1	20	5

Table 19. Summary of support staff/faculty ratios for geography departments, 1987-1988.

(a) **University Funded** Region	Technical/Fac.		Clerical/Fac.		All/Fac.*	
Quebec	0.14	0.14	.0	.0	.0	. 0
Ontario	0.18	0.17	0.23	0.20	0.42	0.41
Western Canada	0.25	0.25	0.23	0.22	0.52	0.52
National	0.20	0.20	0.21	0.20	0.45	0.43
(b) **All sources** Region						
Quebec	0.08	0.08	.0	. 0	.0	. 0
Ontario	0.18	0.17	0.23	0.20	0.43	0.42
Western Canada	0.24	0.24	0.23	0.22	0.51	0.50
National	0.20	0.20	0.21	0.20	0.44	0.43

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

4. Geological Survey of Canada (GSC)

Founded in 1842, the Geological Survey of Canada (GSC) continues its tradition of excellence in providing for Canadians the best possible geoscientific knowledge, technology and expertise about Canada and its offshore, its mineral and energy resources and the natural conditions that affect land and seabed use.

During the past year, GSC management reappraised the Sector's role and responsibilities. As a result, plans to enhance or refocus key programs were developed; these encompass:

- a national mapping program coordinating multidisciplinary geoscience in a long-term strategy;
- an enhanced environmental geology program focussing geoscience on national and global problems;
- an enhanced earthquake hazard program to strengthen national capability and to increase efforts on the West Coast;
- more emphasis on projects in the Western Canada Sedimentary Basin in response to strong industry interest;
- increased development of exploration science and technology in support of the mineral industry;
- a strategy to develop coordinated digital and computer-based data systems;
- a program to encourage technology transfer, cooperative ventures and international business/aid activities;
- a corporate communications unit.

To strengthen and focus productivity, as well as to increase the sharing of common services and logistical support, activities that address the same themes or policy issues are grouped together in the Survey's administrative framework: energy, environment, minerals, information and Arctic sovereignty.

Energy

The *Sedimentary and Marine Geoscience Branch* provides geoscientific information and resource assessments for Canada's economically important sedimentary regions within which are found all of Canada's oil, natural gas and coal resources, as well as such important minerals as lead, potash, uranium and zinc. The Branch's responsibilities for earthquake hazard analysis for the West Coast have grown dramatically since GSC scientists found evidence that points toward the potential for a "mega-earthquake" in southern British Columbia and Vancouver Island. The marine research carried out on both coasts and in the Arctic by this Branch also provides a solid base of geoscientific information about our oceans.

The Branch's three divisions are the *Atlantic Geoscience Centre* (Dartmouth, Nova Scotia), the *Cordilleran and Pacific Geoscience Division* (Vancouver and Sidney, British Columbia) and the *Institute of Sedimentary and Petroleum Geology* (Calgary, Alberta). Highlights for the year include:

- In the fall of 1988, Canada, a member of the international Ocean Drilling Program (ODP) since 1985, signed a Memorandum of Understanding with Australia to share its ODP membership in a ratio of 2:1 (Canada: Australia). During the year GSC scientists participated in two ODP cruises in the Indian Ocean; results had direct applications to ongoing research on East Coast sedimentary basins and on the opening of the Labrador Sea/Atlantic Ocean. Canada submitted three proposals for drilling in the northeast Pacific in 1991-92.
- An important new GSC report, "Conventional Oil Resources of Western Canada (Light and Medium)", was released in April 1988. *Oilweek* called it "required reading for Canada's oil industry", and over 1400 copies have been sold. Another important report "Coal Resources of Canada" neared publication. It has already generated much interest from the coal and investment communities and is expected to be the reference on Canada's coal resources for exploration and development potential and for environmental quality of coal.
- A report on "Petroleum Resources of the Mackenzie Delta-Beaufort Sea" was released in the fall of 1988; it contributes to the Basin Atlas of the Mackenzie-Beaufort Sea which is planned for publication in 1991. The report has been already used to address policy issues related to the development of petroleum resources, possible pipeline development and issues involving the Northern Accord.
- A key product of the Frontier Geoscience Program, the "Labrador Sea Basin Atlas" neared completion. The first in a series of Basin Atlases, it synthesizes four years of research carried out by industry and government. The series describes and interprets the continental margins and associated sedimentary basins of Eastern Canada in terms of their geological structure, sedimentary facies, history of basin development, and the generation, maturation and preservation of hydrocarbons. Atlases for the Scotian Shelf and Grand Banks are slated for production in 1990.

