CANADA

DEPARTMENT OF ENERGY,

MINES AND RESOURCES

GEOLOGICAL SURVEY OF CANADA

ANNUAL REPORT

APRIL 1, 1977 TO MARCH 31, 1978

FOR DEPARTMENTAL USE ONLY

OTTAWA

1978

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GEOLOGICAL SURVEY OF CANADA

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OFFICE OF THE DIRECTOR GENERAL

D.J. McLAREN

Attendance at Meetings, Conferences and Courses

GAC/MAC Annual Meeting, Vancouver, April 1977.

Member of Council, Geological Society of America, Boulder, May 1977.

IUGS Delegation to China, People's Republic of China, September-October 1977.

Member of Council, Geological Society of America, Seattle, November 1977.

Chairman of Board, IGCP Board Meeting, Paris, February 1978.

Visitor, Institut national de recherche scientifique, Quebec, 1977.

Special Talks and Lectures

"The Geological Survey of Canada - Its Meaning to Canadians", University of Montreal and Ecole Polytechnique, Montreal, December 1977.

"Geological Time Scales", Peking University, September 1977.

Membership on Committees

Chairman of the Board, International Geological Correlation Programme, sponsored: UNESCO and IUGS.

Member, Canadian Geological Foundation.

Councillor, Geological Society of America.

Deputy Director General

J.O. Wheeler

Attendance at Meetings, Conferences and Courses

Geological Association of Canada, Vancouver, April 1977.

Royal Society of Canada, Fredericton, June 1977.

Canadian Geoscience Council Meeting, Halifax, October 1977.

Workshop on Geology of S.E. Cordillera, Queen's University, Kingston, January 1978.

Advisory Council Meeting, Princeton University, Princeton, March 1978.

Prospectors and Developers Convention, Toronto, March 1978.

Membership on Committees

President and Director, The Canadian Geological Foundation.

Member, Advisory Council, Princeton University.

R.J.W. Douglas

Principal responsibility continued to be the coordination of the 1:1 million geological atlas. This involved consultation with individual authors in various centres and close liaison with the Cartography group in Ottawa.

Attendance at Meetings, Conferences and Courses

GAC/MAC Meeting, Vancouver, April 1977.

Archean Greenstone Conference, Mont St. Marie, October 1977.

Cordilleran Tectonics Workshop, Queen's University, Kingston, January 1978.

Membership on Committees

Co-ordinator for the Tectonic Map of North America (Canada).

T.E. Bolton

Attendance at Meetings, Conferences and Courses

Third International Symposium on the Ordovician Field Meetings, Columbus, Ohio, August 1977.

Eastern Canada Paleontology and Biostratigraphy Seminar, Waterloo, October 1977.

Membership on Committees

Member, Canadian Geoscience Council, Standing Committee on International Scientific Relations.

Program Office

J.E. Brindle

The Program Office evaluates the Branch Program and advises senior management on the effectiveness of the program in meeting the objectives of the Branch in contributing to the economic and social well-being of Canada. A close check on activities and their progress in the Branch is kept by means of a detailed reporting system. Work continued with the Data Systems Group with a view to eventual computerization of all information handled by Program Office for which this can be justified in terms of speed in obtaining information, or reduction of cost.

The information accumulated by Program Office also forms the source of replies to the complex questionnaires from other departments and agencies (MOSST, STATCAN, INA, etc.) as well as to parliamentary questions and to questions from other sectors. A complete catalogue of scientific and technical projects is prepared and published each year together with a map showing the geographical disposition of projects. An annual report on forthcoming program is prepared for the Government Activities in the North Report.

The Branch Program for 1978-79 was reviewed by senior management in November, and the Activity Documents for the same fiscal year compiled for review by the Executive Committee. The mid-year Performance Report was submitted to the ADM (Science and Technology) in October. Assistance was given in the preparation of Program Forecast for 1979-80.

The numerous unsolicited proposals reaching the Branch from the S&T Sector Office are all channelled through Program Office for referral to appropriate divisions. These proposals continued to increase during the year. Topographic map requirements for the Branch are also compiled annually by Program Office for Surveys and Mapping Branch.

Attendance at Meetings, Conferences and Courses

CGLO Meeting, Kingston, Jamaica, March 1977

International Union of Geological Sciences

W.W. Hutchison

During 1977 the transfer of the IUGS Secretariat, its records and operations from Haarlem, Netherlands to Ottawa was planned. V. Lafferty joined the IUGS staff in November 1977, taking on the responsibility of operating the Secretariat and producing the newsmagazine EPISODES. W.W. Hutchison officially took over his responsibilities as Secretary General in February, 1978. In March, the first issue of EPISODES was produced.

Attendance at Meetings, Conferences, Courses

W.W. Hutchison

Geological Association of Canada, Vancouver, April 1977.

Annual Meeting, SCITEC, Toronto, May 1977.

CODATA Executive Meeting, Paris, June 1977.

IGCP Circum-Pacific Plutonism Meeting, Japan-Korea, August 1977.

Regional Meeting, CGMW, September 1977.

IUGS Delegation to China, September-October, 1977.

Geological Society of America, Annual Meeting, Seattle, November 1977.

UNESCO/IUGS Meeting on Geology Teaching, Paris, November 1977.

IUGS Executive Committee, Haarlem, February 1978.

IGCP Scientific Committee, Paris, February 1978.

IGCP Board Meeting, Paris, February 1978.

V. Lafferty

IUGS Executive Committee, Haarlem, February 1978.

IGCP Scientific Committee and Board Meetings, Paris, February 1978.

IUGS Constitution Committee Meeting, February 1978.

Special Talks or Lectures

W.W. Hutchison

"Recent applications of computers in the geological sciences", University of Peking, China, September 1977.

Membership on Committees

W.W. Hutchison

Secretary General, International Union of Geological Sciences

Member, IUGS Constitution Committee

Member, IUGS Nominating Committee

Member, Executive Committee, CODATA

Foreign Secretary, Canadian Geoscience Council (until February 1978)

Director, Canadian Geological Foundation

Honorary Secretary, SCITEC (until May 1977)

Member, Publications Committee, Geological Society of America

Ex-officio member of Board, International Geological Correlation Program

Editor, EPISODES (effective 1 January 1978)

V. Lafferty

Managing Editor, EPISODES

Data Systems Group

The Data Systems Group continued to assist divisions in computer systems related projects such as computer assisted cartography and mineral deposit data files. In the former area a preliminary evaluation of available systems for computer-assisted cartography (Martin and Gordon) was produced, and in the latter, project co-ordination continued to be supplied (Picklyk and Hutchison). Assistance was also supplied to ISPG (Martin) in the procurement procedures for a mini-computer to be installed in Calgary. Branch procedures were established and documented (Martin) for the use of a second digitizing table.

The administrative duties of the Group included, as in the previous year, the management of the EAI plotter and the compilation of the annual EDP Report and Plan on behalf of the Branch (Martin). In addition, the implications of decentralization on computer users were studied and a report outlining facilities deemed necessary at Thunder Bay submitted to management (Gordon).

Martin also was a member of an international five-man working group on data management which produced a publication - "Relevant Data Structures".

Attendance at Meetings, Conferences, Courses

T.M. Gordon

Second Annual Symposium Workshop on NCGIPG, April 1977.

G. Martin

Second Annual Symposium Workshop of the NCGIP, April 1977.

Workshop on Computer Graphics, San Jose, Cal., July 1977.

SIGGRAPH 77: Fourth Annual Conference on Computer Graphics and Interactive Techniques, San Jose, Cal., July 1977.

D.D. Picklyk

Interactive Computer Graphics Workshop, Calgary, Alta., May 1977.

Man-Computer Communications Conference, Calgary, Alta., May 1977.

IGCP Project 98: Standards for Computer Applications in Resource Studies, Taita Hills, Kenya, November 1977.

Special Talks or Lectures

G. Martin

Panel member: Human problems of conversion of manual to automated methodologies, Second Annual Symposium of the NCGIPG, April 1977.

Computer appreciation for management. A series of talks given in Department of Health and Welfare, 1977.

Membership on Committees

T. Gordon

Member of the National Capital Commission Geographical Information Processing Group.

G. Martin

Member, COGEODATA Committee on Data Capture and Data Display.

Member, COGEODATA Working Group on Data Structures and Data Management.

Member of the National Capital Commission Geographical Information Processing Group.

D.D. Picklyk

Member, Newfoundland DREE Advisory Committee.

Member, Manitoba EMR NREP Management Advisory Committee.

Member, IGCP Project 98 Executive Committee.

Member, Departmental Computer Working Group.

ATLANTIC GEOSCIENCE CENTRE

M. J. Keen

The objectives of the Atlantic Geoscience Centre are to provide timely and accurate advice and information about the earth beneath the sea now and in the future. Consequently, we undertake geological and geophysical studies of the margins off eastern Canada and the eastern Arctic in particular, and of the ocean basins in general, which contribute to departmental programs concerned with energy, minerals, the use of the ocean basins, and science and technology in general. Not only are we a Division of the Geological Survey of Canada, we are also a constituent laboratory of Bedford Institute of Oceanography, and so have a dual role to play. We interact with many organizations in government, industry and university in the Atlantic Provinces, and with geological and oceanographic institutions world-wide.

We have five subdivisions: Administration handles all matters concerning personnel and finance, and takes charge of numerous AGC-wide tasks. Program Support provides or organizes support for oceanographic cruises and field work; the subdivision is the focal point for many projects run jointly with other laboratories at the Institute, such as development of side-scan sonar, and electric drills; it is responsible for instrument development, and for AGC-wide data acquisition storage and retrieval. Environmental Marine Geology is responsible for undertaking research in the field of modern marine geological processes - what is happening now, and what has happened recently in the coastal regime, the shelf, slope, and ocean basins? As an example, studies of the sediment budget of the Bay of Fundy allows us to give advice on siltation which may affect the viability of Fundy Tidal Power, and have led to a technique for determining suspended sediment concentrations in estuaries using satellite imagery. Regional Reconnaissance is responsible for surficial and bedrock mapping of the offshore which contributes to our understanding of the history of the rifted margins of eastern North America, and for undertaking experiments at sea so that we may understand crustal processes. Interest in developing acoustical techniques quantitatively in mapping sediments has led to fruitful interaction with HUNTEC ('70) Ltd., under the Seabed Project. Interest in seeking differences between oceanic and continental mantle has led to interesting experiments with ocean bottom seismometers. Eastern Petroleum Geology is responsible for the sedimentary basins of eastern Canada and the eastern Arctic; these include the Mesozoic and Cenozoic basins offshore, and the Paleozoic basins onshore and offshore. This subdivision undertakes basin analysis, using material from offshore wells drilled by industry, and confidential seismic data provided by industry. As a consequence of its work, we advise the department on matters concerning hydrocarbon inventory, and coal resources for Nova Scotia. The expertise of this subdivision also makes it possible to contribute to global understanding through, for example, the Deep Sea Drilling Project.

The Division consists of the following staff:
Managers(4);Research Scientists 24 , Physical Scientists 21 , and Engineers 2 (47);Administrative staff(11);Scientific and technical support staff(37);there are, in addition, 8 staff members in supporting roles engaged under the Federal Labour Intensive Program, and in the summers we employ about 10 students.

Bosko Loncarevic was promoted from his position as Director to become again a Research Scientist. He was Director for five years, and guided AGC through these formative years. Mike Keen joined the Division as Director, coming from Dalhousie University.

ADMINISTRATION SUBDIVISION

The Administration Subdivision performs the personnel and financial responsibilities for the Atlantic Geoscience Centre. The Personnel Office carries out the pay and benefits function for the Centre. This pay function includes processing regular pay, overtime pay, special allowances and programs. As a regional office this is done through Department of Supply and Services in Halifax. The benefits function covers maintaining leave records, advising on superannuation and insurance coverage, having a knowledge of applicable collective agreements and advising in the writing of PAS's.

The Accounts function includes maintaining ledgers and producing monthly reports, processing suppliers' invoices, obtaining advances, advising on travel regulations and payment regulations, preparing main estimates submissions to GSC, and maintaining inventory records.

The Admin Subdivision also has responsibility for organizing training courses, establishing a safety program for the Atlantic Geoscience Centre and providing a manuscript typing service and central registry service (through Department of Fisheries and Oceans) for the whole Division.

Highlights

In February the EM&R Human Resources Planning and Development Branch put on a one week Basic Management Course at the Dartmouth Inn for 15 AGC employees.

The EM&R Internal Audit Division had the firm of H. R. Doane and Company perform an internal audit at AGC. Overall it was found our accounting system was in good shape. The changes the report suggested were implemented.

An Activity Sheet of things going on at AGC is produced on an intermittent basis. Usually one goes to press every two weeks, but occasionally, depending on the volume of news, it may come out only once a month.

Personnel Notes

The Administration Subdivision consists of 1 Director and Secretary; 1 Admin Officer, 1 Personnel Clerk, 3 Accounts Clerks and 1 Secretary.

Patrick Stewart joined AGC in May as Admin Officer. He was formerly with the Treasury Board, Province of Nova Scotia.

Ron Eden resigned his position as Admin Officer to take a position with Manpower and Immigration, Halifax.

Melba Deluney, Admin typist resigned in June and moved to Greenwood.

Attendances at Meetings, Conferences and Courses

M. J. Keen

Management Development for Research Management, October 1977, PSC, Touraine Centre, Quebec.

Orientation to Financial Management, February, 1978, PSC, Touraine, Quebec.

M. E. MacDonald

Professional Development for the Career Oriented Secretary, October 1977, Waterloo Management Centre, Toronto.

P. G. Stewart

Fundamentals of Budget Formulation and Control, October 1977, PSC, Moncton, N. B.

C. Racine

Introduction to Personnel Administration, October 1977, PSC, Toronto.

D. Campbell

Basic Management Skills, February, 1978, EM&R Training Unit, Dartmouth, N.S.

C. Simmons

The Secretary in the Organization, Atlantic Management Training Centre, July, 1978, Halifax, N.S.

Subdivision Manuscripts

During 1977-78, M. J. Keen co-authored 2 manuscripts; 1 for BIO Data Report, 1 for publication in the Journal of Geophysical Researches.

PROGRAM SUPPORT SUBDIVISION

K. S. Manchester

The objectives of the Program Support Subdivision are directed towards providing an efficient central support facility for the Division. This support is organized in three sections.

The Operations and Maintenance Section is involved in the early stages of a project in advising scientists of equipment and personnel availability and capabilities to acquire desired scientific results, equipment and technical personnel assignment, and equipment and supply acquisition. In the later stages of a project, equipment and supplies are assembled and loaded on the ship or

transported to the field site, instrument installations are carried out, liaison with other agencies established and final instrument calibrations completed. During the operation, launches, vehicles and instruments have to be maintained and operated and special services, such as seismic shooting, scuba diving and watchkeepers provided. Following the operation, equipment has to be demobilized, and repaired, storage arranged for, and new equipment purchased.

The Systems Development Section is responsible for developing, designing and testing new equipment and instruments, or modifying present instruments and equipment to meet new or special division scientific objectives. This is accomplished by initial discussions with division scientists as to requirements, formulating proposals to meet these requirements, then designing, constructing, documenting and testing these in the field to make certain they perform up to expectations.

The Data Management Section is responsible for assisting in processing data in the field, entering field data into and maintaining permanent data files for division research purposes, preparing data for release to outside requestors via open-file and filling individual requests. Special data file catalogues and output routines are produced and maintained for staff use. The section also provides curation services for the entire division for core, dredge, grab, and other marine geological samples. It also manages a contract for the routine soft sediment analysis for the Division and provides a regional sample repository for marine geological samples collected by university and industrial concerns that are unconditionally donated to the Division.

Highlights

Four OBS's with a unique anchoring and release mechanism and a microprocessor controlled clock and programmer were built and field tested successfully off the Canadian East Coast and the Reykjanes Ridge.

The OBS's were used successfully from an ice camp in the Canada Basin on the CANBARX project by use of Kevlar cable to lower and raise them to the surface providing a method of using these in ice-covered waters.

The majority of the planning for the relocation of EM&R staff at the Bedford Institute of Oceanography into the new Murray Building was completed for the planned move in the Fall of 1978.

A review of the AGC Data Management activities in the Division was started with the creation and filling of the Data Manager Position by Dr. A. Fricker in November 1978; he will coordinate data processing throughout AGC.

The Subdivision actively started to provide technical field support to the Institute's rock core drill development project with the intent that we will eventually provide all routine rock core drilling support to AGC field projects.

Personnel Notes

The subdivision consists of five professional and sixteen technical staff, and three support staff. There were also additional summer students and FLIP term employees employed during various portions of the year on subdivision projects.

A. Fricker joined the staff of the Subdivision filling the position of Data Manager on November 1, 1977.

C. Godden retired in December 1977, after twenty-six years of service.

K. Hale joined the drafting group in April 1977, from Parks Canada.

Attendance at Meetings, Conferences and Courses

T. Corbett

Basic Management Skills Course, February 27 to March 3, 1978, Dartmouth, N.S.

A. Fricker

Basic Management Skills Course, February 27 to March 3, 1978, Dartmouth, N.S.
Data Base Concepts Course, March 20-21, 1978, Washington, D.C.

M. Gorveatt

Basic Management Skills Course, February 27 to March 3, 1978, Dartmouth, N.S.
Mercruiser Maintenance Course, March 20-23, 1978, Dartmouth, N.S.

D. Heffler

Basic Management Skills Course, February 27 to March 3, 1978, Dartmouth, N.S.

B. Inkpen

Safe Handling of Explosives Course by Ontario Construction Association, February 19-23, 1978, Lindsay, Ontario

F. Jodrey

Mercury Outboard Maintenance Course, March 20-23, 1978, Dartmouth, N.S.

K. S. Manchester

Offshore Technology Conference, May 2-6, 1977, Houston, Texas.
Management of Time Course, February 27-28, Halifax, N.S.
Oceanology International 78, March 6-10, 1978, Brighton, England

R. Murphy

Mercury Outboard Maintenance Course, February 27 to March 3, 1978, Dartmouth, N. S.

A. Sherin

Elements of System Analysis & Design Course, November 13-25, 1977, Ottawa.

Special Talks and Lectures

D. Heffler

Presented "A Pop Up Ocean Bottom Seismometer", to DREA, February 3, 1978, Dartmouth, N.S.

K. G. Shih

Presented "Shipboard Geophysical Data Reduction System on HP-2100 Computer", at Department of Computer Science, University of Waterloo, November 7, 1977.

Presented "Storage, Retrieval and Interpretation of Marine Geophysical Data", at Department of Geophysics, University of Western Ontario, November 10, 1977.

Laboratory and Technical Services Statistics

New Data Curated:

8 cruises; Logbooks and Cruise Records
31,400 Line-km Bathymetry Data
30,300 Line-km Magnetic Data
25,900 Line-km Gravity Data
9,800 Line-km Seismic Data
600 Line-km Side Scan Sonar Data
1,471 Sample Stations Recorded
271 New Samples Curated
50 Wells Palynology Data Digitized

ENVIRONMENTAL MARINE GEOLOGY SUBDIVISION

D. E. Buckley

This subdivision is engaged in research which attempts to assess the significance of contemporary marine geological processes in controlling the development of sedimentary, geochemical and ecological characteristics. Interdisciplinary and multidisciplinary teams of scientists collect information, which helps to establish the environmental sensitivity of coastal areas as well as the deep sea. Expertise in the specialties of coastal geomorphology, marine sedimentology, geochemistry and paleontology is used to identify potential new resources and to provide advice concerning the management of marine geological resources.

Field activities by members of the subdivision were carried out in a wide variety of geographic areas of the East Coast of Canada. These areas included the upper regions of the Bay of Fundy, the southern Gulf of St. Lawrence, the continental shelf slope off southeastern Newfoundland, the Labrador Coast and the southeastern coast of Baffin Island. The objectives of many of these projects were directed at assessing the rate of sediment movement and deposition, and particularly assessing the significance of these processes with regard to the potential development of mineral and energy resources.

In the Bay of Fundy region, the development of tidal power has long been considered a possibility. For the past two years the joint Federal-Provincial Bay of Fundy Tidal Power Review Board has been re-examining the economic and financial feasibility of development. During this same period of time, geological investigations of the rates of shoreline erosion, sediment transport and deposition have been carried out, particularly in the Minas Basin. These studies have been directed

at identifying any engineering or environmental problems that might be expected from the construction of such a major project.

The southern Gulf of St. Lawrence is characterized by a coastal regime with long stretches of sandy barrier islands and shallow bays and estuaries. A number of Environmental Marine Geological projects have been carried out in this region for the past several years to examine those processes which are responsible for the redistribution of sediments along the barrier islands, through the tidal inlets and from the rivers into the protected bays. Port and harbour development and maintenance projects have required dredging and dumping of nearshore sediments in this region, which has required expert advice on the consequences of such operations.

The gentle slope of the shelf off southeastern Newfoundland extends into the North Atlantic for some 400 km with depths increasing from 300 meters to 3,500 meters. This shelf slope is quite unique in that there is little possibility of massive down-slope movement of recent sediments in contrast to the more characteristic slopes of the rest of the east coast off shore. The potential for oil exploration in this area may increase as technology improves and other more accessable areas are evaluated.

Concerns about the environmental sensitivity of the Arctic and Labrador Coasts to oil spills have increased with the increased attention to oil exploration off these coasts. In order to assess this sensitivity, regional surveys and specific studies along the coast of Labrador and the southeast coast of Baffin Island have been undertaken by the coastal geomorphologists and sedimentologists. Particular attention has been paid to areas in which sedimentary coastlines would be especially vulnerable to oil spill damages.

During the past year, 600 sediment samples were granulometrically analyzed in the subdivision laboratory; about 150 complete organic characterization analyses of hydrocarbons and recent organic matter, about 1,500 inorganic metal analyses were carried out in the geochemistry laboratory; many specialized analyses were also carried out using the Centre's scanning electron microscope, X-ray facilities and the micropaleontology laboratory.

Highlights

- Studies of the sediment budget and sediment dynamics in the Minas Basin use of special techniques, which were applied for the first time in Canada; these included: a) interpretation of Landsat images to quantitatively determine suspended sediments concentration and b) the use of artificially produced radioactive sands to measure the movement of intertidal sediments.

- Minas Basin sediment studies indicate siltation problems may be a major concern in future studies of the feasibility of tidal power development in the Bay of Fundy.

- In the southern Gulf of St. Lawrence, the movement of sediment is generally onshore and along the barrier islands. Large flood-tide deltas are often associated with the tidal inlets indicating significant transport through these inlets into the inner bays and thereby aggravating the problem of harbour development and maintenance.

- The continental shelf slope off southeast Newfoundland is currently an area of relatively low sedimentary deposition, and is strongly influenced by oceanographic currents at mid-depths.

- Along the southern coastlines of Baffin Island and Labrador, boulder barricades are a common feature resulting from ice interaction with the shallow nearshore sediments. These barricades are a hazard to small boat operations, impede access to harbours, and form a semipermeable barrier to sediment movement on and off shore.

Personnel Notes

Lionel Carter, a post-doctorate fellow, from the New Zealand Oceanographic Institute, Wellington, New Zealand, came to EMG on December 28, 1977, for a one year stay.

Dr. Joan Willey, a post-doctorate fellow, left to join the staff of the University of North Carolina.

Edward Bryant, a post-doctorate fellow, is with us for a two-year period which commenced in September, 1977.

Gordon Joice, statistician, resigned in September to become a dairy farmer.

Bernard Long, a post-doctorate fellow from France, left in January to take up employment with the Universite du Quebec at Trois-Rivieres.

Ray Cranston is back at EMG after education leave at the university of Washington from August 1975 to July 1978.

Carl Amos came on staff in May 1977 as a sedimentologist.

Carolyn Frost, secretary of EMG for twelve years, retired in January, 1978.

Attendance at Meetings, Conferences and Courses

C. L. Amos

Seasat Land Applications Group Meeting in Ottawa, September 23, 1977.

Canadian Environmental Professionals, January 19-21, 1978. Paper presented: "Origin, Transport and Deposition of Sediments".

Bay of Fundy Workshop, February 7-8, 1978.

Mount Allison Workshop, February 21, 1978. Re: Field Activities '78.

D. E. Buckley

Oil/Environment '77 Symposium, October 11-14, 1977 at the Lord Nelson Hotel Halifax, N.S.

N. S. Resources Council Seminar Fundy Tidal Power Development, October 22, 1977, Dalhousie University.

Undersea Mining Meeting, November 9-18, 1977, Seattle.

Departmental Committee on Ocean Mining. Patricia Bay Oceanographic Institute, Victoria.

Examiner of Student's Thesis, Rimouski.

National Research Council Association Committee on Shoreline Erosion and Sedimentation, January 17-18, 1978, Ottawa.

Bay of Fundy Workshop, February 7-8, 1978.

Mount Allison Workshop, Re: Field Activities, Bay of Fundy Workshop, February 21, 1978.

R. Cranston

American Geophysical Union Meeting, April, 1978, Miami.

Geological Society of America meeting, November 1977, Seattle.

B. Long

Public Information meeting in Five Islands on Radioactive Tracer Experiment, held by the Five Islands District Fisherman's Association, September 7, 1977.

Centre d'Etudes du Quaternaire, Universite de Montreal, Montreal, Quebec, December 12, 1977.

The Group "Thermonncleaire Pollution", Universite du Quebec a Trois Rivieres.

B. McCann

Long-Range Planning of Coastal Groups in GSC, April 17-19, 1977, Ottawa.

EAMES Meeting, Department of Indian Affairs and Northern Development, June 6, 1977, Ottawa.

Federal, Provincial and Company personnel to discuss MOBIL Canada Environments Manual, September 20, 1977.

MOBILE Operations off Sable Island, September 22, 1977.

Terrain Sciences Meeting, November 8, 1977, Ottawa.

NRC Grant Selection Committee for Earth Sciences, November 24-25, 1977, Ottawa.

CCIW, Program Committee Re: Coastal Conference, December 15-17, 1977, Burlington, Ontario.

NRC Site Visits to S. Ontario Geology Departments, January 23-26, 1978.

NRC Grant Selection Committee for Earth Sciences, February 13-17, 1978, Ottawa.

M. A. Rashid

McGill University, RMCB and Morgan and Schaffer Corp., April 11-16, 1977, Montreal and Ottawa.

Oil/Environment '77 Symposium, Lord Nelson Hotel, October 11-14, 1977, Halifax.

G.E. Reinson

Departmental Committee Meeting on Ocean Mining, April 14, 1977, Ottawa.

Coastal Sediments '77, November 4-7, 1977, Charleston, South Carolina.

Coastal Symposium, Northeast Geological Society of America, March 8-11, 1978, Boston.

EPS Workshop on Effects of Oil Spills on Coastline, May 12-13, 1977, Hull, Quebec.

K. Robertson

"Project Management" Course, January 16-20, 1978, Halifax.

Occupational Health & Safety, January 30 & 31, 1978, Ottawa.

P. Rosen

Coastal Sediments '77, November 4-7, 1977, Charleston, South Carolina.

Coastal Symposium, Northeast Geological Society of America, March 8-11, 1978, Boston.

C. Schafer

Fifth International Congress of Protozoology, June, 1977, New York.

Woods Hole Oceanographic Institute & Lamont-Doherty, June 20-28, 1977.

Third International Meiofauna Conference, August, 1977, Hamburg, Germany.

G. Vilks

Annual Environmental Workshop, Arctic Petroleum Operators Association and the Canadian Petroleum Association, April 17-20, 1977, Fairmount, B.C.

Atlantic Provinces Inter-University Committee on Sciences, November 18 & 19, 1977, Acadia University.

Woods Hole Oceanographic Institute, Massachusetts; Lamont-Doherty Geological Observatory and the University of Rhode Island, November 30 - December 3, 1977.

Canadian Representative to International Workshop of Seabed Working Group of NEA, January 30 - February 7, 1978, Albuquerque, New Mexico.

Arrange Participation on Board RV OCEANOGRAPHER to Monitor Deep Sea Mining in the North Pacific, February, 1978, Seattle.

Discussion Re: Miramichi Oceanography with D. Krauel, Royal Roads Military College, February, 1978, Victoria.

Atomic Energy Control Board, February, 1978, Ottawa.

G. Winters

29th Pittsburg Conference on Analytical Chemistry and Applied Spectroscopy, February 26 - March 3, 1978, Ohio.

Membership on Committees

D.E. Buckley

Atlantic Geoscience Centre Management Committee

Associate Committee for Research on Shoreline Erosion and Sedimentation

Bedford Institute of Oceanography Chemical Advisory Committee

Bedford Institute of Oceanography Safety Committee

College of Cape Breton Advisory Committee on Chemical Technology

Department of the Environment Environmental Impact of Spilled Oil Committee

Department of Environment, Field and Laboratory Coordinating Committee

Departmental - Atlantic Region, Fundy Working Group

Departmental Committee on Ocean Mining

Fundy Tidal Power Environmental Committee

Miramichi Environmental Advisory Committee

Oil in the Environment Symposium - Steering Committee

Submersible Research Program Committee

B. McCann

National Research Council Earth Sciences Grant Selection Committee

Atlantic Geoscience Center Science Committee

M.A. Rashid

Regional Environmental Emergency Team

G.E. Reinson

Departmental Committee on Ocean Mining

Eastern Passage Advisory Committee

Master's Thesis Committee for Three Dalhousie University Graduate Students

K. Robertson

Atlantic Geoscience Centre New Building Committee

G. Vilks

Atlantic Geoscience Centre Representative Atlantic Provinces Inter-University Committee on the Sciences

Seabed Working Group, Radioactive Waste Management Committee of OECD/NEA

Special Talks & Lectures

C.L. Amos

Spoke to CACRS Hydrology Working Group at N.S. Technical College.

D.E. Buckley

"The Arctic Seas - The Frontier for Geochemical Research", April 12 & 13, 1977, Laval University.

"Environmental Projects carried out by the Department of Energy, Mines and Resources in Eastern Canada", June 15, 1977, Regional Board of Department of Fisheries and the Environment (Co-speaker C.T. Schafer).

"The effects of the Canso Causeway on the Marine Environment of the Strait of Canso and Adjacent Bays", November 22-24, 1977, Canso Marine Environment Workshop, Bedford Institute of Oceanography.

R. Cranston

"Flameless Atomic Absorption Analyses in Oceanography", November, 1977, Perkin Elmer Seminar, Seattle, Washington.

B. Long

"Bedload Transport in the Bay of Fundy", December 13, 1977, Marine Science Centre McGill University.

"Bedload Transport in the Bay of Fundy", December 17, 1977, SOUQAR and TNRS University of Quebec at Rimouski.

B. McCann

"Tidal Inlets in the Gulf of St. Lawrence", November 4-7, 1977, Coastal Sediments '77, Charleston, South Carolina (Co-speaker G.E. Reinson).

"Barrier Islands in the S. Gulf of St. Lawrence", March 8-11, 1978, Coastal Symposium at the Northeast Geological Society of America, Boston.

"Coastline Studies, S.E. Baffin Island" by McCann, Reinson and Frobel, March 14-17, 1978, Arctic Oil Spill Program Seminar, Calgary.

M.A. Rashid

"Geochemical and Environmental Significance of Chelation and Cation Exchange Reactions of Organic Compounds in Recent Sediments", June 11-13, 1977, SEPM Research Colloquim, Washington, D.C.

"Role of Sedimentary Humic Compounds in Transport of Transition Metals", June 14, 1977, Old Dominion University, Norfolk, Virginia.

P. Rosen

"Ice-Formed Beach Features of Eastern Canada", November 21, 1977, Long Island University, New York.

C. Schafer

Presented talk to Regional Board of Department of Fisheries and Environment, June 15, 1977 (Co-speaker D. Buckley).

G. Vilks

"Holocene History of Sedimentary Beaufort Sea", April 25-27, 1977, GAC Meeting, Vancouver.

"The Influence of a Causeway on Oceanographic Sediments and Foraminifera in the Strait of Canso", November 22-24, 1977, Bedford Institute of Oceanography.

J. Willey

"Sediments Geochemistry - Miramichi Estuary and Environmental Implications", May 12, 1978, University of Maine, Tra Darling Marine Centre.

Subdivision Manuscripts

During 1977-78 the staff of the subdivision produced 28 outside papers, 6 Geological Survey of Canada papers, 3 Bedford Institute of Oceanography Reports, and 3 abstracts.

Regional Reconnaissance Subdivision

R. T. Haworth (Acting Head)

The objective of the Regional Reconnaissance Subdivision is to understand the recent and ancient history of development of the continental margin of Eastern Canada. This is primarily carried out by the interpretation of data collected during regional geoscience surveys of the margin and by the development of new technology and methodology towards increasing the scope and efficiency of these surveys. Systematic marine geological and geophysical surveys of the margin provide basic geoscience maps of the area, which are then supplemented by regional studies in the adjacent oceanic areas leading to regional analyses and syntheses concerning the geological development of the area.

The Subdivision, comprising fourteen scientists and nine scientific support technicians, is divided into sections organized according to both geography and discipline. The Arctic Marine Studies section is a geographically defined section because of the logistical problems in mounting operations in the Arctic. All scientific operations both of AGC and the scientific units of other departments at Bedford Institute of Oceanography have to be coordinated in order to effectively use the only research vessel capable of operating in the Arctic. The Labrador Sea Studies section is also geographically defined for similar reasons. The Ocean Basins and Margins section is concerned with determining the structure of the present continental margin, and those processes within the ocean basins that control its development. Systematic geological mapping of the continental margin is carried out by the Bedrock and Surficial Geology section, while the Geophysical Surveys section primarily carries out its mapping in conjunction with surveys of the Canadian Hydrographic Service. A group of 6 technicians provides seismic, gravity and magnetic survey support to the whole of AGC, although Regional Reconnaissance Subdivision scientists are the primary users.

The Subdivision is administered by a research manager and a secretary.

Highlights

Crustal Structure:

During the first year of full operation of our AGC designed and built ocean bottom seismometer system, seismic refraction experiments were carried out to determine crustal structure in the vicinity of the actively spreading Reykjanes Ridge, the subsided and modified continental region of the Orphan Basin and Flemish Pass, and in the unexplored Canada Basin in the Arctic Ocean. Orphan Basin has an anomalously thin crust but poor shear wave data did not allow decisive definition of the physical properties of the crustal layers. Synthetic seismogram methods are under development for application to the OBS, following application of the methods to interpretation of Mid-Atlantic Ridge data.

Baffin Bay:

Geophysical and Geological correlation across Nares Strait does not preclude strike-slip motion along the Strait, according to a graduate student thesis resulting from work in Northern Baffin Bay. Further constraints on continental drift in Baffin Bay were provided by analysis of the Tertiary basalts in Davis Strait. Navigational problems in Baffin Bay may be reduced by the use of skywave signals from LORAN-C transmitters which can provide continuous tracking outside the periods of dawn and dusk. The source of the oil seep in Scott Inlet appears to be Paleozoic rocks outcropping on the side of the submarine channel.

Labrador Sea:

Surficial mapping of the Saglek Bank shows a morphology which contrasts strongly with Hamilton Bank in the south. The boulder beds of Saglek Bank have caused drilling problems for the hydrocarbon exploration program. The Bio-Tephra stratigraphic chronology developed for northern Labrador Sea is identical with open ocean chrono-stratigraphy for the period 18000 - 80000 B.P. Geophysical surveys have permitted four 1:250,000 Natural Resource Map editions to be compiled for each of 6 areas and to be released for each of 12 areas during the year.

Geological Mapping:

Extended bedrock and surficial coverage obtained on the Baffin Island shelf, Grand Banks and northeast of Newfoundland. Interactive computer interpretation of geophysical data in terms of structural units was justified by correlation with the measured propertied of bedrock cores drilled as part of these programs. Analysis of sedimentary structures across the continental margin indicated that the development history of prograding sequences was destructive (in which seismic horizons cannot be traced directly across the margin) on the Scotian Margin, but is constructive north of the Grand Banks. The pattern of pockmark development by gas release from within the surficial sedimentary units was more clearly defined from close scrutiny of an area on the Scotian Shelf.

Huntec:

The 5-year SEABED project, in addition to providing field support to most of AGC's surficial geological operations, began to yield data processing results that indicated correlation between the grain-size and morphology of sedimentary units and the quantitatively determined reflectivity and shot-to-shot reflected ray coherence. These results were presented internationally with much interest.

Personnel Notes

The Subdivision presently consists of a permanent staff of 14 scientists and 5 support staff.

Dr. B. D. Loncarevic stepped down as Director, Atlantic Geoscience Centre on March 31, 1977 and joined Regional Reconnaissance as a research scientist on April 1, 1977.

Ms. Ruth Jackson from the Ocean Basins and Margins Group, presently on Educational Leave at Durham University, England, has been replaced by Mr. Steven Moores beginning September 1, 1977.

Mr. David Monahan of the Canadian Hydrographic Service, Ottawa, was on a temporary work assignment with the Subdivision for approximately three months beginning August 31, 1977.

Dr. R. H. Fillon transferred his work station to Lamont-Doherty Geological Observatory, Palisades, New York for a 3-month period, November 1977 to April 1978. He is working with colleagues outside AGC during the critical and final stages of the data processing and interpretation of his Labrador Sea Paleo-oceanography project.

Dr. David Ross, Head of the Subdivision, left on January 1, 1978 under the Executive Interchange Program to take up a temporary position with NORDCO Limited, St. John's, Newfoundland. Dr. R. T. Haworth has assumed the duties of Acting Head of the Subdivision and as Scientific Authority of the Huntec Seabed Project until April 30, 1978.

Attendance at Meetings, Conferences and Courses

R. K. H. Falconer

Antarctic Geology and Geophysics Conference, Madison, Wisconsin, August 21-28, 1977. Presented paper.

CANBARX Planning Conference meeting, Massachusetts Institute of Technology, Cambridge, Mass., January 12-13, 1978.

International Planning Meeting for Arctic Programs, Copenhagen, January 26 to February 3, 1978.

R. H. Fillon

CLIMAP Meeting, Lamont-Doherty Geological Observatory, Palisades, New York, February 1978.

R. T. Haworth

Joint DFE/EMR Guiding Committee on Offshore Surveys Meeting, Bedford Institute of Oceanography, Dartmouth, N.S., November 18, 1977.

Geological Association of Canada Newfoundland Section Annual Spring Meeting, Memorial University of Newfoundland, St. John's, March 2-4, 1978. Presented paper.

Atlantic Geoscience Society Biennial Symposium, Fredericton, N. B., January 20-21, 1978. Presented paper.

C. E. Keen

NRC Panel Meeting, Boulder, Colorado, May 4-8, 1977.

APICS Lecture Tour, Memorial University, St. John's, Newfoundland, January 25-27, 1978.

Canadian Geodynamics Subcommittee meeting, Ottawa, Ontario, March, 3, 1978.

L. H. King

INQUA Congress, Birmingham, England, August 1977.

Workshop on the Application of Imagery to the Field of Oceanography. Jet Propulsion Lab., Pasadena, California, December 1977.

B. D. Loncarevic

Calgary Mining and Metallurgy Association Meeting, Calgary, Alberta, April 27-29, 1977. Presented paper.

Scientific Advisory Committee of the International Geological Correlation Project (IGCP), Paris, France, February 9-22, 1978.

International Planning Group Meeting for Post-Geodynamics Program, Paris, France, February 9-22, 1978.

B. MacLean

Eastern Arctic Marine Environmental Study (EAMES) Meeting, Ottawa, Ontario May 9-11, 1977.

D. I. Ross

ASCO Meeting, Memorial University, St. John's, Newfoundland, November 21-22, 1977.

S. P. Srivastava

International Association of Geomagnetism and Aeronomy Meeting, Seattle, Washington, August 15 to September 3, 1977. Presented 2 papers.

J. M. Woodside

American Geophysical Union Annual Meeting, Washington, D.C., May 29 to June 3, 1977. Presented paper.

Membership on Committees

R. H. Fillon

Atlantic Provinces Subgroup of the Canadian Working Group on Quaternary Glaciations in the Northern Hemisphere (IUGS-UNESCO-USGP).

R. T. Haworth

Geophysical Interpretation of Gravity Data Sepcial Study Group 5.46 of the International Gravity Commission.

C. E. Keen

Working Group 8 of the International Commission on Geodynamics and Study Group Chairman on Continental Margin of Eastern North America.

Editorial Board, Canadian Journal of Earth Sciences.

Member of Ocean Sciences Board of the NRC Continental Margin Panel.

Canadian Geodynamics Committee

L. H. King

Research Associate, Department of Geology, Dalhousie University.

B. D. Loncarevic

Atlantic Sub-Committee on Oceanography

Scientific Advisory Committee of the International Geological Correlation Project (IGCP).

D. I. Ross

Canadian Geodynamics Committee

S. P. Srivastava

Working Group I-4. "Magnetic Anomalies". Division 1 of the International Association of Geomagnetism and Aeronomy.

J. M. Woodside

Member of Special Study Group on Gravity Measurements at Sea. International Gravity Commission.

Special Talks and Lectures

R. K. H. Falconer

"Seismicity Fracture Zones and Poles of Rotation of the Pacific-Antarctic and Indian Antarctic Plate Zones." Presented at the Antarctic Geology and Geophysics Conference, Madison, Wisconsin, August 21-28, 1977.

"The Arctic-Unknown-Research Potential." Presented Seminar to Department of Geology, Dalhousie University, Halifax, N. S. February 9, 1978.

"Arctic Geophysical Research Opportunities." Presented talk to Departments of Geology and Oceanography, Dalhousie University, Halifax, N.S., February 9, 1978.

R. H. Fillon

"Deep Shelf and Slope Terraces off Northern Labrador." Presented Seminar at the University of Maine, May 3-4, 1977 and at Lamont-Doherty Geological Observatory, Palisades, New York, December 1977.

"Benthonic Foraminifera of the Labrador Sea." Presented Seminar at Lamont-Doherty Geological Observatory, Palisades, New York, February 1978.

R. A. Folinsbee

"Hydrography - Step II." Course presented to Canadian Hydrographic Service, Ottawa, November 14-18, 1977.

R. T. Haworth

"Pre-Mesozoic Geology of the Continental Shelf Northeast of Newfoundland." Presented Seminar to Department of Geology, Dalhousie University, Halifax, N. S., February 16, 1978.

"Offshore Geophysical Studies and Relationships to Appalachian Structures." Presented at the Geological Association of Canada, Newfoundland Section Annual Spring Meeting, Memorial University, St. John's, Newfoundland, March 2-3, 1978.

"Is the Moho Just a Deep Unconformity - Provincialism in the Geosciences." Presented at the Atlantic Geoscience Society Biennial Symposium, Fredericton, N. B., January 20-21, 1978.

C.E. Keen

"Baffin Bay - A Plate Tectonic Model." Presented Seminars to Departments of Geology at:
St. Mary's University, Halifax, N.S., November 17, 1977;
Mt. Allison University, Sackville, N. B., November 23, 1977;
University of New Brunswick, Fredericton, N. B., November 25, 1977;
Acadia University, Wolfville, N. S., November 21, 1977.

"Surface Wave Propagation Along the Reykjanes Ridge." Presented talk at Woods Hole Oceanographic Institution, Woods Hole, Massachusetts, April 3-5, 1977.

"Mesozoic Evolution of the Newfoundland Basin." Presented Seminar to Department of Physics, Memorial University, St. John's, Newfoundland, January 1978.

"Advanced Geophysics." Course given to Geophysics students at Dalhousie University, Halifax, N.S, September 19 to October 31, 1977.

B. D. Loncarevic

"The Challenge and Opportunities in the Great Oceans." Guest Speaker for the Sproule Lecture Series, Calgary, Alberta, April 27-29, 1977; and presented Seminar to the Calgary Mining and Metallurgy Association, Calgary, Alberta, April 27-29, 1977.

"Physics of the Earth." Conducted course at the International Centre for Theoretical Physics, Trieste, Italy, September 30 to mid-December, 1977.

D. I. Ross

"Acoustic Measurements of Deep Crustal Structure and Shallow Sediment Properties on the Canadian Margins." Presented Seminars to Hawaii Institute of Geophysics, Honolulu, Hawaii, July 12, 1977; and to Department of Physics, University of Auckland, New Zealand, July 17, 1977.

"Oceanography in Canada." Presented talk to the Wanganui Rotary Club, Wangnaui, New Zealand, August 1, 1977.

"High Resolution Seismic Measurements as an Aid to Classifying Marine Sediments." Presented Seminar to Department of Geology and Physics, Victoria University of Wellington, New Zealand, August 12, 1977.

S. P. Srivastava

"Correlation Between Magnetic Anomalies and the Bedrocks in the Offshore Regions of Eastern Canada." Presented at the IAGA Conference, Seattle, Washington, August 15 to September 3, 1977.

"Evolution of the Labrador Sea." Presented Seminar to the University of British Columbia, Vancouver, B.C., August 15 to September 3, 1977.

J. M. Woodside

"Tectonic Elements and Deformation of the Eastern Mediterranean." Presented at the American Geophysical Union Spring Annual Meeting, Washington, D.C., May 29 to June 3, 1977.

Subdivision Manuscripts

During the fiscal year April 1, 1977 to March 31, 1978, the Subdivision published 20 manuscripts for outside journals, 5 "abstract only", 3 GSC papers and 1 BIO Data Report.

EASTERN PETROLEUM GEOLOGY SUBDIVISION

L. P. Purcell

Eastern Petroleum Geology Subdivision is concerned mainly with studies which, in common with most in AGC, are directed toward an understanding of the geological history of the North Atlantic Basin; the Subdivision's particular concern is the structure and stratigraphy of the sedimentary basins of both offshore and onshore eastern Canada. The major data base is material received from industry drilling. These data are supplemented with studies of geological sections and samples from outside the immediate area, i.e., the eastern Arctic, Greenland, western Europe, the Iberian Peninsula, the United States margin as far south as Baltimore Canyon as well as materials from the DSDP program.

These investigations contribute to the data base for scientific and economic use. A primary concern of the Subdivision is the estimating of future mineral potential, especially hydrocarbons (oil, gas) and coal.

The Subdivision is organized along geographic lines with working groups comprised of staff with expertise that can be applied to the area. No formal sections are recognized, thus staff have the flexibility to apply their expertise according to priorities which may change from time to time depending on departmental or industry needs.

The Subdivision works in close cooperation with Resource Management and Conservation Branch to process paleontological samples which are available for public examination when the confidential period has expired.

Highlights

- Interpretation of reflection seismic data from the Scotian Shelf, Georges Bank and Baltimore Canyon indicate continuity of stratigraphic sequences along the margin reflecting similar depositional histories.

- Organic matter type and thermal alteration index (TAI) determinations on 85 offshore wells indicates general thermal immaturity in offshore basins.

- Compilation completed of 3 sets of maps ('Basement', 'Basement Geology' and 'Sediment Character') for region of Newfoundland to Nares Strait at 1:1,000,000 and 1:2,000,000 scales.

- Offshore coal drilling program revealed new resources estimated at 302 million tons in Harbour and Phalen seams in Lingan - No. 26 area and 282 million tons in Harbour seam in Donkin Block, Sydney Coalfield.

- Paleoecological-paleogeographical model prepared for Labrador-North Sea flysch-type agglutinated foram assemblages (U. Cretaceous-Paleogene).

- Established formal mappable sedimentary formations in the North American Basin using DSDP samples and Canadian-American Shelf data base.

Personnel Notes

The Subdivision has a staff of 14 scientists, 5 technicians and 3 support staff. The Subdivision also supported 2 EMR Research Agreements and 2 contract projects.

Maisie Trapnell resigned in October to take a position with the Department of Fisheries and Environment. Carol Mitchell joined the staff of the Subdivision in October coming from AGC Administration.