- Seismic work on the East Coast included the completion of a deep seismic reflection line across the Scotian Shelf and margin as part of a continuing deep crustal study of the offshore. Another major seismic refraction study was completed in the Gulf of St. Lawrence. Results from both will lead to a clearer picture of the resource potential of these areas.
- A major seismic survey near the Queen Charlotte Islands, B.C. was completed in the summer of 1988. The data collected was used to produce the first modern multichannel reflection results for the western Canadian margin between Vancouver Island and Dixon Entrance. This represents a good first step towards catching up to the level of seismic coverage now available for Canada's other continental shelves. In view of public concern about the Queen Charlotte Islands and the possible effects of seismic testing on the marine environment, the GSC held a series of public meetings and information sessions prior to conducting the work.
- The Peace River Arch Project, aimed at increasing our understanding of the economically important Western Canada Sedimentary Basin, progressed substantially this year. The study involves a range of geoscience subdisciplines and is of particular interest because of the significant hydrocarbon resources associated with Alberta's Peace River Arch.
- GSC continued to study earthquake hazards in the West Coast Cordillera and adjacent offshore, one of Canada's most seismically active regions. Studies have shown evidence for a "mega-earthquake" hazard (as high as 9.0 on the Richter Scale) in southwestern British Columbia and Vancouver Island.
- The "Terrane Map of the Cordillera" and the "Metamorphic Map of the Cordillera" were released. These maps, at the 1:2 million scale, provide an outstanding synthesis of this tectonically complex region and provide the most detailed terrane analysis of a major orogenic belt ever produced. The mineral exploration industry has particularly welcomed their release.

Environment

The *Geophysics and Terrain Sciences Branch* is responsible for national scientific programs that provide information about contemporary geophysical and geological processes posing hazards (e.g. earthquakes, landslides) and constraints to economic development (e.g. ground ice, permafrost). It also conducts research that defines the Quaternary geology and geophysical attributes of the Canadian landmass and offshore.

The expertise housed in this Branch and the results of its work are used by a diverse range of government, university and industry clients interested in public safety, the environment and mineral exploration. For example, research on seismic hazards is used to develop the seismic zoning maps of the National Building Code, while permafrost studies have direct applications to land use planning in the North.

Headquarters and research facilities for the Branch's two divisions, the *Terrain Sciences Division* and the *Geophysics Division*, are located in Ottawa; observation facilities for its national seismological, geomagnetic and geodynamic networks are found throughout Canada. Highlights include:

- The magnitude 6.2 Saguenay earthquake of November 25, 1988 near Chicoutimi, Quebec was the largest in eastern North America since 1935. As a result of a magnitude 4.7 foreshock two days before the event, GSC seismologists had increased field monitoring in the region; this was continued for two weeks through the aftershock period. Because the earthquake took place in a region thought to be "seismically-dead", additional permanent seismic monitoring facilities were established in the Saguenay area. In total, 86 strong earthquakes, 37 of which were felt, were documented in or near Canada during the past year.
- Modernization of the Yellowknife seismological array continued on schedule; the official opening is planned for September 1989. The facility is used for research to discriminate underground nuclear explosions from naturally occurring earthquakes, and to develop seismological techniques that would be part of the verification provisions of a ban on underground nuclear testing.
- Under the federal-provincial Mineral Development Agreements (MDA), GSC continued to manage aeromagnetic survey contracts, totalling over $11 million, that have been tendered out to the Canadian geophysical industry over the past five years. Some 400 aeromagnetic maps were published for various regions across Canada; these support mineral exploration across the country. A complementary program provided maps of surficial geology and stimulated mineral exploration by producing data on the lithology and geochemistry of till, drawing on GSC's strengths in surficial geology and drift prospecting.
- Of particular note, a significant number of mining claims were staked in direct response to MDA publications on the gold content of till in new exploration "plays" and in extensions to existing mining camps in northern Manitoba, northern New Brunswick, and northwestern Ontario. The exploration methods developed and promoted have directly contributed to the success of private sector exploration, such as the recent gold discoveries in Newfoundland.

- Canada's recognized leadership in aeromagnetic surveying has been due in large part to GSC's innovative research and technological development over the past 40 years. In keeping with contracting out policy, GSC established an industry/government committee to promote future private sector developments in this exciting field. In 1988-89, almost $2 million in projects from private industry have been funded through federal government programs, requiring less than 10% EMR funding. These developments include enhanced sensitivity in survey instrumentation, advanced data acquisition hardware and improved navigation capabilities for aerial surveys.
- Five years of work using the Algonquin Radio Observatory (Algonquin Park, Ontario) and the Dominion Astrophysical Observatory (Penticton, B.C.) were successful in proving the concept of the Canadian Geophysical Long Baseline Interferometry (CGLBI) system. CGLBI monitors extragalactic sources (e.g., quasars) to establish a fundamental reference for high precision geodetic and global geodynamics measurements. The system will replace astronomical techniques and will improve earth dynamics measurements (e.g., earth rotation, polar motion) by two orders of magnitude. These are the basis for the terrestrial reference system and are essential for sophisticated navigation requirements and for the maintenance of universal time.
- A major publication entitled "Quaternary Geology of Canada and Greenland" neared completion; this will be the first volume of GSC's new "Geology of Canada" series and the definitive textbook on the Quaternary geology of Canada. It is also a contribution to the Decade of North American Geology (DNAG) series of the Geological Society of America. The publication describes the nature, geological history, resources, and related hazards of Quaternary deposits in Canada.
- A joint project involving GSC, Atmospheric Environment Service and McMaster University was started in 1988 to study links between surficial materials, vegetation and climate. The ongoing field studies at Hot Weather Creek, Ellesmere Island will provide an analog for a possible climate warming in the Arctic due to the enhanced "greenhouse effect".
- The first long-term field program for the absolute gravity meter established three sites around Hudson Bay in Quebec and Manitoba. These will be revisited at intervals to detect the small, continual uplift of this region as a consequence of the removal of its glacial load.
- Joint government-university-industry studies in the Beaufort Sea's coastal zone continued to produce results of value for the design and regulation of pipelines in the Beaufort-Mackenzie region.