R. D. Howie was presented with his 25 year pin and scroll by AGC Director.

Iris A. Hardy presented the Subdivision with a boy in November.

Attendance at Meetings, Conferences and Courses

P. Ascoli

Workshop on the Cretaceous of the North Temperate Realm, and meeting of the Mid-Cretaceous Events Working Group of the International Geological Correlation Programme, Lawrence, Kansas, August 9-11, 1977.

Workshop on Foraminifera, ISPG, Calgary, Alberta, May 1-2, 1977.

M. Avery

Workshop on fluorescence microscopy, Ottawa, Ontario, June 16-17, 1977.

M. S. Barss

Meeting of Kremp Palynological Computer Research Project Steering Committee, Tulsa, Oklahoma, October 17-18, 1977.

Annual meeting of the American Association of Stratigraphic Palynologists, Tulsa, Oklahoma, October 19-21, 1977.

Annual meeting of Geological Survey of Canada Palynologists, Calgary, Alberta, January 16-19, 1978.

J. P. Bujak

International Palynological Conference, Leon, Spain, September 5-8, 1977.

Annual meeting of Geological Survey of Canada Palynologists, Calgary, Alberta, January 16-19, 1978.

Atlantic Geoscience Society Colloquium, Fredericton, N.B., January 20-21, 1978.

EMR Course in Basic Management, Dartmouth, N.S., February 28-March 3, 1978.

F.M. Gradstein

Workshop on Foraminifera, ISPG, Calgary, Alberta, May 1-2, 1977.

Workshop No. 2, "Events on a Cenozoic Scale", Woods Hole, Massachusetts, June 6-9, 1977.

XV Micropaleontological Colloquium Field Trip, Copenhagen, Denmark, September 10-16, 1977.

A.C. Grant

Interdepartmental Subcommittee on Geological Potential, Ottawa, Ontario, August 4-5, 1977.

Symposium on the Mesozoic of the North Sea, Oslo, Norway, October 17-18, 1977.

Western Inter-University Geological Conference (WIVGC), Vancouver, January 19-21, 1978.

EPG/RMCB Hydrocarbon assessment East Newfoundland Basin and Labrador, Dartmouth, N.S., January 30-31, 1978.

Interdepartmental Subcommittee on Geological Potential, Dartmouth, N.S., February 27-March 2, 1978.

P.A. Hacquebard

Meeting of Subcommittee of Nova Scotia Coal Drilling Program, Ottawa, Ontario, April 21-22, 1977.

Annual meeting of American Association of Petroleum Geologists, Washington, D.C., June 11-16, 1977.

Annual meeting of Mining Society of Nova Scotia, Ingonish, N.S., June 29-July 1, 1977.

EMR meeting on Coal and Drilling Program, Ottawa, Ontario, January 14-17, 1978.

Atlantic Geoscience Society Colloquium, Fredericton, N.B., January 20-21, 1978.

Meeting on New Brunswick Coal Drilling Program, Fredericton, N.B., January 20, 1978.

Meeting of Canadian Coal Petrologists, Coleman, Alberta, October, 1977.

I.A. Hardy

Course on Seismic Interpretation for Geologists, Calgary, Alberta, April 25-29, 1977.

Symposium on Carbonate Reservoir Rocks, Banff, Alberta, May 2-4, 1977.

I.M. Harris

Atlantic Geoscience Society Colloquium, Fredericton, New Brunswick, January 20-21, 1978.

R.D. Howie

Meetings on salt formations and salt diapirs in relation to nuclear waste disposal, Baton Rouge, Louisiana, April 25-26, 1977.

Salt Project - Phase II, Ottawa, Ontario, June 22-23, 1977.

A. Jackson

"The New Seismic Explorationist" course, Calgary, Alberta, December 5-9, 1977.

L.F. Jansa

Workshop No. 2, "Events on a Cenozoic Scale", Woods Hole, Massachusetts, June 6-9, 1977.

Annual meeting of American Association of Petroleum Geologists, Washington, D.C., June 11-16, 1977.

International Geological Correlation Program Mid-Cretaceous Field Trip, Iberian Peninsula, October 6-8, 1977.

Atlantic Geoscience Society Colloquium, Fredericton, New Brunswick, January 20-21, 1978.

National Committee meeting for International Geological Correlation Program, Ottawa, Ontario, March 1-2, 1978.

Passive Margin Panel Meeting, LaJolla, California, March 14-17, 1978.

Second Ewing Symposium, "Implications of deep drilling results in the Atlantic Ocean", New York, N.Y., March 22-25, 1978.

L.P. Purcell

Offshore Technology Conference, Houston, Texas, May 2-6, 1977.

Interdepartmental Subcommittee on Geological Potential, Ottawa, Ontario, May 18-20, 1977.

Interdepartmental Subcommittee on Geological Potential, Ottawa, Ontario, August 4-5, 1977.

Interdepartmental Subcommittee on Geological Potential, Calgary, Alberta, November 21-25, 1977.

EPG/RMCB Hydrocarbon assessment of Georges Bank, Dartmouth, Nova Scotia, December 7-8, 1977.

Atlantic Geoscience Society Colloquium, Fredericton, New Brunswick, January 20-21, 1978.

EPG/RMCB Hydrocarbon assessment of East Newfoundland Basin and Labrador, Dartmouth, Nova Scotia, January 30-31, 1978.

Interdepartmental Subcommittee on Geological Potential, Dartmouth, Nova Scotia, February 27-March 2, 1978.

D.C. Umpleby

Meeting on Salt Formations and Salt Diapirs in relation to oil and gas trappings, Baton Rouge, Louisiana, April 25-26, 1977.

Interdepartmental Subcommittee on Geological Potential, Ottawa, Ontario, May 18-20, 1977.

Salt Project - Phase II, Ottawa, Ontario, June 22-23, 1977.

Interdepartmental Subcommittee on Geological Potential, Ottawa, Ontario, July 12-14, 1977.

Interdepartmental Subcommittee on Geological Potential, Calgary, Alberta, November 21-25, 1977.

Atlantic Geoscience Society Colloquium, Fredericton, New Brunswick, January 20-21, 1978.

EPG/RMCB Hydrocarbon assessment of the East Newfoundland Basin and Labrador, Dartmouth, Nova Scotia, January 30-31, 1978.

Interdepartmental Subcommittee on Geological Potential, Dartmouth, Nova Scotia, February 27-March 2, 1978.

J.A. Wade

Meeting on salt formations and salt diapirs in relation to nuclear waste disposal, Baton Rouge, Louisiana, April 25-26, 1977.

Interdepartmental Subcommittee on Geological Potential, Ottawa, Ontario, May 18-20, 1977.

Interdepartmental Subcommittee on Geological Potential, Ottawa, Ontario, July 12-14, 1977.

Course in Probability Methods in Oil Exploration, Snowmass, Colorado, September 10-15, 1977.

Interdepartmental Subcommittee on Geological Potential, Calgary, Alberta, November 21-25, 1977.

EPG/RMCB Hydrocarbon assessment of Georges Bank, Dartmouth, Nova Scotia, December 7-8, 1977.

EPG/RMCB Hydrocarbon assessment of East Newfoundland Basin and Labrador, Dartmouth, Nova Scotia, January 30-31, 1978.

Interdepartmental Subcommittee on Geological Potential, Dartmouth, Nova Scotia, February 27-March 2, 1978.

G.L. Williams

W.R. Evitt Teaching Course on Dinoflagellates, Stanford University, San Francisco, California, July 24-August 5, 1977.

Teaching short course, "Tertiary Dinoflagellates", Louisiana State University, Baton Rouge, Louisiana, September 10-16, 1977.

Annual meeting of American Association of Stratigraphic Palynologists, Tulsa, Oklahoma, October 19-21, 1977.

Annual meeting of Geological Survey of Canada Palynologists, Calgary, Alberta, January 16-19, 1978.

Atlantic Geoscience Society Colloquium, Fredericton, New Brunswick, January 20-21, 1978.

Membership on Committees

P. Ascoli

Working group on North Atlantic Events of Mid-Cretaceous Events Project of International Geological Correlation Program.

M.S. Barss

G.S.C. representative on Kremp Palynological Computer Research Project Steering Committee.

Member of the Atlantic Geoscience Centre Building Committee.

Member of the Atlantic Geoscience Centre Data Committee.

Member of the Atlantic Geoscience Centre Curation Committee.

Member of Dalhousie University Thesis Committee.

Working Group on North Atlantic Events of Mid-Cretaceous Events Project of International Geological Correlation Program.

L.P. Purcell

Vice-President, Atlantic Geoscience Society.

Member Steering Committee, Geological Association of Canada 1980 Annual Meeting, Halifax (Financial Chairman).

Member, Interdepartmental Subcommittee on Geological Potential.

D.C. Umpleby

Member, Interdepartmental Subcommittee on Geological Potential.

J.A. Wade

Member, Interdepartmental Subcommittee on Geological Potential.

G.L. Williams

Editor of Geolog (GAC newsletter).

Member of Editorial Committee Geological Association of Canada.

Member Steering Committee, Geological Association of Canada, 1980 Annual Meeting, Halifax (Entertainment Chairman).

President, Atlantic Geoscience Society.

Chairman, Atlantic Geoscience Centre Science Committee.

Special Talks and Lectures

P. Ascoli

"Occurrence of Tethyan Foraminifera and Ostracoda in the Cretaceous of the Scotian Shelf", International Geological Correlation Programme meeting, Lawrence, Kansas, August 1977.

"Foraminiferal and Ostracod Cretaceous Biostratigraphy of the Scotian Shelf", International Geological Correlation Programme meeting, Lawrence, Kansas, August, 1977.

M.S. Barss

"Visual Kerogen Analysis: The Time for Standardization?", Annual meeting American Association of Stratigraphic Palynologists, Tulsa, Oklahoma, October, 1977.

J.P. Bujak

Executive committee and Treasurer of the Atlantic Geoscience Society.

Co-chairman of the AGS Nova Scotia Geological-Highway Map Committee.

Member of the Atlantic Geoscience Centre Training Committee.

A.C. Grant

Councillor, Atlantic Geoscience Society.

Assoc. Editor, Bulletin of Canadian Petroleum Geology.

Member, 1980 GAC Field Trip Committee.

F.M. Gradstein

Working group on North Atlantic Events of Mid-Cretaceous Events Project of International Geological Correlation Program.

P.A. Hacquebard

Member, Management Subcommitttee of Joint DREE-EMR-N.S. Dept. of Mines Coal Drilling Projects in Nova Scotia.

Chairman, Canadian Coal Petrographers Group.

Member, International Commission on Coal Petrology.

Chairman, 1978 GSA/GAC coal Field Trip Committee.

Member, 1980 GAC Maritime Field Trip Committee.

I.A. Hardy

Member of Bedford Institute of Oceanography Library Committee.

Geogram correspondent.

I.M. Harris

Member working group 9, International Geodynamics Project.

Member, IGCP Caledonian Project.

L.F. Jansa

Member of the National Committee of the International Geological Correlation Program.

East Coast Representative of the C.S.P.G.

J.P. Bujak

"Mesozoic-Cenozoic Dinocysts: North Atlantic Distribution", International Palynology Conference, Leon, Spain, September, 1977.

"Organic Matter Type and Thermal Alteration Index in Scotian Shelf, Grand Banks and Labrador Shelf wells", International Palynology Conference, Leon, Spain, September, 1977.

F.M. Gradstein

"Jurassic-Early Cretaceous planktonic Foraminifera Stratigraphy", AAPG Annual Meeting, Washington, D.C., June, 1977.

Lectures on Mesozoic-Cenozoic Stratigraphy and Depositional history of the Canadian Atlantic Margin: Geological Survey of Sweden, Stockholm, Sweden, September 1977; Exxon Europe, Bordeaux, France, September, 1977; Geological Survey of Netherlands, Haarlem, Netherlands, September, 1977.

Lecture on Paleoecology of flysch-type foraminiferal assemblages, Utrecht University, Netherlands, September, 1977.

Lecture on Foram biostratigraphy, WHOI, Woods Hole, Mass., January, 1978.

Lecture on Foram biostratigraphy, Carleton University, Ottawa, Ontario, March, 1978.

A.C. Grant

Lecture on "The Multichannel Reflection Seismic Method", Dalhousie University, Halifax, N.S., November, 1977.

"Geology and Petroleum Potential of the Baffin Bay-Davis Strait Region", WIVGC meeting, Vancouver, B.C., January, 1978.

"Multichannel reflection seismic evidence of continental crust beneath the Newfoundland Ridge", Geophysics Seminar, Dalhousie University, Halifax, Nova Scotia, February, 1978.

"Geologic structure and history of Labrador Sea and Baffin Bay as interpreted from industrial geophysical data", Subcommittee on Geological Potential, Dartmouth, Nova Scotia, February, 1978.

"Outstanding problems in the geology of the Labrador Sea-Baffin Bay Region", Program Review (J. Ewing), Dartmouth, N.S., March, 1978.

P.A. Hacquebard

"Rank of coal as an index of organic metamorphism for oil and gas in Alberta", AAPG annual meeting, Washington, D.C., June, 1977.

"A geological appraisal of the Coal Resources of Nova Scotia", Mining Society of Nova Scotia, Ingonish, Nova Scotia, July, 1977.

Lectures on coal geology and coal petrology at Acadia University, Dalhousie University, Carleton University, University of Oklahoma, University of West Texas.

I.M. Harris

"Paleozoic Evolution of the North Atlantic Region", Atlantic Geoscience Society Colloquium, Fredericton, New Brunswick, January, 1978.

R.D. Howie

"Upper Paleozoic Salt in southeastern Canada", Salt meeting, Baton Rouge, Louisiana, April, 1977.

L.F. Jansa

"Hydrocarbon potential of the North Atlantic Basin", AAPG annual meeting, Washington, D.C., June, 1977.

"The Mid-Cretaceous of the Iberian Margin", IGCP meeting, Sorria, Spain, September, 1977.

'Stratigraphy and Hydrocarbon Potential of North Atlantic Mesozoic", Atlantic Geoscience Society Colloquium, Fredericton, New Brunswick, January, 1978.

Lecture on Stratigraphy and Hydrocarbon Potential of Central North Atlantic Mesozoic, University of Manitoba, Winnipeg, Manitoba, February, 1978.

"Stratigraphic Systems and Hydrocarbon Potential of the Central North Atlantic Mesozoic", Canadian Petroleum Geologists, Calgary, Alberta, February, 1978.

"Geologic development of the Central North Atlantic Basin", Geological Survey of Canada, Vancouver, B.C., February, 1978.

"Mesozoic-Cenozoic Sedimentary Formations of the North American Basin, Western North Atlantic", Second M. Ewing Symposium, New York, N.Y., March 1978.

J.A. Wade

"Mesozoic Evaporites in Eastern Canada", Salt meeting, Baton Rouge, Louisiana, April, 1977.

G.L. Williams

"Dinocyst Diversity in Time", American Association of Stratigraphic Palynologists, Tulsa, Oklahoma, October, 1977.

"Correlation of some Late Cretaceous mid-continent sediments with European Sections", American Association of Stratigraphic Palynologists, Tulsa, Oklahoma, October, 1977.

"Organic Type and Colour and Hydrocarbon Potential, Offshore eastern Canada", Canadian Society of Petroleum Geologists, Calgary, Alberta, January, 1977.

Subdivision Manuscripts

Manuscripts for 1 GSC Bulletin, 1 GSC Paper, 1 GSC Open file report, 12 outside papers and 7 "abstract only" were produced by the staff of the Subdivision during 1977-78. In addition 30 biostratigraphic reports on wells and outcrop samples, 27 reports on organic matter type and thermal alteration, 7 lithostratigraphic reports, and 38 reports on geological tops for east coast wells were submitted by scientists of the Subdivision during the report year.

Laboratory Statistics

Micropaleontology

Samples picked	818
Slides prepared	1159
SEM photographs	910

Drafting

Pieces of work (including compilations and revisions)	328

Palynology

Samples processed	1636
Organic matter samples prepared from above	1352
Slides prepared	5172
SEM photographs	550

Petrology

Thin sections	880
Polished sections	86
Reflectance analyses	65
Maceral analyses	53

CENTRAL LABORATORIES AND ADMINISTRATIVE SERVICES DIVISION

J.A. Maxwell, Director

Introduction

The achievement of the scientific objectives of the Branch is materially aided by the contributions of Branch internal support units. Chemical and mineralogical scientific support, and mechanical and electronic technical support are provided by the Central Laboratories and Administrative Services Division, which coordinates as well the operations of administrative, financial and personnel units. The Division also provides services to the Canadian public through the preparation and sale of sets of rocks, minerals and ores, by free mineralogical examination of specimens, and through the preparation and publication of guidebooks to Canadian mineral areas.

The Division is organized into five Sections,

Analytical Chemistry
Mineralogy
Technical Services
Branch Administrative Services
Branch Financial Services

The total allotted man-year budget of the Division is 80.5, of which 45 continuing and 3.5 casual man-years are for the laboratory and technical units, and 32 for the administrative units. The staff are classified as follows:

Scientific and Professional

SE REM	1
SE RES	2
PC	11
CH	3
	17

Administrative Support

ST SCY	1
ST OCE	5
ST TYP	3
CR	15
	24

Administrative and Foreign Service

AS	3
FS	2
	5

Operational

GL MAN	3
GS STS	5
	8

Technical

EG ESS	23

Casual 3.5

Most of the work of the laboratories and technical units, and certainly that of the administrative and financial sections, is in the nature of service support to the various geoscientific projects in the Branch. There is, however, a continuing program of instrument and method development carried on concurrently by the laboratories dedicated to providing the facilities and expertise required to meet the demands of Branch scientists for scientific support, and to making contributions to national and international studies in mineralogy and analytical geochemistry.

In addition to making its scientific knowledge and expertise available to the scientific community through publications and by the presentation of papers at scientific conferences, the Division also tries to provide an opportunity for laboratory scientists and technicians to meet to exchange information and discuss recent developments in laboratory methodology and instrumentation. An example of this is the

Symposium on the Analysis of Geological Materials ("Geoanalysis '78) to be held at the Conference Centre, Ottawa, May 15-17, 1978. It will provide a forum for the exchange of information among specialists in the analysis of geological materials. The co-chairmen are J.A. Maxwell and A.G. Plant, Mrs. J.E. Clemmer is Secretary and Sydney Abbey is convenor of a session on Sampling and Reference Standards. Other committee members are from the Geochemistry Section, RGG Division and CANMET, B.C. Ministry of Mines and Petroleum Resources and McMaster University.

Division Administration

Attendance at Meetings, Conferences and Courses

J.A. Maxwell

Course on "Improving Committee Meetings" (EMR); four half-days, July 19-22, 1977.

J.E. Clemmer

"French Language of Work" Course, February-May/78.

Membership on Committees

J.A. Maxwell

Branch Management Committee
Chairman, Branch Administrative Officers Committee
Departmental Coordinating Committee, Official Languages Requirements
Departmental Committee on Energy Conservation
Liaison Officer, EMR Equal Opportunities for Women Program
Liaison Officer, Canada/Federal Republic of Germany Scientific Exchange Agreement
Co-chairman, Organizing Committee for the Symposium on the Analysis of Geological Materials, Ottawa, May 15-17, 1978.

J.E. Clemmer

Floor Warden, Building Emergency Committee

J.H. Lapp

Branch Administrative Officers Committee

Analytical Chemistry

Sydney Abbey

The Section consists of four units, Chemical, X-ray Fluorescence and Spectrographic Services, and Development and Special Analysis, with a permanent staff of 5 scientists and 11 technicians, and 2 casual positions. As in preceding years, the Section continued to provide compositional data, mainly on silicate rocks and minerals, in support of Branch scientific projects, to study, develop and adapt new methodology and instrumentation for that purpose and to act as a source of information and consultation in Canada and abroad, concerning analytical problems.

The announcement, early in October, of the proposal to re-locate the entire Section in Thunder Bay resulted in a demoralizing influence in our work. Strong representations were made on the grounds that Branch units remaining in Ottawa will have greater need of analytical services than will those moving to the proposed new location. Retention of the existing services in Ottawa alone was therefore proposed, with duplication on a reduced scale in Thunder Bay as an alternative.

Highlights

Visitors to our laboratories came from a Canadian metallurgical firm, four Canadian universities, two provincial departments, the United States Geological Survey, the U.K. Institute of Geological Sciences, a British University, the Geological Survey of Norway and other institutions in the Soviet Union, Japan, New Zealand, China, Saudi Arabia and Kenya.

Requests for information and assistance were received from three federal departments, one provincial department, one Canadian university, two Canadian commercial laboratories, the editor of an international journal, and other institutions in U.K, France, Norway, Switzerland, Turkey, Israel and Australia.

In the course of personal travels, Sydney Abbey visited laboratories at the Geological Survey of Norway, Trondheim, the Institute of Geological Sciences, London, and Barringer Research Ltd., Toronto.

An outline of methods used in all our laboratories was prepared in response to a request from the Geological Survey of New South Wales. A 68-page review paper, with over 400 references, was published on developments in the field of silicate rock analysis in the period 1966-1976.

The Section continued its active participation in the work of the Geostandards Newsletter and the International Study Group on Reference Materials. Two papers originating here have appeared in Geostandards Newsletter, one presenting rare-earth concentration data on 24 international samples, the other comparing our results with those of a French centre and those published by the originators of three new rock samples from a Soviet source.

A new compilation and review, covering 75 samples, was published on reference materials suitable for use in the analysis of silicate rocks and minerals. Included were revised values for some established samples, data on a number of new samples and also on several non-rock materials whose compositions make them potentially useful in calibration work.

Studies were also undertaken on the relative merits of several proposed methods for deriving usable assigned concentration values from disparate analytical data. Experiments were also conducted in the synthesis of homogeneous powder standards by a "gel" method, originally developed at the Institute of Geological Sciences, London.

Personnel Notes

Linda Clugston returned from maternity leave to resume her duties in the spectrographic laboratories.

Barbara Culham worked in the spectrographic laboratories as a summer student.

A.G. Douma, originally employed as a language-training replacement for R.M. Rousseau, continued as a term employee in the chemical and x-ray fluorescence laboratories.

Ron Hartree, of the University of Ottawa, spent some time learning methods in our x-ray fluorescence laboratory.

A.J. Heinrich, of the Institute of Sedimentary and Petroleum Geology, also studied x-ray fluorescence methods in the laboratory.

R.M. Rousseau completed his English language training and assumed his duties in the x-ray fluorescence laboratory.

Nicole Roxburgh, originally employed as a language-training replacement and then as a maternity-leave replacement, continued as a term employee in the spectrographic laboratories.

C.T. Wiles resigned his term position to accept a permanent job at CANMET.

Attendance at Meetings, Conferences and Courses

Nicole Bertrand and Jocelyne Watson

"Better English Letter Writing"

R. J. Guillas

First Aid

Sydney Abbey W.H. Champ K.A. Church G.R. Lachance R.M. Rousseau J.G. Sen Gupta

Canadian Spectroscopy Symposium, Ottawa. Sydney Abbey was co-chairman of a session and W.H. Champ presented two papers.

W.H. Champ

Rocky Mountain Spectroscopy Conference, Denver.

Membership on Committees

W.H. Champ

Editorial Committee, Canadian Journal of Spectroscopy

Serge Courville

Branch Safety Committee

Sydney Abbey

Co-ordinator, Task Force on Rock Samples, Canadian Certified Reference Material Project
International Study Group on Reference Materials
Board of Regional Editors, Geostandards Newsletter
Organizing Committee, Geoanalysis '78 Symposium

Special Talks and Lectures

W.H. Champ

Presented two papers at the Canadian Spectroscopy Symposium: "Routine determination of 29 elements in common rocks, minerals and ores using a direct reading optical emission spectrometer" (with C.F. Meeds) and "Improved method for spectrochemical determination of 18 volatile trace metals in silicates by fractional distillation in a D.C. arc (with P.G. Bélanger).

Multi-element analysis of common rocks, minerals and ores by optical emission spectroscopy" (with C.F. Meeds) to the Rocky Mountain Spectroscopy Conference, Denver, Colorado.

Manuscripts

Manuscripts for six outside publications were submitted by Section staff and accepted by the Division.

Laboratory Statistics

Chemical and X-ray Fluorescence Laboratories

All work in these laboratories was drastically disrupted for nearly a month as a result of contract work on the installation of new floors. Not only did it involve vacating certain areas, but the dust produced had disastrous effects in all areas.

Production Analysis

Samples received were 34 per cent more numerous than in the preceding year. As a result of the increasingly complex compositions involved, analytical output, in terms of samples reported, dropped by 25 per cent, but the number of determinations fell by only 8 per cent. As a result, the backlog at year-end was 150 per cent higher than it was at the end of 1976-77.

The inevitable disruptions that may be expected if and when the Thunder Bay proposals are implemented can only serve to aggravate what appears to be a losing battle to keep up with demands for analytical services.

Method Development and Special Analysis

The x-ray fluorescence analytical system continued to be plagued by break-downs, with a slow but persistent increase in "down-time". Special analytical problems developed with samples rich in sulphides. Preparation of fused discs for x-ray fluorescence analysis was improved by changing the fusion flux from a lithium tetraborate-metaborate mixture to one of lithium tetraborate and fluoride. A more accurate method for Rb/Sr was evolved for geochronology.

Two new non-dispersive infrared absorption modules were acquired for a proposed method for simultaneous determination of water and carbon dioxide. Implementation awaits construction of a three-channel digital integrator. Acquisition of a third infrared module may make it possible to determine sulphur as well. Preliminary indications suggest that the new system may be two to four times as productive as existing methods.

A new automatic potentiometric recording titrator was acquired for eventual application to a reportedly more rapid and accurate method for determining ferrous iron. Pending receipt of the special electrodes required for that method, the instrument has been temporarily applied to an existing method, with improved end-point detection.

A new fusion apparatus was constructed for use in the sodium fluoride fusion required in fluorimetric uranium determination. An increasing number of highly variable samples were analysed for lead, uranium, thorium and the rare earths. Nature of the samples required continuing modification of the analytical procedures to suit each case.

Spectrographic Laboratories

Operations were impeded by the now all-too-familiar break-downs in the air-conditioning system, compressed-air supply, the direct reader, etc

Production Analysis

An increase of nearly 25 per cent in the number of samples analysed was not nearly enough to cope with the over 100 per cent increase in the number of samples received. The result was a threefold increase in the size of the backlog. A major impediment to analytical output was the non-availability of the photographic emulsions that had been in use with most of the photographic methods. The resulting increased use of the direct-reading system served to augment output, but severely restricted the variety of work that could be done.

Consideration of possible instrumental needs for Thunder Bay only served to accentuate the state of obsolescence of most of the equipment in these laboratories. No major item is less than 12 years old, and one is over 25.

Method Development and Special Analyses

Because of the urgent need to adapt the photographic methods to new emulsions, most further improvements in the direct-reading system were deferred. However, it was possible to install several monitoring channels to detect hitherto unforeseen interferences. A new high-speed printer was acquired, which permitted direct print-out of reports for the client scientists from the output of the on-line mini-computer.

Progress was made in extending the scope of the semi-quantitative system, in the use of argon-oxygen mixtures to replace air in the jet-controlled general arc methods for trace elements and in the establishing of improved excitation conditions for the two new procedures for low concentrations of volatile trace elements. Much of this work was further complicated by the need to adapt the methods to different photographic emulsions, a continuing supply of which is far from certain.

Production Statistics

1. Samples Processed

	Chemical and XRF	Spectro-graphic	Total
Carried from 1976-77	933	440	1373
Received in 1977-78	4866	4050	8916
	5799	4490	10289
Completed 1977-78	3406	2550	5956
	2393	1940	4333
Withdrawn	42	95	137
Carried to 1978-79	2351	1845	4196
Divisional Breakdown of Backlog			
Central Lab. & Admin. Services	88	0	88
Regional & Econ. Geology	1441	931	2372
Resource Geophys. & Geochem.	749	883	1632
Terrain Sciences	36	31	67
Others	37	0	37
	2351	1845	4196

2. Comparison with Preceding Year

	1976-77	1977-78
Samples received		
Chemical and XRF	3620	4866
Spectrographic	1959	4050
	5579	8916

Samples completed	1976-77	1977-78
Chemical and XRF	4547	3406
Spectrographic	2044	2550
	6591	5956
Total Spectrographic Analyses		
Qualitative	5	6
Semi-quantitative	98	140
Quantitative	3374	3070
	3477	3216
Determinations		
Chemical	17999	16496
X-ray fluorescence	*	44382
Spectrographic-qualitative	161	191
-semi-quantitative	2284	3742
-quantitative	62571	71172
Spectrographic Exposures		
Photographic - analytical	2139	1188
- development	945	1312
Direct Reader - analytical	2777	3204
- development	1609	1250
	7470	6954

*The method of calculating XRF determinations was changed to a more realistice basis for 1977-78, so no valid comparison is possible.

Mineralogy

R.J. Traill

The Mineralogy Section provides the facilities and expertise for mineralogical studies in support of many Branch projects. This includes the specialized fields of crystallography, x-ray diffraction and electron microbeam analysis (microprobe and scanning electron microscope). It also includes sample preparation and mineral separation general services, the curation of four major collections, and the provision of some mineralogical service and advice to the public. The Section staff consists of 11 scientists and 11 technicians, with one or two man-years of casual support.

The highlights of the year's operations are given together with production statistics for each of the units of the Section under Laboratory Statistics.

Personnel Notes

C. Blake was transferred from the Sample Preparation and Mineral-Separating Unit to Branch Administration in February 1978.

J.M. Larose was awarded the Queen's Silver Jubilee Medal.

A.L. Littlejohn joined the staff as Curator of Rock Collections on November 15, 1977.

H.R. Steacy served as chief mineral judge at the annual show of the Central Canadian Federation of Mineral Societies in May 1977.

Ann P. Stenson was awarded the Queen's Silver Jubiliee Medal.

Dr. Thorolf Weiser from Bundesanstalt fur Geowissenschaften und Rohstoffe, Hannover, was a visiting scientist in our electron microbeam laboratories during July and August as part of the scientific exchange program between Canada and Federal Republic of Germany.

Attendance at Meetings, Conferences and Courses

H.G. Ansell

Greater Detroit Gem and Mineral Show, October 1977
Technical Writing Course, EMR, March 1978

M. Bonardi

Administrative Report Writing, EMR, March 1977
Technical Writing Course, EMR, March 1978

J.M. Larose

Prospectors and Developers Association, Annual Meeting, Toronto, March 1978

A.G. Plant

Eighth International Conference on X-ray Optics and Microanalysis and Annual Meeting of Microbeam Analysis Society, Boston, August 1977
Position Classification Course, EMR, June 1977
Meeting on Establishment of an Ion Probe Laboratory in Canada, Toronto, September 1977

A.C. Roberts

Technical Writing Course, EMR, March 1978

W.U. ter Haar Romeny

Defensive Driving Course of Canadian Safety Council, Instructor

H.R. Steacy

Rochester Mineral Symposium, Rochester, NY, April 1977
Tucson Gem and Mineral Show, and meetings of Mineral Museums Advisory Council and Friends of Mineralogy, Tucson, Arizona, February 1978
National Research Council Associate Committee on Meteorites, Ottawa, November 1977
National Museum's Task Force on computerized cataloguing of earth science collections, Ottawa, November 1977
Mineral shows at Oakville, Bancroft and Newark, NJ.

Ann P. Stenson

Mineralogical Association of Canada, Annual Meeting, Vancouver, April 1977
Mineralogical Association of Canada Executive Meeing, Vancouver, April 1977; Winnipeg, October 1977; Toronto, March 1978
Joint Committee on Powder Diffraction Standards, Annual Meeting, Swarthmore, Pennsylvania, March 1978
Gem and Mineral Federation of Canada, Founding Meeting, Calgary, July 1977

R.J. Traill

Mineralogical Society of America, Annual Meeting, Seattle, Washington, November 1977
National Research Council Associate Committee on Meteorites, Ottawa, November 1977

D.A. Walker

Microscopy Society of Canada, Annual Meeting, London, Ontario, June 1977

Membership on Committees

A.G. Plant

Mineralogical Association of Canada representative on the International Mineralogical Association Commission for Cosmic Mineralogy
Co-chairman, Organizing Committee for Geoanalysis '78
Chairman, Microanalysis Group, Spectroscopy Society of Canada
Editorial Committee, Bulletin of the Microscopy Society of Canada
Branch Classification Rating Committee

W.U. ter Haar Romeny

Member, Branch Safety Committee

H.R. Steacy

Member, National Research Council Associate Committee on Meteorites
Member, National Museums of Canada Task Force on Computerizing Earth Science Collections
Mineralogical Association of Canada representative on the International Mineralogical Association Commission on Museums
Vice-President, Mineral Museums Advisory Council

Director, Friends of Mineralogy
Geological Association of Canada representative on Youth Science Foundation
Member, Branch Storage Committee
Member, Branch Library Committee

Ann P. Stenson

Treasurer, Mineralogical Association of Canada
Mineralogical Association of Canada representative on Joint Committee on Powder Diffraction Standards - International Centre for Powder Diffraction Data

R.J. Traill

Chairman, Research Subcommittee, National Research Council Associate Committee on Meteorites
Member, Departmental Classification Rating Committee

A.L. Littlejohn

Member, Representative Rock Collection Users' Committee

Special Talks and Lectures

A.G. Plant

Lectures on "Meteorites" at Ottawa University and Bell High School, February and March 1978

A.G. Plant and D.A. Walker

Joint lecture on electron microbeam analysis to Quaternary Discussion Group, Terrain Sciences Division, February 1978

H.R. Steacy

"Minerals and history blend nicely together in the classic mineral localities of Ontario and Quebec". Annual public lecture of the Rochester Academy of Science, Mineral Section, April 1977

"Mineralogy of uranium and thorium" at Annual Meeting of Walker Mineral Club, Toronto, May 1977

"Mineral localities of Ontario and Quebec" at New Jersey Mineral Symposium, Newark, November 1977

"Mineralogy of uranium", taped lecture to Geoscience Forum, Yellowknife, December 1977

"Geology as a career", Merivale High School, February 1977

"Several talks to groups visiting Logan Hall

Ann P. Stenson

"The Role of the Geological Survey of Canada in Assisting the Amateur Mineral Collector" at Founding Meeting of the Gem and Mineral Federation of Canada, Calgary, July 1977

"Occurrences of Rare Minerals in the Bancroft and Ottawa areas" at the Ottawa Valley Mineral Association Meeting, October, 1977

Manuscripts

Manuscripts for 5 GSC papers and 5 papers for/outside journals were submitted by the staff for publication and approved by the Division.

Laboratory Statistics

Electron Beam Microanalysis (A.G. Plant G.J. Pringle M. Bonardi D.A. Walker)

Analytical studies in support of 33 Branch projects and 8 projects from other areas of the Department showed a significant increase over 1976-77. This increase was due entirely to the addition of the SEM to our analytical facilities at the commencement of the fiscal year, following its installation in February and March 1977. In terms of service charges, the analytical support provided by the project was as follows:

	REG	RGG	TS	CLAS	Other	TOTAL
1977-78	44000	6200	11050	11650	3800	$76700
1976-77	43150	4750	2050	9600	300	$59850

Although the SEM was used to aid projects originating from all divisions, and in fact 7 projects utilized both the SEM and the electron microprobe, its most significant impact was in supporting projects in Terrain Sciences. Of particular note are the extensive studies of diatoms and other microfossils for Dr. Federovich and the characterization of lake sediments and glacial tills for Dr. Shilts and colleagues. In the microprobe laboratory, analytical studies have followed the pattern established in earlier years, and a stimulating variety of mineralogical and petrological investigations were undertaken. Highlights include study of an Archean basaltic pillow for comparison with recent pillows studied under the DSDP program, support of 7 projects associated withe the URP, further study of pyroxene megacrysts from anorthosites the mineralogy of the Dumont nicket deposit, and several studies of the metamorphic assemblages.

Staff from the Computer Science Centre assisted with further development of mini-computer facilities in the laboratory. Project staff completed 2 publications, presented 3 lectures, and provided consultation to representative from universities, industry and other government departments.

X-ray Diffraction and General Mineralogy (R.J. Traill R.N. Delabio A.C. Roberts D.M. Watson)

X-ray diffraction analyses and mineralogical studies were made in support of 56 Branch projects and 2 outside agencies. X-ray powder diffraction analyses involved 2,706 mineral identifications, 10 Gandolfi camera patterns and 8 Guinier camera patterns. Standard X-ray powder patterns and specimen mounts were prepared and added to the reference files for 60 minerals new to the collection. Single crystal studies on analcime and strontiodresserite were completed and a paper on the latter mineral was approved for publication. Mineralogical work was completed on a new barium-calcium carbonate mineral from Cave-in-Rock district, Illinois, and a manuscript was approved for publication. Unit cell dimensions of dachiardite from the Francon quarry, Montreal, were refined. Research was initiated into 3 minerals believed to be new species: a hydrated calcium-thorium silicate from the Yukon; a mercury mineral from Texas; and a hydrated aluminium-uranium phosphate from Oregon.

Clay mineral analyses involving preparation and interpretation of 508 X-ray diffractometer patterns were made, mainly for scientists from Terrain Sciences Division. A study of the clay mineralogy of the Valley Copper porphyry deposit, Highland Valley, British Columbia, was completed jointly with J.L. Jambor, CANMET, and published as GSC Paper 77-9. Microscopic examinations and X-ray diffractometer analyses of 156 samples were completed in support of the radiometric age determinatiion program.

Support for the uranium program was provided through completion of 68 mineralogical studies, involving preparation of several hundreds of autoradiographs and 355 mineral identifications. About 80 per cent of the samples were received from the Uranium Resource Evaluation Section and 20 per cent from Resource Geophysics and Geochemistry Division.

Mineral Sets Preparation Unit (J.M. Larose)

J.M. Larose, R. Marleau and T. Racine prepared and shipped 5,844 Prospectors' Sets of Minerals and Rocks, a slight increase over the previous year. The distribution of these across Canada was as follows:

Alberta	1,094
British Columbia	1,537
Manitoba	46
New Brunswick	80
Newfoundland	69
Nova Scotia	126
Northwest Territories	0
Ontario	1,442
Prince Edward Island	2
Quebec	360
Saskatchewan	168
Yukon	250
Ottawa	452
EMR Sales Office	105
Others	113

Sales of the 120 specimen Collection Representing the Raw Materials of Canada's Mineral Industry amounted to 90. At the request of the National Film Board, 75 collections were supplied to accompany Earth Science Film Strip kits. Total revenue from the sale of all sets and collections, payable to the Receiver General, was $28,251.

An article on Rock and Mineral sets by J.M. Larose was published in the fall issue of GEOLOG. Special requests for specimens were filled for: Commonwealth Institute, London, England; CANMET; Mr. E. Vones, Beeks, Holland. Specimens were collected and supplied for display in the Sir William Logan Building GEOCENTRE exhibit. A special collection of 120 specimens was prepared for presentation to King Baudouin of Belgium.

Field work was conducted from May 30 to October 1977 to 78 locations in Newfoundland, Nova Scotia, New Brunswick, Quebec and Ontario. The work involved more than 24,000 km of travel, and collection of 28 tonnes of minerals, rocks, ores and fossils. Mr. Larose was assisted in the field by B. Machin, on loan from the Mineral Separating Unit.

Mineral Separating Unit (J.C. Paris)

The staff consisted of J.C. Paris, B. Machin, R. Christie, M. Huot, S. Going and C. Blake. Mr. Machin was seconded to the Mineral Sets Preparation Unit for the summer field season. Production statistics were as follows:

Samples received	3077
Samples completed	2831
Crushed, ground, sized	4749
Heavy liquid separations	6042
Frantz separations	1497
Carpco separations	658
Wilfley Table separations	138
Superpanner separations	951
Concentrate extractions	468

Reference Collections of Minerals, Rocks and Ores (H.R. Steacy H.G. Ansell and A.L. Littlejohn)

H.R. Steacy and H.G. Ansell provided curatorial care of the Systematic Reference Series of the National Mineral Collection, improved its representation and complied with requests for sample material from the scientific community.

In 1977-78 the Series showed a growth of three per cent through the selective addition of 280 specimens or groups of specimens, which included 63 minerals new to the Series. Current representation is now about 1800 species (about 75 per cent of all known minerals). Species unrepresented are becoming increasingly difficult to obtain by any means. A significant though yet uncatalogued accession was the A.M. Campbell collection of several hundred specimens. Field collections of rare and unusual minerals for exchange, reference and study were made at 27 localities in Ontario, Quebec, New Brunswick and Nova Scotia by H.G. Ansell mainly, and H.R. Steacy.

In fulfilling its service role the Series complied with 79 requests providing 379 individual specimens for Branch projects and research elsewhere. Additionally 450 gold samples of Canadian origin were provided for testing by the AECB.

Computerized cataloguing of the collection under the National Inventory Programme continued at an accelerated rate with data for 1258 specimens being recorded. Approximately 90 man-weeks will be required to complete the computerization. Target date therefore depends upon available manpower. The cataloguing would be a valuable Branch input for contract work.

The housing of the collection was improved by its relocation to larger quarters in the building. Security was also improved.

Mineralogical services were provided to the public through the identification of 216 specimens of minerals and rocks, with the results being communicated in 62 written and 43 verbal reports. A steady stream of visitors consulted the collection during the year.

Consultative services and advice on mineralogical matters occupied a significant proportion of the project time. External inquiries alone consumed two man-weeks. Assistance was given to the major exhibit in the Sir William Logan Building.

Studies on the minerals of the Kipawa area were continued by H.G. Ansell but anticipated project time for research did not materialize for H.R. Steacy and H.G. Ansell.

The petrographic collection made considerable advances. Mr. A. Littlejohn was appointed curator November 14th and since then has established a Users' Committee and introduced a programme for computerizing the collection which is currently being tested against a model. Management of the collection and its day-to-day service to Branch geologists and projects are hindered by its storage in three different sites. Housing to consolidate the petrographic collection under one roof is essential.

Extraterrestrial Materials (R.J. Traill H.R. Steacy A.G. Plant)

Three meteorite finds in Canada were reported. The first was found in May 1977 by a farmer near Millarville, about 32 miles south of Calgary, Alberta. It is an iron weighing about 9 kg and reported to be in good condition. The meteorite is in the hands of Dr. David Harvey of the Geology Department, University of Calgary, and is reported to be purchased by the university. We hope to receive a small portion from it for the National Collection. The second find, also an iron, was found in May 1946 on a farm midway between Minburn and Kinsella, Alberta. It has been named Kinsella and described by E.R.D. Scott, J.T. Wasson and R.W. Beld in Meteoritics, June 1977. Dr. Wasson has promised a portion of the meteorite to the National Meteorite Collection. The third meteorite find took place about 10 years ago near Skiff railway station, southeast of Lethbridge, Alberta. It is an ordinary chondrite weighing about 4 kg and has been purchased jointly by the University of Alberta and the National Mineral Collection. The name Skiff has been proposed for this latest meteorite, which is the 46th to be found in Canada.

Requests for specimens for research studies were complied with in 6 instances involving scientists from Canada, United States, India and USSR. Fourteen suspected meteorites were examined for the public and all were found to be of terrestrial origin. The meteorite exhibit was loaned for 3 public showings. The meteorite poster was reprinted and 28,000 copies have been distributed to the end of 1977-78. A preliminary mineralogical and petrological examination of the Innisfree meteorite has been completed.

Mineralogy for Collectors (Ann P. Stenson)

Localities investigated during the 1977 field season included 9 in the Bancroft area, 25 chondrodite occurrences in the Westport-Lanark and Hull-Maniwaki-Mont Laurier areas, 7 limestone quarries in the Montreal area. Eight visits were made to the Francon quarry in Montreal. Highlights were prepared for publication in a GSC paper. Field and laboratory investigations of the Bancroft area are now complete and the manuscript is expected to be completed in 1978-79. The pamphlet "Introductory Notes on Rock and Mineral Collection" was revised and a new printing has been ordered. Two outside papers describing new minerals were published. 168 requests for information on mineral occurrences and gemmology were handled by letter, telephone and office visits.

Production Statistics

An internal costing system has been used for several years to record, evaluate and compare services provided to Branch scientists by the three main support service projects of the Section. The charges levied for the various support services are unreal because (1) they were assigned somewhat arbitrarily in 1970 to approximate the minimum charges that would likely be made if such services were provided commercially, and (2) they have not been revised to reflect increased costs as a result of inflation. The figures nevertheless are of interest in that they indicate the relative amounts of support provided to our various customers. A table of annual charges by Division for the past five years is given below.

Comparison of Annual Mineralogical Service Charges

	1973-74 $	1974-75 $	1975-76 $	1976-77 $	1977-78 $
Sample Preparation					
REG	33,440	40,937	23,195	27,647	33,825
RGG	60	952	1,040	880	1,012
TS	32	16	24	24	4
CLAS	5,802	16,015	6,893	8,564	12,096
TOTAL	39,334	57,920	31,152	37,115	46,937
Electron Microprobe					
REG	22,400	37,500	48,000	43,450	44,600
RGG	1,100	100	400	4,750	6,200
TS	400	0	1,050	2,050	11,000
CLAS	9,550	2,250	2,250	9,600	14,750
TOTAL	33,450	39,850	51,700	59,850	76,550

Mineralogy and XRD

REG	13,160	15,315	14,015	14,385	11,820
RGG	640	490	370	690	4,110
TS	1,975	2,195	5,525	3,395	3,175
CLAS	14,006	14,280	19,590	31,040	22,348
TOTAL	29,781	32,280	39,500	49,510	41,453

Totals

REG	78,567	96,247	85,210	85,482	90,245
RGG	4,238	1,542	1,810	6,320	11,322
TS	2,407	2,211	6,599	5,469	14,179
CLAS	29,988	33,051	28,733	49,204	49,194
TOTAL	115,200	133,051	122,352	146,475	164,940

Technical Services Section

G.A. Meilleur

Highlights

Over the past couple of years, the major role for which the Technical Services was originally created, that is, the design and development of prototype instruments, has been greatly affected by the increasing demand for maintenance services needed to sustain existing equipment in support of both field and laboratory projects. Because of staff and budgetary restrictions many request for new developments involving engineering, research and drafting time have had to be shelved or cancelled.

Contrary to the optimistic prediction of the last annual report, the backlog of work has grown and is likely to worsen in the coming year. We wish to apologize to GSC staff if on occasion we are unable to provide requested services or needed services are delayed in completion beyond the promised delivery date.

I wish to acknowledge the dedicated support received from Mr. Cregheur (Senior Technologist), Mr. Walker and Mr. Lalonde; their work is much appreciated; also from Mr. Coté who is responsible for the electronic services.

Personnel Notes

Mr. Paul Fournier retired in December, 1977.

Attendance at Meetings, Conferences and Courses

G.A. Meilleur

Attended the national machine-tool exposition in Toronto.

Laboratory Statistics

Following is a partial list of services requested during the past year:

- Construction of lake sediment samplers
- " " coaxial soil sample analysing tube
- Installation of new high frequency generator for argon extractions (geochronology)
- Construction of rotary burner for chemical laboratory
- Reconstruction of arc stand for spectrographic analysis
- Development of automatic sample changer for gamma ray counter
- Fabrication of new data acquisition system for spectrographic analysis.

Branch Financial Services

C.C. Bowstead

The Branch Financial Services in the Geological Survey consists of the Branch Finance Office and the Accounting Services Office, both of which are the responsibility of the Branch Financial Comptroller.