Minerals

The *Continental Geoscience and Mineral Resources Branch* uses modern techniques to carry out comprehensive geological mapping, synthesis and interpretation of the mineral-rich Canadian Shield and Appalachian region. A current priority is the application and testing of plate tectonic theory to improve understanding of the origin and evolution of Canada's continental crust.

The Branch provides comprehensive knowledge of the nature and distribution of Canada's mineral resources; develops concepts and technologies to aid Canadian industry in the search for new resources; provides a scientific basis for resource management and land use planning; undertakes systematic geochemical and airborne radiometric surveys of the Canadian landmass; provides compositional analyses of geological materials; and develops relevant standards.

The Branch has two Ottawa-based divisions, the *Lithosphere and Canadian Shield Division* and the *Mineral Resources Division.* A new division, the Quebec Geoscience Centre at Sainte-Foy, Quebec was established in October 1988; its mandate focusses on regional geology, metallogeny and Quaternary studies of Eastern Canada. Other highlights for this year include:

- Investigations in the Lupin Mine area north of Yellowknife, N.W.T. identified two new volcanic belts in sedimentary sequences that include gold deposits hosted in iron formation.
- Under the Canada-New Brunswick Mineral Development Agreement, work in Bathurst Camp, N.B. involved careful studies of the volcanic rocks that host the base metal deposits and led to new structural models and a tectonic synthesis that can influence the approach to mineral exploration in the area.
- In northern Manitoba, a study of metamorphosed alteration zones related to massive sulphide deposits in the Flin Flon and Lynn Lake volcanic belts led to the recognition of three main alteration types — potassic, aluminous, and ferromagnesian. These rocks can serve as important prospecting guides.

- GSC participated in the second phase of seismic reflection profiling for the LITHOPROBE southern Cordillera transect. Data were acquired along 950 km of profile to complete lines that extend from east of the Rocky Mountain Trench to the coast. Preliminary sections show results that may have important implications for understanding the nature of earthquakes in this region. A contract for Controlled-Source Audiomagnetotelluric surveys over the Lemieux Dome in the Gaspé region of Quebec was awarded to Phoenix Geophysics (Toronto) Ltd. The CSAMT data, in conjunction with gravity data, may require a reinterpretation of accepted theories on metallogenesis of the Dome.
- Investigation of the Juan de Fuca Ridge off the West Coast yielded the first detailed maps of the Middle Valley submarine sulphide mounds as well as precisely located cores from the high heat flow area. Studies of this underwater phenomenon will aid in the interpretation of analogous ore deposits on land. At Axial Seamount, evidence for fluid phase separation and the fractionation of gold between fluids explains the occurrence of gold-rich massive sulphide deposits.
- Studies of gold camps in the Canadian Shield and Cordillera showed that ore distribution can be predicted from districts and deposit-scale structural analysis. Furthermore, such analyses suggest that many lode gold deposits were formed during seismic activity in regimes dominated by reverse or transcurrent faults. Research on the metallogeny of gold in ophiolite terrains identified new gold occurrences in the Baie Verte Peninsula, Newfoundland and led directly to significant private sector exploration.
- A five year study of hydrothermal zoning around Devonian granites in the Gaspé region of Quebec resulted in a tenfold increases in the target area for potential base metal mineralization.
- Canada's first regional biogeochemical maps were completed over an area of gold exploration in eastern Nova Scotia. The use of helicopters for rapid, cost-effective biogeochemical sampling was successfully developed and tested in British Columbia.
- Eight 1:500 000 radioactivity maps of Nova Scotia were released; these are the first coloured regional radioactivity maps ever published in Canada. A contract project demonstrated that airborne gamma ray surveys can predict areas prone to high radon levels in homes.
- GSC's borehole geophysics expertise continued to be in demand outside its primary field of mineral exploration. New applications included geotechnical problems of coal mining, environmental aspects of Fredericton's aquifer (the source of its water supply), asbestos ore grade control and heat pump technology.
- GSC won an important contract, sponsored by the Asian Development Bank, to carry out a feasibility study for a major airborne geophysical survey in Indonesia. There is a good possibility that further opportunities and spin-offs for Canadian industry (e.g. sale of Canadian equipment, development of training programs) will result from this contract. It also continued international assistance by providing technical expertise through CIDA for projects in Thailand, Zimbabwe and Jamaica, and through the United Nations Development Fund to Pakistan.
- In technology transfer, an induced polarization borehole logging system for use in mineral exploration was licensed to a Quebec-based company. Equipment for sampling groundwater was successfully designed, built and tested and is being transferred to a Canadian company for manufacture, sale and service.

Information

Fundamental to the Survey's mandate is a commitment to make the results of its diverse research programs accessible to all Canadians. The combined *Office of the Chief Scientist* and the *Programs, Planning and Services Branch* manage an in-house publishing process ranging from editing and translation, cartographic work and design, through to distribution and sales. The Branch also coordinates corporate communications and marketing requirements for the Survey, and maintains the National Geoscience Library, Canada's premier collection of earth science literature.

The Branch is responsible for the overall quality and integrity of GSC's scientific programs, for the information and management systems by which they are planned and evaluated, for common administrative services, and management policies and procedures. It also provides "across the board" coordination for a wide range of special programs including: special national programs delivered by more than one of GSC's Branches; GSC's involvement in external collaborative, multi-agency research initiatives (e.g. the federal geoscience elements of the Mineral Development Agreements with the provinces and territories); various federal programs such as Northern Land Use Planning; all aspects of GSC work funded through the Energy Research Program; technology transfer; and all international activities.

The Branch also administers the Departmental Research Agreements Program. This program provides funds to scientists and researchers at Canadian universities and institutes for work in support of Departmental priorities. In 1988-89 $1.4 million was awarded to 178 projects at 42 research centres across Canada. Other highlights include:

- A major event for the GSC was the renewal in September 1988 of the Frontier Geoscience Program (FGP). Recognizing the program's importance to Canada's energy future, Cabinet decided that FGP should become a permanent part of the Survey's research responsibilities.
- Discussions with the provinces and territories on cooperative Geoscience Information Systems (GIS) and national mapping ventures were initiated through the National Geological Surveys Committee. These are likely to signal the start of major new directions within the Survey.
- Continued participation in Northern Land Use Planning discussions is ensuring that geoscientific research gets a strong hearing as a number of land use plans are developed.
- Publishing capabilities were upgraded with new computerized equipment that modernized and streamlined the production process for maps and publications. As a pilot project, the new system was used to produce 15 colour separations for geological maps and almost 500 digitally-generated graphics. The GSC's first digitally-produced coloured map was published.
- The GSC produced 43 publications, 460 maps and 170 Open File reports; responded to close to 9000 information requests from clients; and delivered nearly 16 000 documents to external users. Over 14 000 records were added to the library's three databases (GEOSCAN, GEOCAT and PHOTOLIB) thus increasing the availability and accessibility of geoscience information.
- A new corporate communications unit for the GSC was set up. Its mandate is to ensure that Canadians are kept informed of the results and implications of the Survey's research program and that the visibility and profile of the organization is improved and maintained.

Arctic Sovereignty

The *Polar Continental Shelf Project* (PCSP) runs a sophisticated logistics network which safely and efficiently supports more than 1000 research scientists in the Canadian Arctic each year. It works closely with other sections of Energy, Mines and Resources and cooperates with other government agencies and university groups in providing expertise, accomodation, communications, transportation and specialized field equipment in support of Arctic research. Another important function of PCSP is to keep the scientific community and Arctic residents informed of research projects that are underway.

PCSP's headquarters is in Ottawa, but the hub of its operations is its base stations at Tuktoyaktuk and Resolute in the Northwest Territories. It also maintains a permanent research station on an "Ice Island" floating in the Arctic Ocean. Highlights for 1988 were:

- Recognizing the strategic importance and economic potential of the Arctic, the federal government annouced in April 1988 that PSCP's funding would be increased by a total of $4.5 million over the next two years and by $1.2 million each year after.
- PCSP provided logistics support to 214 field parties from more than 40 different agences during the 1988 field season which ran from early March to mid-September. This included more than 100 researchers who worked at the Ice Island Research Station and carried out navigation, physical oceanography, chemical oceanography, seismic reflection, submarine geology, heat flow measurements, and geochemical-microbiological studies.
- Logistics for the Ice Island Research Station continued to present new challenges: Hercules aircraft belonging to the Department of National Defence were used for low altitude parachute drops of heavy equipment onto the Ice Island; PCSP later successfully flooded a 45 by 1500-metre-long airstrip on the Ice Island.
- Construction of the new accomodation and storage facilities at the Resolute base camp was completed; they will be officially opened in 1989-90. At Tuktoyaktuk, upgrading of the base camp facilities continued.

Christy Vodden

5. Royal Society of Canada (Earth Sciences Section) (RSC)

Some 650 Canadian scientists from all disciplines have been elected Fellows of the Royal Society of Canada. About 100 of these are geoscientists, making this the largest disciplinary Section in the Society. This may, in part, reflect the vital role played by Earth scientists in the founding of the Royal Society of Canada in 1882!

Through the Royal Society of Canada, this country 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. W.R. Peltier (University of Toronto) now chairs, and Bill Fyfe (University of Western Ontario) remains heavily involved in, 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.

Besides their involvement in the IGBP, Earth science Fellows 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 is its Executive Director. Both are heavily committed to working to strengthen the Society's financial base and to raise its public profile, as the Society seeks to solidify its position as the umbrella national body to which government can turn for dispassionate expert advice from the broadest possible range of disciplines on the scientific components of matters of public concern. Having served as Vice-President (1987-88) of the Academy of Sciences, C.R. Barnes (GSC, Ottawa) now chairs the committee on the reorganization of the Academy aimed at increasing that body's public role. Ward Neale (GSC, Calgary) chairs the Royal Society's advisory committee on the public appreciation of science, whose work led to the Society's recent publication "Science and the Public." Another Fellow, Derek York (University of Toronto) contributes strongly to the latter committee's goal by his regular articles in the Globe & Mail.