The Branch Finance Office co-ordinates the annual Program Forecast and Main Estimates exercises, co-ordinates and reviews the forecasting of expenditures, ensures that Treasury Board guidelines and departmental procedures are implemented as they apply to financial matters, provides the link between the financial administration staff of the Geological Survey and the departmental Financial Services Branch, and generally provides functional guidance to divisions on all financial matters.

The Accounting Services Office continued as the front line of Branch Financial Services under the supervison of Mrs. Mary Going. The staff is charged with making travel arrangements, auditing and processing field accounts, travel and removal claims for all divisions of the GSC and the payment of all invoices for the Director General's Office and Branch administration. The payment of such items as freight, express, telephone and taxis are also handled by this group.

Personnel Notes

Travel arrangements are the forte of Mrs. Iris Deslauriers who booked trips to most corners of the world. Other "soldiers" who continued to win battles, but could not end the paper war, were Becky Taylor and Margaret McDonald. Pat Laflamme came from the home front and returned to it after a stay of nine months. Betty Lisle was shanghaied into Les Jackson's "Navy" in Terrain Sciences while Marion Hodowanec preferred to join George Artichuk's air force in RGG. Alfred Tsang was the sole "general" from the time John Azar left in September 1977, until he was relieved by Cyril Bowstead, an evacuee from Financial Planning in the Sir William Logan Building.

Branch Personnel Unit

K. Fracke

Highlights

The major role of the Personnel Unit in the Geological Survey during 1977/78 has, as in previous years, been in the field of recruitment and promotion of employees through the competition process and the processing of classification actions, including job description writing of positions. Staff relations actions involved the interpretation of collective agreements and the grievance procedure. The performance appraisal system is working effectively and all employees of the Geological Survey are being appraised on an annual basis.

Statistics

The following is a numerical breakdown of classification and staffing actions processed by the Personnel Unit during 1977/78.

Classification Activity

Positions Classified	Positions Cancelled	Classification Decisions Permanent	Term	Total
375	221	155	441	596

Staffing Activity

Type 1 Appointments - Term and Full-time Continuing

Scientific and Professional	-	110
Technical	-	56
Admin. and Foreign Service	-	1
Admin. Support	-	69
Operational	-	15
		251

Type 2 Appointments - Term and Full-time Continuing

Scientific and Professional	-	27	
Technical	-	35	
Admin. and Foreign Service	-	3	
Admin. Support	-	29	
Operational	-	11	
		105	Total = 356

Administrative Services

Mrs. M.A.F. Casey

The responsibility of this Section is to provide administrative support and service to the Ottawa-based Divisions as well as functional guidance and advice to the Regional offices. This includes areas of accommodation, communication systems, building maintenance and tenant services, procurement, vehicles, records management, word processing and secretarial services, personnel and physical security, accident prevention and emergency disaster programs.

Highlights

Work on the Master Plan for Accommodation started in October 1976, with completion scheduled for March 1978. Renovations are progressing slowly with the following projects still outstanding ($ are estimated job cost):

1)	Auto Cartography facility	- 4th floor)	- $325,000
2)	Computer Terminal Room	- 5th floor)	
3)	Paleo Lab Facility	- Ground floor)	- $25,000
4)	Partitions	- 2nd floor)	
5)	Mineral Data Bank	- 6th floor - $10,000	
6)	Partitions for Paleo Office	- 1st floor - $15,000	
7)	Partitions for Geomath	- 6th floor - $20,000	
8)	Construction new photolaboratory	- 1st floor - $60,000	
9)	Alter Radio Carbon Labs	- 5th floor)	- $35,000
10)	Partitions & Lab changes	- 5th and 6th floor)	

Major factors which continue to affect the accommodation plans are:

- #5 Temporary Building is scheduled for demolition in September 1979, therefore, both rock storage and sediment lab space is required;
- the GSC is attempting to lease a building to house the Reference Collection. The planned requirements for the next ten years total 48,200 sq.ft.; detailed requirements are being identified;
- move of Contract Surveys from City Centre to the Sir William Logan Building;
- move of cartography from City Centre to 601 Booth.

In addition, new acid-resistant flooring was installed in the laboratories in 601 Booth Street, and modifications to the washrooms in both 601 Booth and 401 Lebreton were made to accommodate their use by handicapped individuals.

The Safety Program organized the following presentations:

- Safe Lifting and Carrying
- Pain Pills
- Don't Push Your Luck (outlines the Line Managers responsibility in the Prevention of accidents)
- Bomb Threat
- Cancer in Women/Check Point for Men
- Flammable Liquid Fire Safety
- Highrise: Plan for Survival

A disaster emergency organization, together with well-defined fire orders and evacuation plans, was developed. The Chief Building Emergency Officer and his deputies were briefed regarding any situation or condition that may represent a specific threat to the lives of employees in particular and/or the building in general.

The Word Processing Centre is becoming increasingly popular and is being used by employees from all Divisions. The present equipment includes four Xerox-800 and plans include adding one Xerox-850 in September 1978. The new system offers various ways of increasing output production and makes it simple to produce error-free work. In addition, it is not necessary to proofread copy more than once. These features, coupled with the best word processing operators available, have made the difference in meeting the ever-increasing workload.

On April 1, 1977 a system was implemented to accurately determine the value of GSC equipment-in-use. The objective is to provide an audit trail that will enable the tracing of chain events from procurement to the current location of equipment. Branch Administration is progressing well towards this objective; lack of resources continues to be the major problem.

Personnel Notes

Messrs. C. Blake and A.C. Winges joined the staff in February 1978. The following employees either retired or left to develop their careers in new environments:

R. Bertrand	- July 1977
J. Bourque	- October 1977
D. Gauthier	- February 1977
D. Griffin	- September 1977
B. Hanafi	- June 1977
V. MacKenzie	- July 1977
V. Moreau	- December 1977
G. Plouffe	- January 1978
C. Roy	- April 1977

Attendance at Meetings, Conferences and Courses

Branch Administration continues to encourage its staff to take additional training, with the following results:

C.G. Barnard C. Blake D. Busby D. Davidson M. Graham K. Lacelle H. Mulder B. Shipman D. St. Dennis L. Thompson

Applying and Preparing for Competitions - March 1978

D. Davidson

Defensive Driving Course, March 20-28, 1978.

K. Lacelle V. Moreau I. Salter J. Bourque J. Charlebois D. St. Dennis G. Plouffe D. Davidson R. Rozon L. Thompson D. Gauthier H. Mulder J. Cochrane N.J. Balderston M. Graham B. Ford B. Shipman

Departmental Orientation course

H. Mulder

Effective Reading Course - March 15-30, 1978

W.J. Lagroix

Fire Extinguisher Course

C.G. Barnard R. Rozon

First Aid Course - November 709, 1977

K. Wiskemann

French Language Training - September 1977

W.J. Lagroix

Grid for Supervisory Effectiveness - Jan. 9-20, 1978

K. Lacelle L. Thompson

Letter Writing Course

M. Graham

Managing Personal Growth - December 12-13, 1977

Davidson, D.

Materiel Management (General Level) - Aug.22-Sept.2, 1977

H. Mulder

Records Management Phase I, Algonquin College, Feb. 1978-May 1978

N.J. Balderston J. Legere

The New Supervisor - Dec. 5-12, 1977

M. Colterman D. Gauthier

Xerox Key Operator Course

J. Legere

Xerox 800 Operators Course - December 1977

Meetings attended by staff of Branch Administration include:

Departmental Administrative Committee
Departmental Safety Committee
Departmental Parking Committee
Departmental Security Committee
Departmental Suggestion Award Committee
Departmental Energy Conservation Committee
GSC Branch Management Committee
GSC Branch Administrative Officers Meeting
GSC Safety Committee
GSC Emergency Organization
GSC Storage Committee
CLAS Division Meeting
Administrative Services Section Meeting

GEOLOGICAL INFORMATION DIVISION

Peter Harker

The Division provides support services to all programs of the Geological Survey by maintaining capabilities and physical facilities in scientific editing and information, cartography, library services, technical photography and publication distribution.

The Division manages a comprehensive scientific publication program and issues Geological Survey reports as Memoirs, Bulletins Economic Geology Reports, Miscellaneous Reports and Papers. All are well established serials with a substantial publication record and are widely sold and distributed on an exchange basis to many institutions in Canada and abroad. Forty five printed reports were published during the year, many were extensively illustrated with photographs, figures and maps produced in the Division. Current Research was issued in three volumes totalling just over 1000 pages and provides an important outlet for short summary reports of research.

Twenty nine geological maps were issued, most of them colour printed. Two hundred and ninety two aeromagnetic maps together with 18 foreign maps (CIDA) were prepared under contract.

Open File releases continue as a major supplement to conventional publication. Such files are made available for viewing at the offices of the Survey and through the cooperation of the Ministry of Natural Resources, Ontario, certain files have also been released in Toronto as a service to the mining community. Ninety two Open File releases were made involving the preparation of 271 maps. This has required a major effort by the Cartography Section and Editorial staff in a continuing cooperative operation.

A significant part of the total research output of the Geological Survey finds an outlet in scientific journals and this complements the in-house program by providing external standards of acceptability and a degree of visibility not always available to government publications. Each year a volume of abstracts of these papers is prepared in the Division and published in the Geological Survey Paper Series.

The Geological Cartography Section prepares manuscript material for printing as multicoloured geological maps, uncoloured preliminary maps and also produces line graphics as illustrations for geological publications. The Photomechanical Unit prepares base maps on which field officers plot and compile their data. Some progress has been made in computer-assisted cartography for map production and two sheets in the 1:1 000 000 atlas series have been printed but the proportion of computer assisted input to hand work remains disappointingly low.

A monthly information circular is produced by the Division and mailed as a free service to several thousand addresses in Canada, the United States and overseas. The circular announces all publications and Open Files released during the month; some items of immediate economic significance to users in government

and industry have a specified time and date of release. All maps and reports are released through the Publications Distribution Section and more than 202 000 items were distributed through this office which also handled many thousands of requests for publications and information on publications. Sales facilities for geological maps and reports are also maintained at the Survey's offices in Calgary and Vancouver. Both offices report a high volume of business and in addition to providing a useful service, they also serve to bring the identity of the Department and the Branch to a larger public.

The Geological Survey Library has a large and nationally important collection of books and periodicals on geology and related sciences, occupying more than two miles of shelving and comprising about 150 000 volumes, microfilms and maps. There are also branch libraries at Dartmouth, Calgary and Vancouver. In addition to the research needs of the Survey, the Library serves the scientific community at large by interlibrary loans and bibliographic services.

On demand retrospective bibliographic services are offered on a partial cost recovery basis by means of bibliographic files in CAN/OLE and from files available in Canada through INFOMART, mainly GEO.REF. A computerized information dissemination service, CAN/SDI provides bibliographic references on a monthly basis according to the user's scientific interest profile. These services are offered in collaboration with the National Research Council's Institute for Scientific and Technical Information. Users pay for the service by annual subscription. Although the volume of service has remained constant, there have been a number of cancellations, possibly due to the general tightening of budgets for institutional research. There has, however, been a steady growth in the number of retrospective searches.

Geoscience information is provided by the Division on a wide variety of topics through a technical enquiries telephone listing and by correspondence, and on many occasions the Division staff form the first contact between the Department and the enquiring public.

As a service division, our principal goal is to prepare and release to the user public the results of the scientific research of the branch, consequently production targets are directly related to the output from the research divisions. Throughput in scientific publishing equated with this output and no significant backlog of manuscripts remained at year end; backlogs do, however, exist in some divisions due to delays in critical reading. Some reduction in carry over of work at year end was achieved in cartography, but demand for maps and illustrations is somewhat cyclical in pattern and one year is too short a period to fully assess production trends. It is clear, however, that a high level of output was maintained.

Membership on Committees

P. Harker - Chairman, Department Committee on Scientific Information.
- Chairman, Library Policy Committee.
- GSC exhibits committee.
- Senior adviser, Treasury Board negotiations for Physical Sciences Contract.

SCIENTIFIC EDITING

R.G. Blackadar

The data in the accompanying table illustrate very clearly the variations that occur in report and map production due to the fact that the production time (from editing to publication) for many items exceeds 12 months. Items "in process" include any manuscript received before April 1, 1978 which remained unpublished at that time. The large number of items "in process" at the end of 1977-78 meant that the publication budget was underspent but that a much larger expenditure can be expected in 1978-79 as items that were within a few months of publication on March 31 are received.

These figures include the 1100-page, 3 part "Report of Activities" paper series report. During calendar 1977 about 3500 printed pages were published. The 92 Open File items include 27 releases resulting from the Uranium Reconnaissance Program. Each of these involved 12 to 14 separate maps and the processing of this material made considerable demands on the unit. The table does not include 32 releases in the geophysical series that presented airborne radioactivity data. All of these were on microfiche. Each involved separate maps for 7 parameters as well as numerous profiles. User reaction to microfiche has been limited but most is favourable. The convenience to us is considerable.

No backlog exists in the files of the Chief Scientific Editor although divisional editors are experiencing some delays in processing reports. Priority demands made on this office result in a few reports being sidelined from time to time. Every effort is made to involve only those reports which are terminal in nature and for which there are published interim reports. Such delays do not involve the scientific or production editing but are most commonly experienced in the Word Processing Unit or in Cartography.

Beginning with Paper 78-1A the title of the "Report of Activities" series was changed to "Current Research" to more truly reflect the nature of the papers that are included. Papers are divided into scientific and technical papers, scientific and technical notes. A "Discussion and Communications" section was added and the first contribution to this was published in Paper 78-1A. Use was made of the GSC input to the Canadian Index to Geoscience Data to produce the 1977 Index to Geological Survey Publications and for the first time since 1950 it became feasible to produce a subject index for the year. A general subject index (15 pages) was included with the printed text and a complete subject index was included in microfiche form. "La prospection au Canada" was published in May 1977. The English edition had been released in 1970 but translation problems had caused this unacceptable delay.

In last year's report reference was made to delays in proofreading resulting from staff reductions. The arrangements made at the departmental level to contract out some work especially between October and January, has alleviated the problem.

During the report period the decision was made by branch management and with our concurrence, that the GSC would publish the proceedings of certain symposia held in Canada and the collected papers of some of the projects of the International Geological Correlation Program. It appears that the services presently available in the Geological Survey are capable of processing about three such volumes each year providing it is understood that their timing cannot be allowed to interfere with the release of "Current Research". Volumes anticipated in 1978-79 include the proceedings of the symposia on metamorphism in the Canadian Shield held in Ottawa in May 1977, on exploration geophysics held in October 1977 and on rock analysis held in May 1978.

No staff changes occurred during the report period.

STATUS OF GEOLOGICAL MANUSCRIPTS ON MARCH 31, 1978

WITH COMPARABLE FIGURES FOR 1974-75, 75-76, 76-77

Type of Report	In Process[1]				Published During Year			
	77-78	76-77	75-76	74-75	77-78	76-77	75-76	74-75
Memoirs	18	9	7	7	1	1	3	5
Bulletins	53	21	23	18	9	14	13	13
Economic Geology Reports	1	0	0	0	1	-	1	2
Miscellaneous Reports	2	1	1	1	0	1	1	4
Multicolour Maps*	53	-	-	-	28	10	25	22
Papers	58	20	28	47	34	50	50	51
Open File Reports	0	0	0	0	92	111	59	69

[1] Includes I.S.P.G. and T.S. editorial units and reports with P.R.I.S. for editing and printing.

* For maps see report of Cartographic Unit.

LIBRARY SERVICES

A.E. Bourgeois

This year has been one of great changes in the library. The physical renovations of the library were completed over a period of three and a half months. On the personnel side there was almost a complete turnover of staff with five of the six professionals having changed and two new para-professional positions being created.

The staff changes have certainly resulted in a loss of continuity but have also brought new strengths to the library which have offset the disadvantages.

The physical changes have resulted in more space for clientele using the library but some stack space has been lost. As a result more use is being made of the G70 area to relieve congestion. The library maintained only essential services during the renovation; as a result library statistics are lower for this fiscal year but have been steadily increasing since February.

Plans are in progress to revise the computer programme which produces the library's list of periodical and serial holdings. We hope to be able to produce a new list sometime in 1979.

A preliminary study of the library's map collection indicated the need for better control and access to our holdings; a physical reorganization of the maps is underway and should be completed in early 1979. We are now looking into the possibility of an automated index for better retrieval of the map literature.

The library has been actively involved in a co-operative study of the feasibility of implementing a departmental automated cataloguing system. The six branch libraries of the department, under the chairmanship of Mrs. Lois Claxton, have been studying the various systems available in the library community. The result of implementing a joint cataloguing programme should give us access to the collections held throughout the department and eliminate the need for duplication of resources and efforts in cataloguing the collection.

A major binding programme was undertaken. Funds were made available to bind a large portion of the periodical collection which had been neglected in the past. Hopefully the binding of these will increase their durability and decrease the possibility of missing issues.

Due to lack of staff resources and the coverage of the periodical literature by commercially available data bases, we have decided to decrease the number of analytics incorporated into the card catalogue. The only analytics now being done are those not easily available elsewhere.

A steady increase in the demand for the Library's Retrospective Search Services has resulted in the need to train more staff in the use of on-line services. A side benefit of the on-line capabilities has been the verification of items requested on interlibrary loans; this has resulted in faster and more accurate services for our clientele.

A long-range programme to eliminate the enormous backlog is underway; no target date has been set for its completion.

The library's serial holdings records are being revised and updated; this should be completed in the next fiscal year.

Personnel Notes

Annette Bourgeois replaced Doreen Sutherland as the Head, Library Services. Mrs. Sutherland retired after eleven years with the GSC.

Elizabeth Frebold accepted the position of Assistant Head, Information Services. She replaces Mary Williams who retired.

David Reade accepted the position of CAN/SDI co-ordinator.

Alice Solyma resigned as reference librarian. She was replaced by Myra Owen.

Alicia Prata accepted the position of Assistant Head, Technical Services. She replaces Diane Parsonage who resigned.

Le'Anne Frieday accepted the newly created position of Cataloguing Assistant.

Allan Wilcox accepted the position of Indexer for the Canadian Geoscience Index.

Membership on Committees

A.E. Bourgeois

- Member, Branch Computer Facilities Committees.

- Branch representative,

  Standing Committee of Chief Librarians of EMR.

  Federal Libraries Council Binding Committe.

D. Reade

- Branch representative,

  CAN/SDI Centers Committee.

Membership on Committees (cont'd)

A. Wilcox

- Branch representative,

Geoscience Index Advisory Committee.

Statistics

I Collection Growth (received by purchase, exchange or gift)

Periodicals and serials	21 808
Books	1 147
Maps	1 512
Open Files	290

II Circulation

(a) Loans	
Books, periodicals, etc. to GSC staff	13 614
To individuals other than GSC staff	1 627
To other libraries	875
(b) Maps	600
(c) Articles xeroxed in lieu of loan	5 412
(d) Books borrowed from other libraries	619

III Cataloguing

Books, periodicals, serials	1 225
Analytics	850
Maps	1 093
Items added to the Geoscience Index	1 156

IV Acquisitions

Requisitions and Purchase Orders:

- Library	933
- Divisions	40

Total Subscriptions:

- Library	918
- Divisions	29

V Reference and Interlibrary loans

Library enquiries	12 600
Interlibrary loan requests received	6 182
Requests for GSC staff from other libraries	845

VI Translations

Prepared by Secretary of State	132

VII CAN/SDI Unit

Requests for Information	200
Total GEO.REF Profiles	150
Total Profiles by the GSC Search Centre	145
Total retrospective searches	168

GEOLOGICAL CARTOGRAPHY SECTION

J.G. Roberts

During the year the section provided a wide variety of graphic and reproduction support to Branch programs from initial field compilation sheets to final multi-colour or monochrome printing including the supplying of base maps and other materials to GSC Divisions, units and offices located across the country and to a large extent met it's major objectives.

There was a dramatic increase in the requirements for quick release graphics in the Branch which resulted in the decision to develop specifications for "B" Series single or 2 colour maps using authors manuscript line work. Guidelines for production are expected to be completed early in the new year and the first printing of the terrain sheets in this series should go to press late in the next fiscal year.

The six 1:1,000,000 geological atlas series maps in hand were at the final checking stages at year's end and are expected to be printed by late autumn or early winter. In addition the Magnetic Anomaly map of Canada was compiled, drawn and published to meet an urgent deadline.

An interim report was produced in November 1977 by the 3 draftsmen (S. Frohberg, A. King and B. Mainville) seconded to do a study of Surveys and Mapping's PDP/10 Cartographic Monitor (XCM). The results were favourable and with the throughput of Prince Rupert-Skeena 1:250,000 map sheet the system proved versatile. The study continues with expected improvements in methodology and the broadening of system usage for map production. A final report with recommendations is expected by the summer of 1978.

Renovations to the fourth floor were started on March 10 and the dismantling of the drafting and photo-mechanical facilities were expected to cause major interruptions in service. In order to provide field sheets for the 1978 season and to meet high priority photo-contact commitments, arrangements were made with Surveys and Mapping Branch and the Military Mapping and Charting Establishment for the loan of dark room facilities and accommodation for 4 of our photo-mechanical operators. Other lesser priority and routine work has been contracted to commercial firms under D.S.S. standing offer agreements.

It is expected that renovations will be completed and all units in new accommodation in the main building by October 1978.

The number of man years remains at 56 and disposition of manpower resources is the same as reported in 1976-77.

PRODUCTION DATA

Maps and illustrations received during the fiscal year:

	1976-77	1977-78
Multicoloured geological maps	14	7
'B' Series maps	0	2
Figure illustrations (pocket)	20	19
Figure illustrations (page)	265	224
Open File maps	294	271

Maps, illustrations and photomechanical work completed by the Cartography Section:

	1976-77	1977-78
Multicoloured geological maps	26	37
Preliminary geological maps	2	0
Figure illustrations (pocket)	33	19
Figure illustrations (page)	89	85
Open File maps	191	271
Multicoloured maps reprinted	0	2
Indexes to Publications revised	8	6
Camera	6,830	9,907
Contacts		
Films and papers	20,680	21,531
Colour Keys	1,131	1,310
Peelcoats	358	338
Scribetches	17	39
Colour Proofs	111	162
Whiteprints	13,779	13,114

Carry over of maps and illustrations in progress at the end of fiscal year:

	1976-77	1977-78
Multicoloured geological maps	46	32
Figure illustrations (pocket)	14	28
Figure illustrations (page)	230	309
'B' Series maps	0	2

Miscellaneous production of aeromagnetic maps, illustrations, slides, plotting projections, base maps, open file items and preparation of specialized art work and displays expended approximately 36% of available production man years, a slight increase over the previous year.

PERSONNEL NOTES

J.P. Corriveau transferred back to GSC from Environment Canada to fill the vacant position resulting from the untimely death of Frank Yeager.

Through promotional competition John Bill became the supervisor in Sub-Unit B1 and Vern Foster transferred from the Geographical Division of Surveys and Mapping Branch to fill the resulting vacancy.

Karen Knudson was appointed to the vacant secretarial position in the section on August 22, 1977.