Earth scientists inducted as new Fellows of the Royal Society at the 1988 Annual Meeting at the University of Windsor were Drs. J.A. Cherry (University of Waterloo),M. David (École Polytechnique, Université de Montréal), and D.C. Ford (McMaster University).

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

M.G. Rochester

REPORTS OF THE STANDING COMMITTEES

1. Education Committee Report (EdGeo)

Four EdGeo workshops were held in 1988 - a week-long program at the Tyrrell Museum in Drumheller with teachers from across Alberta, a day-and-a-half session "Going for the Gold" in Edmonton, and weekend sessions at Star Lake in Manitoba and Bancroft (from Waterloo) in Ontario. Reports from all these are enthusiastic and the organizers plan repeat performances in 1989.

It is the EdGeo Chairman's recommendation that since this program can contribute significantly, both to the country and the Earth Science Community, the Geoscience Council take steps to promote EdGeos throughout the country. This will, of course, require funds, and such funds should be in place before any further activity is started. At this time, governments are not a good source, although they shouldn't be overlooked down the road - particularly if we have a good thing going. This leaves the societies (CGC members) and industry and perhaps both can be tapped. Industry will have to be approached in an organized manner - mining across the country and petroleum primarily in Calgary. This will require an "EdGeo Finance Committee" with appropriate membership and it is our further recommendation that such a committee be struck as the first step in further promoting country-wide EdGeo programs.

P.J. Savage

2. Marine Geosciences Committee

The Marine Geosciences Committee was created to advise CGC on relevant matters. Bernard Long of INRS in Rimouski took over the chairmanship of the committee in 1988 from founding chairman Mike Keen. The mandate of the MGC is to respond to requests for advice from CGC on all matters relating to marine geoscience in Canada, to bring to the attention of CGC issues and concerns of the Canadian marine geoscience community, to promote marine geosciences in Canada through the CGC and other bodies as appropriate, and to receive reports from its members and national committees (e.g. ODP) concerned with marine geosciences.

Two meetings were held in 1988: the annual May meetings of GAC-MAC in St. John's and in December in Ottawa. The MGC concerned itself with availability of scarce shiptime and logistic support for university researchers, monitored Centres of Excellence proposals in marine geosciences, received reports on Canadian participation in ODP, discussed proposals before the International Centre for Ocean Development concerning offshore developments in Third World countries and how Canada might become further involved, expressed concern over declining opportunities for individual researchers in the light of a shift towards support for large international projects, and initiated discussions on a JOI-like organization for Canada.

S.D. Scott

3. Registration of Geoscientists Committee

The Professional Registration Committee of the CGC was expanded in 1988, with John Gale of Memorial University as Chairman. Three members were appointed to this committee by the President of the CGC. The three committee members are: Rex Gibbons, Nfld. Dept. of Mines and Energy, St. John's, Nfld., John Maher of Polaris Petroleum, Calgary, and Ron McMillan of Westmin Minerals, Toronto. The committee's agenda consists of:

1. Providing an updated report on the current status and plans for registration of geoscientists by province and territory by May of 1989.
2. Developing a vehicle for transferring registered status from one province to another.
3. Evaluating the different models that could be used if nationwide accreditation becomes a reality.
4. Organizing and preparing material to support a lobby effort for registration of geoscientists in other provinces.

Much of the year was spent in getting the committee in place. John Gale attended the CGC meeting in Ottawa on December 8th and 9th, 1988. The general tone of the CGC members was positive to neutral on the registration and accreditation issue.

On December 10th, 1988, John Gale met with Ron McMillan in Toronto to discuss registration in Ontario. As a result of these discussions, a local committee was set up in Ontario to establish the current mood in the geoscience community towards registration and to determine how receptive APEO would be towards a proposal for a common association for engineers and geoscientists.

The initial meeting to set up the committee was held on January 7th, 1989. This meeting was hosted by Bill Pearson of Derry, Michener, Booth and Wahl. The meeting was attended by John Drury, John Gale, Ron McMillan, Jack McQuat, and Owen White. Bill Pearson agreed to serve as the chairman of an Ontario *ad hoc* committee on professional registration of geoscientists. A meeting is scheduled for the Sunday before the Prospectors and Developers Conference in early March. This will be an organizational meeting for the Ontario committee with John Maher, Ron McMillan, and Rex Gibbons attending to represent the CGC National Committee. Hopefully, this will ensure that the registration model followed in Ontario will be compatible with that which has been set up in other provinces, hence ensuring transferability between provinces.

John Maher and Rex Gibbons are focussing on the transferability issue as it applies to Alberta and Newfoundland. The transferability issue is basically mini-accreditation. Hence, John Maher and Rex Gibbons are reviewing possible accreditation models that might apply to British Columbia and Ontario if these two provinces develop common associations with the engineering community. It is possible that a system similar to, or set up in conjunction with, the Canadian Accreditation Board for engineers, may be a reasonable model to consider.

CGC Professional Registration Committee members will assist with, or determine the feasibility of, establishing local professional registration committees in the other provinces during 1989. A meeting of the CGC National Committee and local Provincial Committees is planned in conjunction with the GAC/MAC/CGU meeting in Montreal, in May 1989.

John Gale

4. Lithoprobe

Lithoprobe is a Canadian earth sciences research programme 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. It is funded on a continuing basis by the Natural Sciences and Engineering Research Council and the Geological Survey of Canada, with additional contributions from industry and provincial government agencies as the work relates to their interests and mandates. During 1988, many significant developments and achievements occurred. This report highlights some of these from both the organizational and scientific aspects of the project.

Lithoprobe - A Functioning Centre of Excellence: In March 1988, the Lithoprobe Secretariat moved into five new offices completed for it by U.B.C. on the third floor of the Geological Sciences Center. To complete the Secretariat staff, Mr. Peter Carroll, formerly an industry consultant in Calgary and a geophysicist with 22 years industry experience, was hired as Operations Manager, effective November 28, 1988. His responsibilities are primarily with seismic reflection and other contracts, major field programmes, industry liaison and other duties to assist the Director. In September 1988, the Secretariat published *LITHOPROBE News Notes* #1, an informal newsletter, and distributed it widely within Canada and internationally; it will be published periodically two or three times per year. R.M. Clowes, Director, continued his national tour of universities with earth science departments to present a talk on Lithoprobe and respond to questions; by December he had made visits to 10 cities involving 15 universities. At the 1988 GAC/MAC Annual Meeting, the Director was awarded the Past-President's medal of the G.A.C., primarily for his scientific and organizational contributions to Lithoprobe Phase I on Vancouver Island.

The Board of Directors met twice during the year, at the U. of Calgary in March and at U.B.C. in early December. They received reports concerning all aspects of Lithoprobe, approved budget proposals and responded with advice on a number of matters. The Scientific Committee also had busy meetings in March and December, immediately before the Board meetings. In addition to keeping the pulse of the project through reports from the Transect Leaders and Chairmen of the disciplinary subcommittees, they discussed the scientific programme and budget, and recommended procedures for new transect proposals. They also established procedural guidelines for post-contract seismic reflection

reprocessing as well as the acquisition of remote site hardware. The disciplinary subcommittees (Geology and Geochemistry, Electromagnetic and Other Geophysics, and Seismic and LSPF) held meetings through which they provided speciality advice on a number of aspects; they will play an important role in the evaluation of new transect proposals.

Lithoprobe Seismic Processing Facility (LSPF): The LSPF, the one physical facility of Lithoprobe, installed at the University of Calgary in late 1987-early 1988, was officially opened during the March meetings of the Board and Scientific Committee. It consists of a Control Data Corporation (CDC) CYBER 835 CPU with an attached MAP-V array processor and other peripherals; software includes CDC's NOS/VE operating system and Cogniseis Development's DISCO seismic processing software. Dr. Kris Vasudevan, an industry scientist with many years of seismic processing experience, was hired in January 1988 as the LSPF Manager under the direction of Dr. Fred Cook, a faculty member at U. of C. Through their efforts and others, the facility has flourished, but not without a number of problems (as expected), some of which are still being addressed. Usage of the system has increased dramatically throughout the year, including extensive usage from remote sites (universities of Western Ontario, Toronto, Manitoba, Saskatchewan, Alberta and British Columbia and the G.S.C. in Ottawa). LSPF Newsletter No. 1 was published in November 1988 and is intended to inform users and other interested scientists of the activities at and related to the LSPF, including the status of hardware, software and communications for remote sites.

Transect Activities:

Kapuskasing Structural Zone (KSZ): As the first active transect following committed funding, the scientific programme is well evolved. Contract processing of the 340 km of regional and 20 km of high resolution seismic reflection data was completed in mid-1988; interpretation and reprocessing are continuing. In February and November 1988, 2-day transect workshops were convened; workshop reports detailing the many scientific accomplishments were produced for each meeting. The combined geoscience studies are clarifying and modifying the conceptual model of upthrust being tested by the transect.

Southern Cordillera (SC): In terms of the reflection programme, which spearheads Lithoprobe transect activities, the SC was the transect of principal activity in 1988. More than 900 km of crustal reflection profiles were recorded through a contract to Sonics Exploration of Calgary during June-December; favorable bids enabled completion of the seismic reflection part of the transect. Contract processing by Western Geophysical is proceeding; data quality along most of the 14 separate lines is excellent. Through this and the many other continuing studies, the scientific programme is well developed.

Lithoprobe East (LE): With funding from GSC's Frontier Geoscience Programme in 1984 and 1986, 1600 km of offshore deep seismic reflection lines have been recorded northeast of Newfoundland and in the Gulf of St. Lawrence; a number of interpretations are published or in review. A second Transect Workshop was held in St. John's in October and a Transect Report prepared. Plans are in place for major transect effort over the next few years, including the reflection line which will be run across central Newfoundland in 1989.

Abitibi-Grenville (A-G): In conjunction with the 1987-88 KSZ reflection programme, two full-scale preliminary reflections surveys were recorded in the Abitibi sub-province in January 1988. In the Ontario section, 80 km of regional profiling and 30 km of high resolution data, concentrating on the Cadillac-Larder Lake shear zone, were carried out in the Kirkland Lake region with financial assistance from the Ontario Geological Survey. In the Quebec section, 50 km of regional and 35 km of high resolution profiling, with emphasis on both the Cadillac-Larder Lake and Porcupine-Destor faults, were run in the region of Rouyn-Noranda with financial assistance from the Ministère de l'Energie et Ressources. The data are proving of considerable interest to the mining industry. Following the October 1987 Transect Meeting, a Workshop Report including updated scientific proposals was prepared in English and French and circulated in early 1988.