MEMBERSHIP ON COMMITTEE

R. Daugherty	- Member, Cartography Suggestions Award Sub Committee
J.G.E. Gagnon	- Member, Cartography Suggestions Award Sub Committee
J. Bill	- Member, Cartography Suggestions Award Sub Committee (replaced R. Daugherty - March 1978)
J.G. Roberts	- Member, Cartographic Committee Canadian Institute of Surveying - Member, National Commission for Cartography - Member, Advisory Committee on Cartography Algonquin College

PUBLICATIONS-INFORMATION OFFICE

J.L.L. Touchette

The following publications were received during the year:

Economic Geology Series (Fr)	1
Memoirs	1
Bulletins	9
Preliminary Papers	35
Preliminary Papers (reprinted)	3
Miscellaneous Geology	25
Open Files	14
Open Files (reprinted)	3
Microfiche	35
Indices to Geol. Maps (revised)	6
Indices to Aero. Maps (revised)	23
Maps "A" Series	29
Maps "A" Series (reprinted)	1
Preliminary Maps (reprinted)	1
Aeromagnetic Maps	292
Aeromagnetic Maps (reprinted)	21
Foreign Maps	18

Distribution Data

Maps	68,206
Reports	49,059
Indices, listings, posters, etc.	84,345
Total distribution (free and paid)	201,610

Other Data

Requests for publications, information, rock and mineral sets		13,218
Visitors (Cash sales 1,368) (Others 2,092)		3,460
Notification lists		19
Total publications advertised		333

Revenue

Cash received from sales of reports, maps, rock and mineral sets, photographs, etc.		$89,310.56
Sales charged to deposit account	4,903.03	
Rock sets and publications supplied to Sales Office:		
Calgary	36,237.50	
Vancouver	20,801.00	
Quebec	3,024.20	
Yellowknife	3,377.90	
Whitehorse	3,871.50	$72,215.13
TOTAL SALES VALUE		$161,525.69

PHOTOGRAPHIC SERVICES

J.W. Kempt

The past year has been one filled with activity and change; with more changes expected in the future.

The work load as usual, has been steadily increasing, especially that of the colour section. The photography of rock specimens, mineral specimens, colour slides, colour duplicates, continually expands. Autoradiography, B&W internegatives from colour slides have joined the ever increasing production line. A formal request for additional staff has been submitted through regular channels.

The change over of Kodak Canada Limited to the new E-6 processing chemicals has caused additional problems. The increase in temperature to 101.4°F (E-6) from the old 85°F (E-4) has made it extremely difficult and at times impossible to carry out the necessary procedures with our present sink line process.

The purchase of an automated colour processor to handle these changes has just been completed. When installation of this equipment takes place some time in the future, it is expected to solve some of our problems.

In answer to numerous requests, colour printing has been reactivated in a limited way. With the purchase of additional equipment and additional staff this could be augmented.

In all probability B&W field rolls will be sent to the Government Photographic Centre at Tunney's Pasture for processing and printing as arrangements have been conducted to produce this result.

Shortage of personnel has made it imperative that staff training be continued in all photographic positions.

We are very fortunate at this time that all personnel, including the Supervisor, of the Photographic Section are willing to undertake more than their share of the work load.

G.S.C. Photographic Section
Production Report

1977-1978

Supervisor
J.W. Kempt

Prints&Enlargements	Exposed	Processed	Dried	
Black&White	24643	24643	24643	
Colour	190	190	190	Totals
	24833	24833	24833	74,499

Photographs Produced			B/W Negs	Colour Negs	Colour Transp.	Totals Exposed
Route-plans-Portraits-Passport			70		168	238
Con. tone-maps-charts			347	59	3465	3871
Line copies			1027		40	1067
Rock&Mineral Specimens			363		764	1127
Fossil&Macro fossil Specimens			1255			1255
Macro-Micro-Thin&Polished Spec.			422		10	452
Auto-Radiographs			330			
Neg. Processing	B&W Rolls	Col. Rolls	591		2321	
Field Photos.	B&W Rolls	Col. Rolls	8338		828	
B & W Negs from colour slides			471			471
	Total Processed		13,234	59	7596	8481

Prints&Enlargements Numbered&Stamped	15477	
Prints&Enlargements to outside Agencies	655	
Duplicate colour slides	3046	
Colour Slides	3894	
B&W Slides	1159	
Slides mounted	5816	
Negatives Opaqued	1366	
Negatives retouched	335	
Prints spotted	234	
	31982	61352

Government Photo Centre						
Commercial Photo Services						

Grand total 135851

INSTITUTE OF SEDIMENTARY AND PETROLEUM GEOLOGY

D.F. Stott, Director

INTRODUCTION

The Institute is responsible for all aspects of the bedrock geology of the sedimentary basins of Western and Arctic Canada, an area that contains most of Canada's known oil, natural gas, and coal resources. It has national responsibilities for ascertaining and evaluating Canada's potential resources of petroleum, natural gas, and coal, and contributes to the data base required for the projections of the mineral resources of the country. The Institute undertakes sedimentological, structural, and stratigraphic investigations which facilitate exploration and development of energy and other minerals and establishes standards of chronology and biostratigraphic correlations by paleontological methods. It is concerned also with the publication and dissemination of information on Canada's landmass and resources.

The Institute is organized into six subdivisions, each comprising several sections. The Regional Geology Subdivision is responsible for geological investigations to determine the nature of the sedimentary basins and to provide detailed geological maps of the region. The Paleontology Subdivision is charged with the responsibilities for providing standards, controls and reference material to ensure consistent correlation within the region and also on a national scale. The Energy Subdivision has responsibilities for the preparation of quantitative estimates of the national resources of hydrocarbons. In addition, it carries out basic research in geochemistry pertaining to petroleum generation, migration and accumulation. The role of the Coal Geology Subdivision is to establish a sound geoscience base in the coal measures throughout Canada, and to evaluate the resources of Canadian coal deposits. The Geological Information Subdivision provides scientific editing as well as cartography, photography and library services for the Institute. It is responsible also for the distribution of publications of the Geological Survey and other major branches of the Department of Energy, Mines and Resources. The Administrative Office provides financial services, central registry, stationery and supplies, and office services including the typing pool. In addition, because the Department of Energy, Mines and Resources owns the physical plant, building and engineering services have an important role within Administration.

The present establishment of the Institute comprises 138 permanent positions and 9 casual man-years. It includes 67 research and physical scientists specializing in structural geology, stratigraphy, sedimentology, paleontology, mineralogy, geochemistry, geophysics, coal and petroleum geology; it includes also 20 scientific, 19 technical, and 32 administrative support positions.

Other occupants of the building in which the Institute is housed include representatives of the Terrain Sciences Division of the Geological

Survey of Canada, the Mining Research Centre of the Canada Centre for Mineral and Energy Technology and the National Energy Board. The ISPG has the responsibilities for building and engineering services.

The building also serves as a major repository for drilling cores, samples, and other data from both onshore and offshore exploration, activities in Yukon and Northwest Territories, and for samples from all provinces and from the Continental shelves. Approximately 375 m^2 of additional storage space for cores were under construction during the current year.

Personnel Notes

Ann E. Fenwick, the Director's Secretary since September, 1974, resigned in January, 1978 to take a position with the Department of Indian and Northern Affairs. Joyce Andrechuk, formerly with the Paleontology Subdivision, has now taken charge of the front office.

A. (Red) Jamieson, who joined ISPG as office manager at its inception in 1967, was the successful candidate for the position of Administrative Officer in the Vancouver office; and left Calgary in May. Mr. Jamieson's wealth of knowledge had been of immense help at ISPG and he provided excellent support service.

R.L. Munson, from PFRA, assumed the duties of Office Manager in May, 1977.

Irene Garner, Head of the Stenographic Pool, resigned in December to take a position in industry. Mrs. P.L. (Pat) Greener, who was employed at the Customs Building before the ISPG was formed, left her position as Accounts Clerk to take charge of the Pool. She was succeeded by Joanne Drake, who came from Central Registry.

The position of junior clerk in Central Registry has had three incumbents in the current year: K. Grose, J. Drake and N.E. Poole. Continuing problems of recruitment in the steno pool are indicated by a rapid turnover with as many as 4 changes in one position.

R.H. Warne was appointed to a vacant position in Building and Engineering Services and is apprenticing in the machine shop.

Attendance at Meetings, Conferences and Courses

A.E. Fenwick

Development Seminar for Executive Secretaries, Banff, Alberta, November 21-24, 1977.

D.F. Stott

Geological Association of Canada, Annual Meeting, Vancouver, British Columbia, April 24-29, 1977.

D.F. Stott continued

Canadian Coal Conference, 29th Annual Meeting, Edmonton, Alberta, October 2-3, 1977.

Metric Conversion Course, Canadian Society of Petroleum Geologists, University of Calgary, February 14-16, 1978.

Global Tectonics and Earth Dynamics, Canadian Society of Petroleum Geologists Seminar, Calgary, February 20-22, 1978.

Coal Colloquium, Canadian Society of Petroleum Geologists, Coal Division, Calgary, March 3, 1978.

Membership on Committees

D.F. Stott

Canadian Society of Petroleum Geologists, Vice President, 1977.

Canadian Society of Petroleum Geologists, President, 1978.

Internal

Library Committee: J.H. Wall (Chairman)

J.R. McLean
M. Jones (Secretary)
R.W. Klassen
N. Haimila
R.I. Thompson

Exhibits Committee: F.G. Young (Chairman)

E.R.W. Neale
D.J. Walter
A.R. Sweet

Nomenclature Committee: J.D. Aitken (Chairman)

E.R.W. Neale
W.A.M. Jenkins
D.G. Long

Committee on Photography: N.C. Ollerenshaw (Chairman)

E.W. Bamber
R.L. Christie

Safety Committee:	G.H. Jamro (Chairman)
	R.J. Broadfield
	G.M. Peterkin
	M. Cecile
	D. Peatman
Tour Committee:	D.W. Gibson (Chairman)
	N.G. Koch
	J.D. Hughes
	A.F. Embry
McConnell Club:	R.G. Young (Chairman)
	J.R. McLean (Secretary)
Metric Log Committee:	D.G. Wilson (Chairman)
Metric Conversion Committee:	D.G. Wilson (Chairman)
	G.A. Jamro

REGIONAL GEOLOGY SUBDIVISION

G.C. Taylor

The objectives of the Regional Geology Subdivision are directed toward the increased understanding of the nature, origin, and history of Proterozoic and Phanerozoic sedimentary rocks of Western and Arctic Canada. The investigations provide the data base essential for the appraisal of the potentialities of these sedimentary suites, both as reservoirs for, and sources of, oil and gas, and as hosts for other economic deposits including coal, potash, lead, zinc and copper.

The Regional Geology Subdivision is organized along geographic lines, partly in response to similar geological problems and partly because of similar logistical problems. It comprises three sections. The Sverdrup-Mackenzie Section is responsible for surface and subsurface geology of upper Paleozoic, Mesozoic, and Cenozoic rocks of Sverdrup Basin (Arctic Archipelago) and the Beaufort-Mackenzie region of the northern mainland and adjacent offshore. The Arctic Islands Section is responsible for part of the sedimentary areas of the Arctic Islands, with geological investigations being concerned mainly with the Paleozoic rocks of the Parry Island Fold Belt and the Franklinian Geosyncline and adjacent shelf. The Mainland Section is concerned with the geology of the Yukon and mainland Northwest Territories exclusive of the Mackenzie Delta, and of the more southerly sedimentary regions lying within British Columbia, Alberta, Saskatchewan and Alberta.

The Subdivision also includes the Curation and Technical Services unit which provides curation services for the entire division including rock, fossil, and coal samples. It also monitors and effects the loan of curated

materials to the public as directed by the responsible scientific authorities. The technical service mainly relates to the preparation of rock sections for microscopic examination.

The Institute is the repository for cuttings samples, cores, and other data resulting from both onshore and offshore exploration drilling by industry in Yukon Territory, Northwest Territories, including the Arctic Islands, and for samples from all provinces and continental shelves of Western Canada. Some nine (9) million samples are stored at the Institute, and this number increases by about 300 000 each year. With the exception of samples from wells in Alberta, all are available to the public for free examination. Files are maintained of all the logs and other data related to more than 60 000 wells drilled in Western and Arctic Canada.

Highlights

- Stratigraphic studies of lower Paleozoic rocks in the western Mackenzie Mountains have led to the recognition of a major paleogeographic feature, the Misty Creek Embayment, and the delineation of facies trends, paleocurrents, and volcanic centres all pertinent to significant lead-zinc deposits hosted in this stratigraphic assemblage.

- The major field phase of stratigraphic and mapping studies at a scale of 1:250 000 was largely completed for the northern area of Ellesmere Island. The distribution and character of the lower Paleozoic rocks of the Franklinian Geosyncline were determined as well as the northeastern extension of the Sverdrup Basin.

- As the result of field work in the northeastern segment of the Sverdrup Basin, and the application of "sequence analysis", significant new concepts relating to the depositional history of the Sverdrup Basin have evolved resulting in major re-evaluation of the stratigraphic succession.

- Field stratigraphic and mapping studies of the Helikian succession of the Mackenzie Mountains have resulted in conceptual modeling of reef development and associated facies of the Little Dahl Group. This is pertinent to the evaluation of lead-zinc potential of these rocks.

Personnel Notes

The Subdivision presently consists of a permanent staff of 21 scientists, 2 technicians and 5 support staff. The Subdivision also supported several doctoral students and university contract projects.

During April, A.F. Embry joined the Subdivision as a research scientist replacing a technical position.

M.P. Cecile joined the staff in May as a replacement for R.W. Macqueen.

Also in May, L.A. Bligh transferred from the Paleontology Subdivision as a replacement in the lapidary unit.

D.M. Mottley resigned his position in August as clerk to the Subdivision and was replaced by Denise Armstrong.

R.J. Broadfield transferred to Paleontology from the Curation Unit in September and was replaced by I. Scott.

R.A. Rahmani resigned his position as a research scientist in October. His replacement, J. Dixon, was not available until July of 1978.

A. Bjarnason retired in March and his position was filled by D.H. McLean.

Attendance at Meetings, Conferences and Courses

J.D. Aitken

Geological Association of Canada, Annual Meeting, Vancouver, British Columbia, April 23-27, 1977.

Carbonate Sedimentology Field Seminar, Yucatan, Mexico, October 22-30, 1977.

Geological Society of America, Annual Meeting, Seattle, Washington, November 8-10, 1977.

H.R. Balkwill

Carbonate Sedimentology Field Seminar, Yucatan, Mexico, October 22-30, 1977.

M.P. Cecile

Carbonate Sedimentology Field Seminar, Yucatan, Mexico, October 22-30, 1977.

A.F. Embry

Carbonate Sedimentology Field Seminar, Yucatan, Mexico, October 22-30, 1977.

J.W. Kerr

Canadian Society of Exploration Geophysicists, Calgary, Alberta, June, 1977.

N.C. Meijer-Drees

Carbonate Sedimentology Field Seminar, Yucatan, Mexico, October 22-30, 1977.

A.D. Miall

Canadian Society of Petroleum Geologists, Fluvial Conference, Calgary, October 20-22, 1977.

A.D. Miall continued

Sedimentology of the Pocohantas Basin, Clastic Field Seminar, West Virginia, March 19-23, 1978.

D.W. Morrow

Carbonate Sedimentology Field Seminar, Yucatan, Mexico, October 22-20, 1977.

G.C. Taylor

Carbonate Sedimentology Field Seminar, Yucatan, Mexico, October 22-30, 1977.

R.I. Thompson

Geological Association of Canada, Annual Meeting, Vancouver, British Columbia, April 23-27, 1977.

H.P. Trettin

Sedimentology of the Pocohantas Basin, Clastic Field Seminar, West Virginia, March 19-23, 1978.

F.G. Young

Canadian Society of Petroleum Geologists, Fluvial Conference, Calgary, Alberta, October 20-22, 1977.

Sedimentology of the Pocohantas Basin, Clastic Field Seminar, West Virginia, March 19-23, 1978.

Membership on Committees

J.D. Aitken

International Union of Geological Sciences/International Geological Correlation Program, Precambrian Boundary Project, Boundary Working Group, Corresponding Member.

American Commission on Stratigraphic Nomenclature, Vice-Chairman and Secretary.

H.R. Balkwill

University of Alberta, Canadian Society of Petroleum Geologists, Advisory Committee on National Conference on Earth Sciences, Member.

Bulletin of Canadian Petroleum Geology, Associate Editor.

R.L. Christie

Canadian Society of Petroleum Geologists, Lexicon Committee, Co-Chairman.

A.F. Embry

Canadian Society of Petroleum Geologists, Sedimentological Division, Field Trip Chairman.

Canadian Society of Petroleum Geologists, 50th Anniversary, Reprint Editor.

Canadian Society of Petroleum Geologists, Arctic Symposium, Editor.

J.W. Kerr

Canadian Society of Petroleum Geologists, Link Award Committee, Chairman.

A.D. Miall

Canadian Society of Petroleum Geologists, International Symposium on Fluvial Sedimentology and Fluvial Lecture Series, Chairman.

Canadian Society of Petroleum Geologists, Fluvial Conference Proceedings Volume, Editorial Committee, Chairman.

Canadian Society of Petroleum Geologists, World Oil Conference, Editorial Committee, Chairman.

Canadian Society of Petroleum Geologists, Sedimentology Division, Chairman.

Canadian Society of Petroleum Geologists, Nomenclature Committee, Member.

D.W. Morrow

Canadian Society of Petroleum Geologists, Sedimentology Division, Program Director.

H.P. Trettin

Canadian Geodynamics Commission, Corresponding Member.

F.G. Young

Journal of Foraminiferal Research, Associate Editor.

Subdivision Manuscripts

Manuscripts for 2 GSC Bulletins, 2 'A' Series Maps, 4 GSC Papers, 13 Current Research papers, and 15 outside papers were submitted for publication by the staff during 1977-78. Scientists of the Subdivision also submitted geological formation picks to the Department of Indian and Northern Affairs for all northern wells released from confidential status during the report year.

Laboratory Statistics

Curation

'C' numbers issued	10 200
Wells curated	55
Lots shipped	2 955 collections
Lots received (transfer)	2 695 collections

Open File 490 released (approximately 30 000 entries)
Open File 491 released.

Lapidary

Thin sections	2 281
Polished sections	50
Sieve analysis	10
Stainings	264
Impregnations	250
Special +	200

Core and Sample Repository

Well samples (washed) received:

Alberta	293 238
British Columbia	88 799
Saskatchewan	18 168
Northwest Territories	14 033
Manitoba	-
	414 238

Well logs received (Riley's):

Alberta	4 756
British Columbia	489
Northwest Territories	32
Saskatchewan	515
Manitoba	32
	5 824

Core and unwashed samples, Northwest Territories:

Core	200 boxes 1100 feet
Unwashed	311 boxes

Customers

150 persons per month
1 170+ requests for sample examination
400 requests for core examination

ENERGY SUBDIVISION

R.G. McCrossan

The Energy Subdivision is responsible for the Institute's programs on evaluation of oil and natural gas for the sedimentary basins of Arctic and Western Canada. Research is also conducted into the mode of origin and occurrence of these commodities to provide necessary background for the evaluation studies. The Subdivision's program of resource evaluation is interrelated with other programs of the Division and is coordinated with the work of other agencies within the Federal Government. The Subdivision is responsible for the petroleum inventory program which depends in part on basic geological work supplied by the Regional Geology Subdivision of the Institute. The Energy Subdivision comprises three sections.

The Petroleum Resources Section is primarily responsible for the assessment of Western and Arctic Canada's potential petroleum resources, for conducting research on the habitat of oil, and on methods of resource evaluation. Development and maintenance of computer data files related to well data, oil and gas pool data, and other information are a secondary responsibility. Much of the work of the Section is coordinated in part through the Geological Subcommittee on Resource Potential with related activities within the Institute's programs, with scientists at Halifax (Atlantic Geoscience Centre) and Ottawa (Resource Management Conservation Board), and with the Department of Indian and Northern Affairs.

The Geochemistry Section provides scientific services to the Division, develops and publishes analytical techniques in X-ray diffractometry, X-ray fluorescence and analytical chemistry and carries out research in the field of diagenesis related to the oil-generating potential of source rocks. Crude oil studies also are undertaken to determine oil-source relationships and to document geochemical changes in crude oil composition that occur in the reservoir. Most of these studies are carried out on material from the Arctic Islands, Mackenzie Delta region and East Coast offshore and provide data for the petroleum resource evalution program.

The Data Management Section maintains a computer facility and provides systems analysis and programming services to the various Subdivisions within the Institute. The Section's activities may be summarized under the categories of file development, operating systems integration, assessment system enhancements and new program development.

Highlights

- Numerous information exchanges between the Energy Subdivision and Federal and Provincial Governments and industry personnel have occurred this year in the field of oil and gas resource evaluation. Discussions on methodology have been held with personnel of the U.S. Department of the Interior and their contractors, and from government agencies in Greenland, Australia and Finland.

- Extensive studies in the Upper Cretaceous-Tertiary sediments of the Mackenzie Delta have confirmed the immature nature of the sediments. Studies on resin concentrates from coals have provided additional evidence for the origin of condensate and light oil from resins in this area.

- Gasoline range data have been used to divide the oils and condensates from the Mackenzie Delta into genetic families.

- Clay diagenetic studies have been extended to include studies on the variation of the different clay-size fractions with diagenesis. It has been found that there is a net decrease in clay content with diagenesis. These changes have been correlated with petroleum maturation.

- Laboratory techniques have been devised and improved in the following areas: analysis of C_5 to C_8 hydrocarbons in shales; solvent extraction and chromatographic separation of hydrocarbons; mass spectrometry of aromatic hydrocarbons; low temperature ashing of coals; and preparation of beads for XRF analysis.

- The hydrocarbon assessment program (HASP) was provided to the U.S. Department of the Interior in response to a request made to the Minister. The Data Management Section modified HASP to run on the U.S. Department's system.

- Implementation of various processing systems and routines has been undertaken, including Surface II from the Kansas Geological Survey and a generalized posting routine from the University of Alberta. The Alberta Oil and Gas Pool File has been created at EMR-CSC and direction and assistance in the editing of the KREMP file of paleontological data have been undertaken. A data acquisition system for gas chromatograph data has been designed and implemented.

- The facilities of the entire Subdivision have been taxed to the limit of the last year in doing a complete reassessment of Canada's hydrocarbon resources. This has restricted severely the research component of the work. Current work, in cooperation with the Energy Sector of Energy, Mines and Resources, is aimed at producing estimates as a band of cost curves for oil and gas for each major region.

Personnel Notes

The Energy Subdivision presently employs a permanent staff of 17 scientists, 1 programmer, 9 technicians and 1 support staff, although a number of vacancies has occurred throughout the year.

J.N. Van Elsberg resigned his position as Petroleum Geologist in the Mackenzie Delta area to establish his own consulting firm.

G. Boguslaw joined the staff from the National Energy Board to take a position as Petroleum Geologist - Heavy Oil, which he later resigned to join the staff of Petro-Canada.

K.A. Baer joined the computer staff from Digitech Systems Ltd. as a computer programmer.

N.G. Koch joined the staff from Dome Petroleum as a Petroleum Geologist in the Mackenzie Delta area.

D.N. Skibo joined the staff from the Massachusetts Institute of Technology as an Evaluation Systems Geologist.

D.G. Wilson has been transferred from the Regional Geology Subidivion to take up a position as a Petroleum Geologist for Western Canada.

F.H. Verhoeff has been transferred from the National Energy Board to become a Petroleum Geologist in Unconventional Gas.

Attendance at Meetings, Conferences and Courses

R.J. Baird

American Association of Petroleum Geologists, Continuing Education Class, Seismic Stratigraphy Interpretation, Monterey, California, November, 1977.

Society of Exploration Geophysicists Convention, Calgary, Alberta, September, 1977.

E.C. Dahlberg

Frio Oil Ltd., Hydrodynamics course by King Hubbert, Calgary, Alberta, August 15-26, 1977.

A.A. Densmore

Society of Exploration Geophysicists Convention, Calgary, Alberta, September, 1977.

K. Evis

Development Seminar for Executive Secretaries, Banff, Alberta, March, 1978.

R.G. McCrossan

Canadian Institute of Mining and Metallurgy, 28th Annual Technical Meeting of Petroleum Society, Edmonton, Alberta, June, 1977.

Global Tectonics and Earth Dynamics, Seminar I, University of Calgary, February 20-22, 1978.

K.N. Nairn

Mini-Micro Computer Symposium, Montreal, Quebec, November 17-19, 1977.

E.M. Northcott

Applied Chromatography for Petroleum Fuels and Power, Edmonton, Alberta, August, 1977.

T.G. Powell

U.S. Geological Survey, Petroleum Research and Resources Seminar, Golden, Colorado, March 13-16, 1978.