GLIMPCE: The Great Lakes International Multidisciplinary Program on Crustal Evolution was carried out principally in 1986 with the GSC's Lithoprobe contribution and other resources. The scientific results have been spectacular and about 8 papers are published or in press. In 1988, a detailed aeromagnetic survey of Lakes Superior, Huron, Erie and Ontario was completed by the GSC; in 1989, the USGS will collect gravity data over Lake Huron and in Georgian Bay. The Union session at the Spring AGU in Baltimore will focus on GLIMPCE.

University Supporting Geoscience Projects: This unique component of the Lithoprobe programme is maintaining a high level of scientific activity. For fiscal 1988-89, 53 applications requesting $1.33M were received and evaluated by the Subcommittee established for that purpose; 37 awards totalling $635K were made. Scientists working through this part of Lithoprobe are among the major contributors at the various transect workshops.

New Transect Proposals: In the fall of 1988, a call was issued by Lithoprobe for proposals for new transects for the continuing scientific programme; 6 proposals, all of significant scientific value, were received. The range of proposals is indicated by their titles: Alberta Basement, Dempster Highway, Eastern Canadian Shield Onshore-Offshore, Great Slave Lake, Northern Cordillera, and Trans-Hudson Orogen/Williston Basin. By the end of 1988, the process of national and international peer review of the proposals was being established by the New Transects Evaluation Subcommittee, established for that purpose.

In Conclusion: In its first full calendar year of activity, Lithoprobe has made great strides forward on all aspects of the project. This success follows from the dedication, enthusiasm and excellent work displayed by the many Lithoprobe scientists (now numbering in the order of 300). As Director, I have attended all the transect workshops and am particularly impressed with the fact that the multidisciplinary facet of Lithoprobe, a unique concept among similar national programmes, is really working. Lithoprobe will continue to build on its momentum and surge forward with new and exciting results.

R.W. Clowes

5. Ocean Drilling Program

Canadian participation in ODP is managed by a Council (Ken Babcock, ADM EMR, Chairman) for setting overall policy and responsible to the Government of Canada, a National Committee (Steve Scott, University of Toronto, Chairman) for monitoring science involvement and representing Canada in institution-to-institution relations, and a Secretariat (John Malpas, MUN, Director) for delivering Canada's program. Malpas represents Canada at the international Planning Committee of ODP and Chris Barnes (DG GSC) is our representative at the Executive Committee. Four of the members of the National Committee are appointed by CGC.

Originally, the Secretariat was at Dalhousie University where Paul Robinson had held the dual roles of Chairman of the National Committee and Director of the Secretariat. In April, it moved to MUN at the time that the structure of ODP itself underwent a number of changes including panel structures. As the program becomes more theme oriented, the once powerful regional panels have been downgraded to Detailed Planning Groups. The thematic panels are Lithosphere, Tectonics, Ocean History and, a new one, Sedimentary and Geochemical Processes.

Canada's participation in ODP was reviewed in 1988 by an investigative committee headed by Ward Neale. Their report, *Exploring the Oceans*, was highly lauditory of Canada's input into ODP and the benefits that we have derived from our involvement. Approximately 95 percent of scientists encountered by the committee were positive about ODP and its predecessor, DSDP.

In December, Canada and Australia formed an ODP consortium. Australia is entitled to 1/3 of the rights and privileges of the consortium in return for paying 1/3 of the subscription fee of $2,750,000 US. Panel representation, publications and shipboard participation are split on a 2:1 basis in proportion to the two countries' GNPs. The Council and National Committee, and endorsed by CGC, have strongly urged the Canadian financial contributors to ODP (EMR, NSERC, IST and DFO) that the monies saved by the reduction in Canada's fees be used for ODP projects.

S.D. Scott

6. Canadian Continental Drilling Program

Substantial progress has been made towards the conclusion of the planning phase and the move towards the operational phase of this new national geoscience program.

Review of the thirty proposals received up to the end of 1987 was the major activity during 1988 and will be completed during the first half of 1989. A series of two-day workshops are being held to allow open discussion of proposals or groups of related drilling proposals. The full program of workshops is:

- February 18/19, 1988 at the University of Toronto.
  The Kapuskasing structural zone and lower and mid-continental crust.
- October 6/7, 1988 at Laurentian University
  The Sudbury Structure.
- October 19/20, 1988 at the Pacific Geoscience Centre.
  Investigation of major faults by drilling.
- November 23/24, 1988 at the Geological Survey of Canada, Ottawa.
  Greenstone belts and associated granitoids.
- February 9/10, 1989 at Ontario Hydro, Toronto
  The Algonquin Arch.
- March 1/2, 1989 at the Aquitaine Building, Calgary.
  Drilling bases investigations in the Western Basins.

The proposals being considered at the series of workshops involve approximately 150 scientists from universities, industry and government. Total workshop attendance is expected to be about 300.

The review process will conclude with a national discussion meeting, to be held in Toronto in August 1989, after which time the Steering Committee of CCDP will recommend a 5-year phase of regular operations to the Canadian geoscience community.