American Chemical Society-Chemical Institute of Canada, Joint Meeting, Symposium on Oil Sand and Oil Shale, Montreal, Quebec, May, 1977.

L.R. Snowdon

Gulf Oil Symposium on Oil Source Rocks and Migration, Pittsburg, Pennsylvania, October, 1977.

Special Talks or Lectures

T.G. Powell

The Oil Deposits of Alberta: Their Origin and Geochemical History; Symposium on Oil Sand and Oil Shale, American Chemical Society-Chemical Institute of Canada Joint Meeting, Montreal, Quebec, May, 1977.

Diagenesis of Organic Matter and Clay Minerals: Implications to Petroleum Source Bed Evaluation; Institut National de la Recherce Scientifique, Quebec, 1977.

L.R. Snowdon

Organic Geochemistry of Upper Cretaceous-Tertiary Delta Complex, Beaufort-Mackenzie Basin, Canada; Gulf Oil Symposium on Oil Source Rocks and Migration, Pittsburg, Pennsylvania, October, 1977.

Membership on Committees

R.J. Baird

Canadian Society of Exploration Geophysicists Bulletin, Associate Editor.

Canadian Society of Exploration Geophysicists, University Liaison Committee, Member.

E.C. Dahlberg

Geological Potential Subcommittee (Interdepartmental), Member.

N.E. Haimila

Geological Potential Subcommittee (Interdepartmental), Member.

Geoscience Working Committee for Remote Sensing, Member.

Canadian Society of Petroleum Geologists, 1977 Waterton Glacier Conference, Business Manager.

N.G. Koch

Canadian Society of Petroleum Geologists, Membership Chairman.

R.G. McCrossan

Geological Potential Subcommittee (Interdepartmental), Chairman.

Policy Committee of Computer Modelling Group, Director and Liaison Officer for Energy, Mines and Resources.

Departmental Coordination Committee - Oil and Gas, Member.

American Association of Petroleum Geologists, Petroleum Resources Estimation Project Steering Committee, ex officio member.

T.G. Powell

Canadian Society of Petroleum Geologists, Geochemistry Division, Chairman.

Canadian Society of Petroleum Geologists, Research Committee, Member.

Canadian Society of Petroleum Geologists, Graduate Awards Committee, Member.

R.M. Procter

Geological Potential Subcommittee (Interdepartmental), Secretary.

Energy Resource Data System, Technical Committee, Department Representative.

Laboratory Statistics

Organic Geochemistry

Analysis of light hydrocarbons and organic carbon:

	76/77	77/78	78/79 est.
Light hydrocarbon analyses	6500	3888	3500
Organic carbon analyses	3100	3734	3500
Number of wells involved	26	13	12

Extraction and separation of hydrocarbon fractions, rocks and oils:

	76/77	77/78	78/79 est.
Extraction	369	321	300
Distillation	0	64	20
Separations	451	381	320
Gas chromatographic analyses	346	381	320

Kerogen studies:

	76/77	77/78	78/79 est.
Isolation	106	97	80
Elemental analysis	71	90	80
Carbon isotope	55	19	10

Source-oil correlation studies:

		76/77	77/78	78/79 est.
Carbon isotope determinations	extract	34	12	15
	oils	78	62	15
Gasoline range	extract	0	15	30
	oils	27	50	20
Mass spectrometry	extract	0	5	20
	oils	0	40	100

Inorganic Geochemistry and Mineralogy

	76/77	77/78	78/79 est.
X-ray diffraction mineral determinations	1125	3024	3000
Infra-red analyses	60	300	200
X-ray fluorescence elemental analyses	0	2120	2000
Thermal analyses	135	752	750
Atomic absoprtion elemental	1564	1609	1500

Requested analytical services to Division

	76/77	77/78	78/79 est.
X-ray diffraction mineral determinations	1270	2203	2200
X-ray fluorescence elemental analyses	160	450	600
Atomic absoprtion elemental analyses	144	328	400
Miscellaneous analyses	0	210	300

COAL GEOLOGY SUBDIVISION

D.K. Norris

The role of the Coal Geology Subdivision is to establish a sound geoscience base in the coal measures throughout Canada and to provide and maintain a resource evaluation of Canadian coal deposits in collaboration with the Provinces, with industry and with the Atlantic Geoscience Centre, and to meet national inventory requirements of the Energy Development Sector of the Department of Energy, Mines and Resources.

To fulfill this role, the Subdivision is organized into three sections. The Geology of Coal Section conducts independent studies of the stratigraphy and structural geometry of Canadian coal deposits to assist in the establishment of a geoscience data base from which resource evaluations can be made. As most of the increase in the future domestic demand for coal is expected to be for electrical power, the present emphasis of the Section is on the geology of low rank coal deposits in western and northern mainland Canada, and on the bituminous coals of Nova Scotia and New Brunswick. The Coal Technology Section is engaged mainly in studies of the petrographic character of coal seams and their application to seam identification, correlation and quality prediction. In addition, this Section is studying the maturation of organic material, including coal, in fine-grained, clastic rocks for the prediction of the nature and quality of hydrocarbons for resource evaluation. The Resource Evaluation Section is responsible for the carrying out of field programs, alone or jointly with the provinces and with other branches of the Department. They are designed to provide data required for the overall estimation of the coal resources of Canada in terms of occurrence, nature, quantity, quality and mineability.

Highlights

1977 saw a number of significant advances in the Geological Survey's coal program. These include the publication by the Department of the first annual report on the coal resources of Canada, produced under the auspices of the Coal Assessment Group. Moreover, the joint Federal-Provincial program to evaluate the lignite resources of southern Saskatchewan culminated with the completion of a two-volume geological report and atlas which is expected to be published by August, 1978. It will serve as a model in quantitative coal resource evaluation methodology which should be applicable to coal deposits elsewhere in the world.

Steps toward energy self-sufficiency in the Maritimes have been taken in collaboration with the Nova Scotia Government. Coal seams of suitable thickness and quality for mining have been identified through drilling offshore from Cape Breton Island. In addition, new coal resources have been outlined in Yukon Territory from recent mapping in the Bonnet Plume Basin. Studies in the Foothills of Alberta and British Columbia are providing precise paleogeographic models of the coal measures and, in turn, predictive tools in prospecting and mining for coal.

Personnel Notes

The Subdivision presently consists of a permanent staff of 13 scientists, 2 technicians and 1 support staff. It supported 1 Post-doctoral Fellow (T. Jerzykiewicz).

S. Creaney joined the Coal Technology Section in December, 1977. He comes to us from the University of Newcastle, England where he studied the rank variation and geothermometry of the Northern Pennine Orefield, northern England.

D.L. Marchioni joined the Coal Technology Section in October, 1977. He comes to us from the University of Newcastle, New South Wales, where he studied the coal petrography and sedimentology of part of the Permian upper coal measures of the Sydney Basin, eastern Australia.

L.G. Marconi joined the Coal Technology Section in June, 1977. He hails from Coleman, Alberta and a family of coal miners.

J.A. Irvine was invited by the International Development Research Centre to consult with the Government of Turkey on lignite exploration. This entailed a trip to Turkey, September 19 to October, 5, 1977. He coordinated a return visit by Turkish representatives in November, 1977.

A.R. Cameron was elected Vice Chairman of the Coal Division of the Geological Society of America.

T. Jerzykiewicz completed his post-doctorate fellowship and returned to Poland in December, 1977.

N.C. Ollerenshaw visited the British Columbia Ministry of Mines and Petroleum Resources, Victoria, British Columbia, January, 1977, for purposes of collaboration on joint projects in southeastern British Columbia.

Attendance at Meetings, Conferences and Courses

A.R. Cameron

Canadian Coal Petrographers Workshop, Coleman, Alberta, September 18-19, 1977.

Geological Society of America, Annual Meeting, Coal Research Symposium, Seattle, November, 1977.

Canadian Society of Petroleum Geologists, Continuing Eduction, Delta Sedimentation and Delta Models, October 24-26, 1977.

Canadian Society of Petroleum Geologists, Colloquium on Coal Reserves and Resources, Calgary, March 3, 1978.

S. Creaney

Canadian Society of Petroleum Geologists, Colloquium on Coal Reserves and Resources, Calgary, March 3, 1978.

D.W. Gibson

Society of Exploration Geophysicists, Field Trip to Drumheller area, Co-leader, September 18, 1977.

Canadian Society of Petroleum Geologists, First International Symposium on Fluvial Sedimentology, October 20-22, 1977.

P.S. Graham

Clastic Sedimentology of the east Kentucky Coal Measures, March 18-24, 1978.

Canadian Society of Petroleum Geologists, Continuing Education, Delta Sedimentation and Delta Models, October 24-26, 1977.

Canadian Society of Petroleum Geologists, Colloquium on Coal Reserves and Resources, Calgary, March 3, 1978.

J.D. Hughes

Clastic Sedimentology of the east Kentucky Coal Measures, March 18-24, 1978.

Canadian Society of Petroleum Geologists, Continuing Education, Delta Sedimentation and Delta Models, October 24-26, 1977.

Canadian Society of Petroleum Geologists, Colloquium on Coal Reserves and Resources, Calgary, March 3, 1978.

J.A. Irvine

Canadian Institute of Mining and Metallurgy, 79th Annual General Meeting, Ottawa, April 18-20, 1977.

Canadian Society of Petroleum Geologists, Colloquium on Coal Reserves and Resources, Calgary, March 3, 1978.

J. Jerzykiewicz

Canadian Society of Petroleum Geologists, Continuing Education, Delta Sedimentation and Delta Models, October 24-26, 1977

B.A. Latour

29th Canadian Conference on Coal, Edmonton, Alberta, October 2-4, 1977.

Canadian Society of Petroleum Geologists, Colloquium on Coal Reserves and Resources, Calgary, March 3, 1978.

D.G.F. Long

Clastic Sedimentology of the east Kentucky Coal Measures, March 18-24, 1978.

Canadian Society of Petroleum Geologists, First International Symposium on Fluvial Sedimentology, October 20-22, 1977.

D.G.F. Long continued

Geological Society of America, Rocky Mountain Section Meeting, Missoula, Montana, May 14-15, 1977.

Canadian Society of Petroleum Geologists, Colloquium on Coal Reserves and Resources, Calgary, March 3, 1978.

D.L. Marchioni

Clastic Sedimentology of the east Kentucky Coal Measures, March 18-24, 1978.

Canadian Society of Petroleum Geologists, Continuing Education, Delta Sedimentation and Delta Models, October 24-26, 1977.

Canadian Society of Petroleum Geologists, Colloquium on Coal Reserves and Resources, Calgary, March 3, 1978.

J.R. McLean

Clastic Sedimentology of the east Kentucky Coal Measures, March 18-24, 1978.

Colorado Geological Society, Rocky Mountain Coal Symposium, Golden, Colorado, May, 1977.

Canadian Society of Petroleum Geologists, 1977 Field Conference, Waterton-Glacier Park, September 10-12, 1977.

Canadian Society of Petroleum Geologists, 9th Annual Seminar, Global Tectonics and Earth Dynamics, February 20-22, 1978.

Canadian Society of Petroleum Geologists, First International Symposium on Fluvial Sedimentology, October 20-22, 1977.

Canadian Society of Petroleum Geologists, Continuing Eduction, Delta Sedimentation and Delta Models, October 24-26, 1977.

Canadian Society of Petroleum Geologists, Colloquium on Coal Reserves and Resources, Calgary, March 3, 1978.

D.K. Norris

Canadian Society of Petroleum Geologists, 1977 Field Conference, Waterton-Glacier Park, September 10-12, 1977, Co-leader.

29th Canadian Conference on Coal, Edmonton, Alberta, October 2-4, 1977.

Canadian Society of Petroleum Geologists, Continuing Education, Delta Sedimentation and Delta Models, October 24-26, 1977.

Canadian Society of Petroleum Geologists, Colloquium on Coal Reserves and Resources, Calgary, March 3, 1978.

D.K. Norris continued

Geoscience Forum, Whitehorse, December 5-6, 1977.

Canadian Society of Petroleum Geologists, 9th Annual Seminar, Global Tectonics and Earth Dynamics, February 20-22, 1978.

N.C. Ollerenshaw

Canadian Society of Petroleum Geologists, Field excursion to Burnt Timber Creek, October, 1, 1977, Leader.

Clastic Sedimentology of the east Kentucky Coal Measures, March 18-24, 1978.

C.F. Stevens

Canadian Society of Petroleum Geologists, Colloquium on Coal Reserves and Resources, Calgary, March 3, 1978.

Membership on Committees

A.R. Cameron

Geological Society of America, Coal Division, Program Committee, Vice Chairman.

B.A. Latour

Department of Energy, Mines and Resources, Coal Reserves and Resources Subcommittee, Member.

J.R. McLean

Canadian Society of Petroleum Geologists, 1977 Field Conference, Finance Committee, Member.

Canadian Society of Petroleum Geologists, Link Award Committee, Member.

D.K. Norris

Canadian Society of Petroleum Geologists, 1977 Field Conference, Technical Co-Chairman.

Department of Energy, Mines and Resources, Coal Committee, Member.

N.C. Ollerenshaw

Canadian Society of Petroleum Geologists, Circulation Committee, Member.

Canadian Society of Petroleum Geologists, Type Section Guidebook Committee, Chairman/Editor.

Special Talks and Lectures

A.R. Cameron

Coal Petrography in Exploration; Canadian Society of Petroleum Geologists, Coal Geology Division, Calgary, November, 1977.

Petrographic Characteristics of Saskatchewan Lignites; Canadian Coal Petrographers Workshop, Coleman, Alberta, September 19, 1977.

D.W. Gibson

The Jura-Cretaceous Kootenay Formation in Alberta and B.C., a Stratigraphic Summary; Geological Association of Canada, Annual Meeting, Vancouver, April 26, 1977.

The Jura-Cretaceous Kootenay Group; Coal Geology Subdivision, February 10, 1978.

Stratigraphy, Nomenclature and Sedimentology of the Jura-Cretaceous Kootenay Formation, Alberta and B.C.; Canadian Society of Petroleum Geologists, Coal Geology Division, Calgary, March 15, 1978.

Stratigraphy and Sedimentology of the Coal-Bearing Kootenay Formation; Edmonton Geological Society, Edmonton, March 20, 1978.

P.S. Graham

Tertiary Coal Deposits of Central B.C.; Coal Geology Subdivision, February 24, 1978.

J.D. Hughes

Resource Evaluation of the Dodds-Roundhill Area, Alberta; Coal Geology Subdivision, February 24, 1978.

J.A. Irvine

Saskatchewan Lignite Resource Evaluation Methodology; Canadian Society of Petroleum Geologists, Colloquium, Calgary, March 3, 1978.

Lignitic Tourism in Turkey; Coal Geology Subdivision, January 19, 1978 and ISPG McConnell Club, February 14, 1978.

A Computer Assisted National Coal Inventory; Canadian Institute of Mining and Metallurgy, 79th Annual Meeting, Ottawa, April, 1977.

T. Jerzykiewicz

Some Geographical, Geological and Paleontological Data from the Polish Expedition to the Gobi Desert; Coal Geology Subdivision, October 14, 1977.

The Stratigraphy and Sedimentology of the Brazeau and Paskapoo Formations in the Central Foothills - a Progress Report; Coal Geology Subdivision, November 4, 1977.

B.A. Latour

E.M.R. Coal Resource Terminology; Canadian Society of Petroleum Geologists, Colloquium, Calgary, March 3, 1978.

D.G.F. Long

Proterozoic Stream Deposits: Some Problems of Recognition and Interpretation of Ancient Sandy Fluvial Streams; Canadian Society of Petroleum Geologists, First International Symposium of Fluvial Sedimentology, Calgary, October, 1977.

Depositional Environments and Stratigraphic Setting of Rocks of the Tsezotine Formation and Katherine Group, Mackenzie Fold Belt, Yukon and Northwest Territories, Canada; Belt Symposium, Coeur d'Alene, Idaho, November, 1977.

Stratigraphic Relationships among Proterozoic Rocks of the Cordillera and Northwest Canadian Shield; Belt Symposium, Coeur d'Alene, Idaho, November, 1977.

Sedimentary Framework of Coal Deposition in the Cretaceous-Tertiary Sequence of the Bonnet Plume Basin, Northern Yukon; Canadian Society of Petroleum Geologists, Sedimentology Group, Calgary, February 24, 1978.

J.R. McLean

Coal in the Blairmore Group of Alberta; Coal Geology Subdivision, March 10, 1978.

D.K. Norris

Coal Occurrences in Yukon Territory; Geoscience Forum, Whitehorse, December 5, 1977.

The North American Cordillera in Canada North and East of the Tintina Fault; University of Toronto, Department of Geology, March 21, 1978.

The Western Canadian Coal Mining Industry; University of Toronto, Department of Geology, March 21, 1978.

N.C. Ollerenshaw

Structure in the French Alps; Canadian Society of Petroleum Geologists, Structural Division, April 18, 1977.

Geology of the Dominion Coal Block, Parcel 82, Fernie, B.C.; Coal Geology Subdivision, February 10, 1978.

Subdivision Manuscripts

Seven manuscripts were prepared and 16 contributions to the geology of Canada's coal deposits were published during the report year. The published works comprised 8 outside papers, 1 abstract and 7 GSC Papers. Included among these contributions is a major, internal report on the stratigraphy and sedimentology of the Lower Cretaceous Gething Formation.

Coal Preparation Laboratory

In the specimen preparation area of the Coal Technology Section, samples from the field are processed for microscopic examination. These samples come mainly from two sources: those collected by Coal Technology personnel and those submitted by other ISPG personnel on a service basis. Samples are crushed, riffled, molded with various resins into grain mounts or pellets and then polished. Many samples require hand picking of material while others, including many processed for oil and gas research, require special chemical and mechanical separation. Larger blocks of coal are also prepared as well as thin sections and smear slides for transmitted light study. In 1977-78, the following specimens were prepared.

Pellets

For Coal Technology projects	550
For oil and gas projects	96
For other ISPG projects (service)	255

Blocks

For Coal Technology projects	12

Smear Slides

For oil and gas projects	44

PALEONTOLOGY SUBDIVISION

W.W. Nassichuk

The Paleontology Subdivision is responsible for scientific studies in biostratigraphy, paleoecology and systematics in support of regional mapping, and stratigraphic studies, and the exploration for and assessment of hydrocarbon, base-metal and other non-renewable resources in western and northern Canada. Most of the Subdivision's activities are centred on the Northwest Territories, including the Mackenzie Delta, Beaufort Sea and Arctic Island regions but an increasingly broader participation in British Columbia and Alberta is being realized. In all these areas, paleontology assumes an extraordinary importance in the evaluation of energy reserves and in the search for stratigraphically controlled mineral deposits.

The Paleontology Subdivision is charged with maintaining standards for effective intrabasinal and interbasinal correlation and is exploring means for improving zonal schemes and improving interpretations of paleoenvironments. Fossil groups that display relatively rapid evolutionary changes are important for establishment of models showing significant refinements of time-scales. Similarly, relatively little known fossil groups are being tested within the Subdivision for biostratigraphic potential and application. A large part of the program involves dating, correlation and determination by means of detailed studies of palynomorphs, foraminifers, conodonts and other microfossils and macrofossils recovered from the cuttings and cores derived from wells drilled in the Yukon and Northwest Territories.

The Subdivision consists of three scientific sections. The Micropaleontology Section, through detailed study of microfaunas and microfloras, develops and applies models of biostratigraphic and paleoecological zonations to refine knowledge of the stratigraphy of Phanerozoic rocks of Canada, which contain all Canada's fossil fuels and a significant proportion of her mineral deposits. The Macropaleontology Section and the Ottawa Paleontology Section conduct research for the same purposes, using macrofossils.

Research and service programs within the Subdivision are closely coordinated with those of the other subdivisions of the Institute, with similar programs of the Atlantic Geoscience Centre, the Regional and Economic Geology Division, and with those of a number of universities in Canada and the United States, France and the United Kingdom. A substantial portion of the functions of the Subdivision is conducted through contract by consulting companies and by university scientists who are, nonetheless, supervised by the Subdivision. Also, a number of EMR Research Agreements are administered by the Subdivision.

Highlights

- A monograph dealing with taxonomy, biostratigraphy and biogeography of cleoniceratinid and gastroplitinid ammonites throws new light on evolutionary relationships and on Albian correlations in Western and Arctic Canada.

- Five members of the Subdivision summarized the stratigraphy and age relationships of Paleozoic and Mesozoic rocks in the Mackenzie Delta, Richardson Mountains area for a guidebook commemorating the 50th Anniversary of the Canadian Society of Petroleum Geology.

- Early Devonian (Lochkovian) brachiopods and conodonts from the "Delorme" Formation, Northwest Territories were monographed and zonal comparisons and refinements made for two important faunal groups. Brachiopods are indicative of the *Gypidula pelagica* Zone of Johnson (1977) and conodonts are assigned to the *Woschmidti* (= *hesperius*) and possibly also the *eolatericrescens-postwoschmidti* (= *eurekaensis*) Zones.

- Palynological investigations have thrown new light on mid-Cenozoic paleogeography and tectonism in the St. Elias Mountains region in the Yukon and on age relationships of the Tent Island Formation in the Yukon. Also, palynological investigations were completed and biostratigraphic zonations refined for the Ravenscrag and Frenchman Formations in southern Saskatchewan. The Tent Island and Frenchman Formations are interpreted as Maastrichtian and the Ravenscrag as Paleocene.

- Devonian corals have provided significant new data for refinements of definition of Lower/Middle and Middle/Upper Devonian boundary beds in northern and western Canada. An important conceptual model showing the facies distribution of Devonian corals in western Canada was completed.

- The Subdivision provided 8 comprehensive reports on wells in the Mackenzie Delta, Beaufort Sea and Arctic Islands regions and also 150 reports on 1200 lots of fossils in individual collections for direct quotation in publications.

Personnel Notes

The Subdivision includes 14 scientists, 7 technicians, a secretary and, on occasion, a number of temporary assistants. One Post-doctoral Fellow is currently on staff. Togo Shimazaki, a visiting scientist from Japan, spent the year with the Subdivision. During the fiscal year, the Subdivision monitored 5 EMR Research Agreements and 8 contracts with university and industrial personnel.

During October, W.W. Nassichuk succeeded B.S. Norford as Subdivision Head. Dr. Norford served a successful 5-year term as Head of the Subdivision and returned "to the bench" in order to devote his full concentration to lower Paleozoic biostratigraphic research.

D.H. McNeil from the University of Saskatchewan joined the Micropaleontology Section of the Subdivision in October and is involved with foraminiferal research in Mesozoic and Tertiary strata in the Mackenzie Delta-Beaufort Sea regions.

B.J. Kennedy joined the Subdivision in order to operate the conodont laboratory in October.

E.B. O'Keefe assumed responsibilities in the foraminifer laboratory in February.

R.J. Broadfield transferred to the Macropaleontology Section of the Subdivision from the Curation Unit in September.

G. Brown joined the Micropaleontology Section as a palynological technician in January.

J.W. Andrechuk vacated the secretarial post of the Subdivision to become secretary for the Director's office in February. She was succeeded by R.I. Quarry.

Attendance at Meetings, Conferences and Courses

J.W. Andrechuk

Geology for Secretaries, Southern Alberta Institute of Technology, Calgary, September 22-November 10, 1977.

W.S. Hopkins, Jr.

"Applied Petroleum Geology" course by Oil and Gas Consultants International Inc., Calgary, October 24-31, 1977.

Palynology Workshop, Geological Survey of Canada, Calgary, January 16-18, 1978.

W.W. Nassichuk

International Carboniferous Congress, organizational meeting, Urbana, Illinois, October 10-12, 1977.

B.S. Norford

Geological Association of Canada, Annual Meeting, Vancouver, April 25-27, 1977.

Geological Association of Canada, Cordilleran Section, Selwyn Basin Workshop, Vancouver, February 10, 1978.

International Union of Geological Sciences, Working Group on Cambrian-Ordovician Boundary Meetings and Third Symposium on the Ordovician System, Columbus, Ohio, August 14-16, 1977.