As a result of discussions with NSERC held in May 1988, the Steering Committee of CCDP has decided to arrange a Pilot Project before beginning the first phase of regular operations: After extensive discussion, part of a proposal to investigate by drilling several features of mid-lower continental crust, as seen in the Kapuskasing Structural Zone of Ontario, has been adopted as the content of the Pilot Project. With good surface and Lithoprobe seismic studies already completed, and objectives of international interest, such as the nature of the seismic laminae frequently seen in lower continental crust, the project promises to provide a great deal of important information at a relatively low cost. John Percival of the GSC and Dennis Shaw of McMaster University are currently developing detailed plans for this project, which is expected to take place between mid-1989 and the end of 1990.

CCDP is receiving broad support, both in terms of interest and financial commitment. Fifteen major companies have become Associate Members of the Project and their financial participation has led to the granting of adequate NSERC funds, under the Matching Funds policy, to cover the needs of the remaining part of the planning process. This process is being co-ordinated by Dr. Malcolm Drury, on secondment from the GSC, through the CCDP Planning Office located at Carleton University in Ottawa.

James M. Hall

7. International Geoscientific Relations

(See Report of the Foreign Secretary)

8. Canadian National Committee: International Union of Geological Sciences

(See Report of the Foreign Secretary)

REPORT OF THE REPORTS COMMITTEE

1. Comparative Study on Funding of Earth Sciences in Canada

The draft final report of the completed study was tabled at the Annual Meeting of the C.G.C. in December. Margot J. Wojciechowski, Director of the Queen's University Centre for Resource Studies, introduced the report and described some of the main findings and conclusions.

This study resulted from a realization that information and statistics on Research and Development funding in the earth sciences was inadequate and did not provide a rational base of data for decision-making by industry, government, and funding institutions. Funding for the study was provided, equally, from three sources: the Federal Government, Provincial Governments, and Industry and Industry-related Associations.

The study is an independent one and the views expressed are those of the author. However, a Verification Committee was struck to review statistical data.

The study is designed to examine funding trends in research and development in the earth sciences in Canada. The activities of federal and provincial governments, industry, and the universities in earth science R & D are included. Comparisons are made with the other academic disciplines and resource sectors in Canada and with earth science and mineral industries in seven other OECD countries: Australia, Finland, France, the Federal Republic of Germany, Sweden, the United Kingdom and the United States.

A wide variety of information sources have been used, from published data sources as far as possible, supplemented by interviews, on-site visits and correspondence. Strong reservations are expressed about the reliability and consistency of published R & D data and its use as a guide for policy formulation.

A main conclusion derived from the study and the background material on which it is based is that Canada has good economic justification for maintaining and increasing its expenditure levels in earth science R&D. Unfortunately, the expenditure levels are losing ground in the public sector and they are extremely low and probably declining in the private sector.

The report will be published by the Centre for Resource Studies, Queen's University, Kingston, Ontario, K7L 3N6, in 1989.

D.K. Mustard

2. Careers in Geoscience Booklet

A large number of requests were received for the English version of the *Careers in Geoscience* booklet during 1988. The booklet has been out of print for several years, but work commenced in late 1988 on the third edition. The Council hopes to see a new version of the booklet in print before the end of 1989. A limited number of copies of the French version were still available at year end 1988.

A.V. Morgan

REPORTS OF THE ADVISORY AND REVIEW COMMITTEES

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

This Committee was established in mid-1987 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 consists of 9 members, 3 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. Dvitt, Mr. C. Jobin, Dr. W. Kaula, Mr. J-C Mareschal, Dr. R. Masse and Dr. J. Oliver.

The first meeting was held in Ottawa in December 1987, at the GSC. Portions of the Committee then visited all the various GSC establishments out of Ottawa, viz. the Atlantic Geoscience Centre (Dartmouth, N.S.), the Institute of Sedimentary and Petroleum Geology (Calgary), the Cordilleran and Pacific Geology Division (Vancouver), and the Pacific Geoscience Centre (Sydney, B.C.), during the first half of 1988.

A return visit was made to the GSC in Ottawa in October, during which time a session was held with the new ADM, Dr. Elkanah Babcock (replacing Dr. Ray Price), and the Directors General of the various GSC Branches.

Briefs have been solicited by the Committee and received, either verbally or in writing, from numerous GSC scientists at various times in the course of the Committee deliberations.

A first draft of the Committee's report has been prepared. The remainder of the Committee's program is as follows:

Review first draft	- January 11, 1989 (meeting in Toronto)
Complete second draft	- April 1, 1989
Finalize and submit report to ADM (GSC)	- June 15, 1989 and to the President of the CGC.

Harold O. Seigel

2. Advisory Committee to the Geological Survey of Canada on Geochemistry

In the pursuit of its mandate to evaluate geochemical research at the Geological Survey of Canada, the Committee has interviewed approximately 30 employees of the Mineral Resources and Terrain Science Divisions, since the commencement of its activities in July, 1988. Approximately 150 questionnaires have been returned from industry, universities, and provincial government personnel (a return of over 67 %), and the opinions on the use, quality, timeliness, relevance, and adequacy of the GSC geochemical output is being collated and analyzed.

The Committee will meet again in February and May, and anticipates the completion of a draft report by late 1989.

J. Alan Coope