A.W. Norris

Subcommission on Devonian stratigraphy, Field Excursion and Meeting in the Barrandian area, Czechoslovakia, and Field Excursion to Martenberg, West Germany, October 2-11, 1977.

A.E.H. Pedder

Subcommission on Devonian stratigraphy, Field Excursion and Meeting in the Barrandian area, Czechoslovakia, and Field Excursion to Martenberg West Germany, October 2-11, 1977.

Paleontological Society, Meeting on Devonian of western North America, Seattle, Washington, November 7-9, 1977.

T.P. Poulton

Geological Association of Canada, Annual Meeting, Vancouver, April 25-27, 1977.

International Field Meeting on the Jurassic, Stuttgart, Germany, September, 1977.

J.R. Coleman's short course on Deltaic Sedimentation, Calgary, March, 1978.

A.R. Sweet

Palynology Workshop, Geological Survey of Canada, Calgary, January 16-18, 1978.

Membership on Committees

E.W. Bamber

International Subcommission on Permian Stratigraphy, North American Study Group, Member.

International Subcommission on Carboniferous Stratigraphy, Dinantian Working Group, Member.

J.A. Jeletzky

International Union of Geological Sciences, Cretaceous Subcommission, Commission on Stratigraphy, Member.

International Union of Geological Sciences, Commission on Stratigraphy, Working Group on Jurassic-Cretaceous Boundary, Member.

W.W. Nassichuk

International Union of Geological Sciences, Subcommission on Permian Stratigraphy, Vice-Chairman.

International Union of Geological Sciences, Subcommission on Carboniferous Stratigraphy, Titular Member.

International Union of Geological Sciences, Subcommission on Carboniferous Stratigraphy, Working Group on Middle Pennsylvanian of North America, Chairman.

W.W. Nassichuk continued

International Union of Geological Sciences, Subcommission on Permian Stratigraphy, Working Group on Permian Stratigraphy in Boreal Regions, Co-chairman.

B.S. Norford

International Union of Geological Sciences, Working Group on Cambrian-Ordovician Boundary, Member.

Geological Association of Canada, Paleontology Division, Chairman.

Palaeontological Association, Overseas Representative for Canada.

University of Calgary Sigma Xi Club, President.

University of Calgary, Senate, Chairman of Concerns and Enquiry Committee.

A.W. Norris

International Union of Geological Sciences, Subcommission on Devonian Stratigraphy, Titular Member.

North American Devonian Study Group, Organizing Member.

A.E.H. Pedder

International Union of Geological Sciences, Subcommission on Devonian Stratigraphy, Corresponding Member.

International Committee for the Study of Fossil Snidaria, Canadian Representative.

E.T. Tozer

International Union of Geological Sciences, Subcommission on Triassic Stratigraphy, Vice-Chairman.

International Union of Geological Sciences, United Nations Educational, Scientific and Cultural Organization, International Geological Correlation Programme, Secretary, Canadian National Committee.

T.T. Uyeno

International Union of Geological Sciences, Subcommission on Devonian Stratigraphy, North American Devonian Study Group, Member.

J.H. Wall

Journal of Foraminiferal Research, Associate Editor.

Canadian Society of Petroleum Geologists, Paleontology Division, Committee for commemoration of 50th Anniversary, Member.

Special Talks and Lectures

D.H. McNeil

Foraminifers and biostratigraphy of the Cretaceous System, Manitoba Escarpment; Canadian Society of Petroleum Geologists, Paleontology Division, January 10, 1978.

B.S. Norford

Occurrences of Ordovician and Silurian faunas west of the Rocky Mountain and Tintina Trenches, British Columbia and Yukon Territory; Geological Association of Canada, Annual Meeting, April 26, 1977.

Ordovician and Silurian biostratigraphy and paleoecology in the Selwyn Basin; Geological Association of Canada, Cordilleran Section, Selwyn Basin Workshop, February 10, 1978.

Inarticulate brachiopods can't talk, neither can they write; University of Calgary, Department of Geology, Noon Seminar, March 3, 1978.

A.E.H. Pedder

Corals of the Lower/Middle and Middle/Upper Devonian boundary beds of northern and western Canada; Paleontological Society, Annual Meeting, on the Devonian of western North America, November 9, 1977.

Sequence and distribution of Devonian rugose coral faunas of western and arctic Canada; Canadian Society of Petroleum Geologists, Paleo Group, May 2, 1977.

T.P. Poulton

Distribution and significance of trigoniid bivalves in the Mesozoic of Canada; Geological Association of Canada, Vancouver, May, 1977.

Subdivision Manuscripts

Manuscripts for 4 GSC Bulletins, 8 GSC Papers, and 13 outside papers were produced by the staff of the Subdivision during 1977-78.

Laboratory Statistics

Macropaleontology Laboratory

Thin sections	2100
Plaster casts	82
Acid residue separation	12
Polished sections	47

Foraminifer Laboratory

Samples processed	896
Residues picked	13
Wells samples	12

Conodont Laboratory

Samples processed	183
Residues picked	173

Palynology Laboratory

Samples processed	1338 (miospores 1093, megaspores 152, foraminifers 154, kerogen 197)
Wells sampled	13

During the year, representatives of the following companies and institutions visited Subdivision laboratories in order to discuss technical laboratory procedures, aspects of laboratory design, equipment, ventilation and chemical waste disposal:

Companies in Canada

Amoco
Union Oil
Imperial Oil
Texaco
Robertson Research
Petro-Canada
Dome Petroleum
Rock Surgery
Geochem

Universities

U. of Saskatchewan
U. of Calgary

Foreign Companies

Statoil, Norway
Japex Oil, Japan
Robertson Research, Wales
Union Oil, U.S.A.

GSC Centres

Vancouver
Pat Bay
Ottawa

GEOLOGICAL INFORMATION SUBDIVISION

E.R.W. Neale

This Subdivision is responsible for communicating the results of the Institute's program to government, industry, the universities and the general public. This is done chiefly through publications in the Geological Survey's own series and in established national and international scientific and technical journals. Some results are also made available through an Open File system. In support of this objective, the Subdivision maintains capabilities and facilities in scientific editing and information, cartography, technical photography, library services and publication distribution. The Subdivision also communicates with the public and the scientific community by responding to direct requests for information, by preparing semi-popular articles and displays, by lectures, and by participation in the work of committees and associations.

During the past year, the two members of the editorial staff processed 56 reports in the Geological Survey series, 35 outside publications and 9 Open File reports. This involved selection of critical readers and evaluation of their reports, scientific editing, copy-editing and, in most cases, layout and proofreading.

Most maps and illustrations produced by Institute scientists for publication are prepared in the Cartographic Section. To expedite publication, some are now prepared by the scientists themselves with the advice and guidance of our drafts-persons. This and other short-cuts are helping to reduce the backlog which has grown in recent years. The work of the Section includes both black-and-white and multicoloured illustrations in addition to photomechanical and reproduction work. The Section also prepares slides for oral presentations and large graphic displays for workshops and meetings.

The Photographic Section provides general and specialized photographic services for the Institute staff. Preparation of paleontological plates is possibly its most demanding and unique function.

Our Library, the second largest geoscience library in Canada, has become established as the major public source in the West of information on energy resources, government policies and the geological data base. It serves both Institute scientists and the industrial and academic communities in many ways and handles requests from members of the public. Library users from many walks of life in several countries have expressed their appreciation of research and information services rendered.

All publications of the Geological Survey, selected publications of the Surveys and Mapping Branch and certain other pertinent Departmental publications are sold and distributed from our Publications Section. This Section features a self-serve system for topographic maps and an automated selective system for products of the National Air Photo Library. These amenities and the courteous efficient service of the staff not only serve as a convenience to the petroleum industry and the general public but also as an advertisement for the scientific work of the Institute and, in fact, the entire Department.

Highlights

The Cartography Section successfully met its stringent deadlines for the publication "Coal Resources of Southern Saskatchewan: A Model for Evaluation Methodology". It established the specifications for all illustrative material and within the review year completed 19 atlas pages and 167 page drawings for this joint project with the Saskatchewan Department of Mineral Resources and the Saskatchewan Research Council. Our Editorial unit participated in the crash program of editing with officers from both these institutions and the final product of this cooperative project reached the printers on schedule.

The Library acquired the collection of Dr. Nicholas Polunin, distinguished Arctic botanist and ecologist. It consists of 232 volumes, many of them rare and valuable. A catalogue of this collection has been published.

The Library completed and published a computerized serial holdings list which will be updated semi-annually.

Despite a shortage of staff and several high-priority assignments, the Cartography Section succeeded in reducing its backlog from 9 to 6 months. Several short-cuts, including increased use of author's drafting, have contributed to this improvement.

Preparations were completed in this year for installation of a giant cartographic process camera which will handle 52" x 72" film and will add a new dimension to quality and speed of reproduction in our Photomechanical Unit.

Cartographic work on the Calgary map-area was expedited in anticipation of it being completed and printed in time for display and sale at the Canadian Society of Petroleum Geologists Convention in June, 1978. It represents the most complex 1:250 000 coloured map undertaken by our cartographers.

Two semi-official social events deserve mention: 1) A gala retirement tea party was held in the Boardroom in honour of Win Irish's 35 years of service to the Geological Survey; and 2) The 10th Anniversary Party of this Institute was celebrated by all founding members at a Library Tea, with the Director General present to cut the birthday cake.

Personnel Notes

The Subdivision includes 22 permanent employees: 12 in Cartography (including Photomechanical), 2 in Photography, 2 in Publication Distribution, 4 in the Library, and 2 in Scientific Editing. Part-time employees are used when available in both the Library and Cartographic Services and are required continually in the Publication Distribution Section.

E.J.W. Irish retired in December, 1977, after over 35 years of service with the Geological Survey. For the past 11 years, he was Scientific Editor and Head of the Subdivision. He was replaced by E.R.W. Neale.

Catharine Findlay, editorial assistant for 7 years, was promoted from the clerical ranks to Information Services 1 and became Assistant to the Editor.

E.R.W. Neale was awarded an honorary LLD by the University of Calgary and was recipient of the Queen's Anniversary Medal.

D.G. Lawrence resigned as supervisor of the Photography Section to accept a post with the RCMP in Regina. He was replaced by Brian Rutley.

W.B. Sharman joined us in November, 1977 as second in command of the Photography Section.

Archie Ellis resigned from Cartography in April, 1977 and was replaced by Murray Wade. Anne Pelletier resigned in August and was replaced by James Waddell. Dianne Wallace rejoined the Section in October after an absence of 3 years.

Attendance at Meetings, Conferences and Courses

J.C. Graff

A day-long workshop on automation in libraries and several luncheon meetings of the Calgary Chapter of the Canadian Micrographic Society.

Organizer of a workshop on "The user and on-line services" sponsored by the Calgary Chapter, CASLIS. This workshop resulted in the formation of a Calgary on-line user's group.

E.R.W Neale

Canadian Geoscience Council meetings in St. John's (June), Halifax (October), and Ottawa (December).

Geological Association of Canada, Annual Meeting, Vancouver, May, 1977.

Solar Energy Society, Annual Meeting, Edmonton, August, 1977.

Association of Earth Science Editors, Annual Meeting, Columbus, Ohio, October, 1977.

National Research Council Journals of Research, Editorial Board Meeting, Ottawa, November, 1977.

L.A. Sharp

Seminar at the University of Calgary on the Petroleum Abstracts database.

Membership on Committees

J.C. Graff

Served on the program committee for the Calgary Chapter of the Canadian Association of Special Libraries and Information Services. Some of the meetings she organized were: 1) metric measurement; 2) demonstrations of on-line access to the Canadian Remote Sensing database; 3) patents and standards; 4) government documents retrieval; and 4) identification and conservation of rare materials.

E.R.W. Neale

Canadian Journal of Earth Sciences, Editor.

Geoscience Canada, Associate Editor.

University of Calgary, Adjunct Professor.

Canadian Geoscience Council, Foreign Secretary.

Geological Association of Canada, Editorial Committee, Member.

Canadian Geological Foundation, Member.

Special Talks and Lectures

C.E. Findlay

Lecture on Copy-Editing in Geowriting Course, University of Calgary, February, 1978.

L. MacLachlan

Poster session on ISPG cartographic processes, Canadian Society of Petroleum Geologists, January, 1978.

E.R.W. Neale

Lecture series on structural geology, plate tectonics, environmental geology and geowriting, various courses at The University of Calgary.

Structure of the Appalachians; Canadian Society of Petroleum Geologists, Structural Group, November, 1977.

Completion of Sigma Xi National Lecture Tour - talks at Rider College, N.J., Union Carbide, N.J., Beloit College, Wisc., and Northeastern University, Chicago, Ill., April/May, 1977.

STATISTICS ON SUBDIVISION ACTIVITIES

Manuscripts Processing Section

	1976-77	1977-78
Manuscripts processed and forwarded to printer		
GSC Memoirs	1	1
GSC Bulletins	4	5
GSC Papers	38	25
Maps (A-series)	0	1
Outside Papers	10	27
Manuscripts being processed for publication		
GSC Memoirs	4	3
GSC Bulletins	12	10
GSC Papers	6	6
Maps (A-series)	5	5
Outside Papers	10	8
Publications printed		
GSC Memoirs	0	0
GSC Bulletins	7	2
GSC Papers	34	29
Maps (A-series)	0	0
Outside Papers	14	19
Open File items initiated	8	9

Geological Cartography Section

Production Data

Maps and figures prepared by the Cartographic Section and sent to Ottawa for printing between April 1, 1977 and March 31, 1978.

	1976-77	1977-78
Multicolour geological maps	4	7
Figure illustrations (page)	297	481
Figure illustrations (pocket)	16	33

Manuscripts received	1976-77	1977-78
Multicolour geological maps	8	2
Figure illustrations (page)	386	565
Figure illustrations (pocket)	38	17

Maps and illustrations in progress at March 31, 1978	1976-77	1977-78
Multicolour geological maps	4	6
Figure illustrations (page)	201	199
Figure illustrations (pocket)	4	2

Miscellaneous drafting, which averaged 10.2 per cent of the total drafting time, accounted for 207 separate items of which 41 were slides. No figures for outside publication were drafted.

Reproduction services	1976-77	1977-78
Diazo prints	4466	3933
Diazo prints (frame shots)	498	570
Photostat prints	992	290
Di-chrome		

Photomechanical services		
Film (sheets, negative and positive)	3492	3181
Drafting keys on scribe	106	85
Blueline on Cronaflex	356	307
Colour proofs	19	32
Peel coats	125	124
C-1 prints	576	469
KC-5 prints	1472	1122
Autopositives	550	374
Sepia (dry erasable film)	9	35

Photographic Section

Production Data

	1976-77	1977-78
Total number of continuous tone 4 x 5 negatives	1947	1116
Total number of prints	10870	7624
Total number of contact sheets	771	512
Total number of high contrast line negatives	971	972
Total number of colour negatives and prints	90	78
Total number of rolls (5→40 exp.) of black and white negative film	118	109
Total number fo rolls submitted by scientific staff for processing	68	92
Total number of rolls (20 & 36 exp.) of colour slide film	88	126

Library

Statistics

Acquisitions

Books, etc. acquired by purchase	1 291
Books, etc. acquired by gift or exchange	2 007

Circulation

Books and periodicals (to staff only)	15 402
Interlibrary loans	
Borrowed	332
Loans and xerox copies provided	485
Reference inquiries	10 000 (est.)
On-line searches performed	50

Publications and Air Photo Section

Statistics

Charge Accounts: A total of 207 companies and individuals have charge accounts with this office.

Correspondence and Orders: Approximately 2300 orders and enquiries were received by mail.

Telephone Calls: A total of 8880 calls were received.

Visitors: Approximately 8300 individuals made use of the facilities.

Distribution:

Year	Items Received	Items Sold	Value
1976-77	47 157	38 840	$58,968.51
1977-78	52 686	46 093	$71,397.15

Breakdown of Deposits:

	1976-77	1977-78
Surveys and Mapping	$33,370.85	$34,437.72
National Air Photo Library	3,276.75	11,540.80
Mineral Development	45.25	33.50
Rock and Mineral Kits	1,154.00	1,054.00
GSC Publications	15,458.70	15,549.98
GSC Maps (Geol. & Aero.)	5,080.50	8,520.55
Energy Development Sector	356.46	36.60
Gravity Maps	226.00	224.00
TOTAL:	$58,968.51	$71,397.15

Breakdown of Accounts:

	1976-77	1977-78
Credit Sales	$30,775.70	$32,533.15
Cash Sales	$28,624.76	$38,489.45
Received on Account	$30,343.75	$32,907.70

Air Photos:

A total of 231 orders were forwarded to NAPL during the year, of which 160 were prepaid. Orders consisted of:

11 528 Black and white contact prints
38 Transparencies
71 Colour contact prints
129 Flight Line index maps
23 Enlargements at 10" x 10"
14 Enlargements at 15" x 15"
9 Enlargements at 20" x 20"
37 Enlargements at 30" x 30"
113 Enlargements at 40" x 40"
11 Enlargements to miscellaneous scales
1 Mosaic 112-29

Twelve photo catalogues and 61 landsat mosaics were sold during the year.

REGIONAL AND ECONOMIC GEOLOGY DIVISION

J.E. Reesor, Director

Introduction

The Division is responsible for all aspects of the bedrock geological framework of Canada, excluding the Western Canada and Arctic Sedimentary Basins, but including the Pacific Continental Shelf and Slope. In addition, units of the division are charged with responsibility for integration of the regional geological framework with mineral deposit data and metallogenetic concepts and using the results in projecting the mineral resource potential of the country.

The objectives of the division are: to provide a systematic study of the geological framework across the country to standards consistent with the needs for mineral resource discovery and evaluation of future resource potential; to provide standards, controls and reference material to ensure consistent correlation and uniform presentation of the geology of Canada; to establish the geological settings favourable to the occurrence of mineral deposits and fuels; and to establish the potential abundance and probable distribution of mineral resources in Canada.

The objectives require a sophisticated geoscience data base synthesized, generalized, and portrayed on geologic maps and in extensive reports; a data base consistent with leading current concepts and ideas. An outfall from this work is the development of ever improving geological expertise on the various regions of Canada by individual scientists that enables them to assimilate new information from all sources such as Provinces, Universities, Industry and other Departments of Federal Government to build upon the data base of earth science information concerning Canada's landmass. All such information is constantly judged, used and reworked in the light of currently developing concepts. From this constant, thoughtful integration come new ideas, new applications in regional geology, in assessment of potential terrains for mineral discovery, and for assessment of the mineral endowment available to Canada.

Activities in the Canadian Shield over the next two or three decades have been designed to provide an up-to-date coverage at a scale of 1:250,000 of the most important areas, particularly those least well-known in the Northwest Territories. Thus Precambrian studies in 1977 were directed toward understanding the extent and relationship between Yellowknife Group and its basement, toward further examination of the Coronation Geosyncline, toward completion of the first systematic reconnaissance of the Precambrian of Ellesmere Island and toward a stratigraphic study of the Late Precambrian sedimentary basin of Northern Baffin Island. Eventually the latter study will contribute toward a correlation of mid- to upper Precambrian rocks across the Arctic mainland.

Regional studies in the Cordillera combine specific studies of stratigraphy and structure of regional importance with systematic mapping to bring 1:250,000 maps to current standards. Operation Dease was one such study in north central British Columbia designed to complete two and a

half map areas along with studies to expand knowledge of upper Paleozoic to Mesozoic stratigraphy previously studied farther south.

In early 1978 with the opening of the Patricia Bay Ocean Institute, the Marine Group of the Cordilleran Subdivision moved into new quarters on Vancouver Island. Their responsibility will be the study of both bedrock and surficial deposits in the offshore. In the summer of 1977 they undertook the first seabottom bedrock mapping, using the small submarine Pisces IV, off the northwest coast of Vancouver Island. Results to date show that it is indeed possible to map and thus to extend to the offshore stratigraphic units recognized on land.

Resources discovery and resource potential forecasts build upon the accumulating data-base by adding every increasingly sophisticated knowledge of Canadian deposits and those known elsewhere in the world for which favourable geologic settings may be known in Canada. As with the data-base, such knowledge builds slowly and often depends upon the growing expertise of one or several individuals in broad fields of mineral deposit geology combined with an understanding of regional geology and metallogenic concepts. Measurements of accomplishments are visible in the rapidity with which new ideas, new mapping information and new discoveries of mineral deposits can be integrated into an overall appreciation of mineral potentiaon in Canada.

The Economic Geology unit within this Division carries a continuing mandate to study and keep informed on developments in major mineral commodities across the nation as well as some limited regional metallogenic studies in the Northern Cordillera, the Western and Northwestern Shield. In addition, the Uranium Resource Assessment Section carries out an annual assessment of Uranium resources available in Canada.

Summaries and highlights of the activities of each of the subdivisions, Precambrian, Cordilleran, Correlation and Standards, and Economic Geology follows below.

In October 1977 the Geological Survey was informed of the Cabinet decision to form and to relocate a Precambrian Unit in Thunder Bay, Ontario. Since that time many in the Division have been occupied and preoccupied in detailed planning, in consideration of reorganization for the Precambrian Institute or in simply considering the impact of such a relocation on personal and professional life.

Attendance at Meetings, Conferences, Courses

J.E. Reesor

Penrose Conference, Tucson, Arizona, May 1977.

Geological Society of America, Annual Meeting, Seattle, Washington, November 1977.

Special Talks and Lectures

J.E. Reesor

"The culmination of the Shuswap Metamorphic Complex"; Penrose Conference, Tucson, Arizona, May 1977.

"The Shuswap Metamorphic Complex"; Geological Society of America, Annual Meeting, Seattle, Washington, November 1977.

CORDILLERAN AND PACIFIC MARGIN SUBDIVISION

H. Gabrielse

The Cordilleran and Pacific Margin Subdivision is responsible for geological studies in most of the Canadian Cordillera and the adjacent offshore regions. These studies are aimed at increasing the knowledge of the composition, age, distribution and origin of regionally mappable rock units to assess mineral and hydrocarbon potential, to guide mineral exploration and to aid in the planning of the orderly development of land utilization.

The Subdivision includes a Marine Section based at the Pacific Geoscience Centre, Sidney, Vancouver Island. Its scientists carry out stratigraphic, biostratigraphic, sedimentological and structural studies of the Pacific Continental Shelf and adjacent areas with particular emphasis on assessing hydrocarbon potential; seismic and magnetic studies in conjunction with investigations by the Earth Physics Branch to determine the disposition of shallow to deep crustal layers on the Pacific continental shelf and slope; magnetic investigations in the Beaufort Sea region and terrain sciences projects dealing with surficial sediments in the offshore areas and geomorphic processes along the coasts to aid in coastal management. The Cordilleran Section, based in Vancouver, is involved in a broad spectrum of research in those parts of the Cordillera mainly southwest and west of the areas of major hydrocarbon potential. Therefore, emphasis is placed on projects that are important for mineral exploration and assessment. An Information Services Unit is part of the Cordilleran Section and integrates the functions of a Sales Office and a library.

Highlights

- Geological mapping was completed in Finlayson Lake and Quiet Lake map-areas of south-central Yukon Territory. The area is classic for facies changes in th lower Paleozoic and the presence of allochthonous sheets of cataclastized ophiolitic, granitic and metasedimentary rocks. The increased und standing of the geology has promoted an upsurge in exploration ac ivity.

- Reconnaissance mapping was essentially completed in the Yukon part of St. Elias Mountains. The studies facilitate correlation with Alaskan geology to the west and southeast and emphasize the importance of remarkedly well defined and continuous faults.

- Regional and detailed investigations in the Dease Lake area of north-central British Columbia led to correlation of Mesozoic rocks around the east and north sides of the Sustut Basin, demonstrated the wide-spread occurrence of lower Jurassic volcanic rocks around Bowser Basin and showed the regional extent of the important base-metal bearing Upper Triassic (?) rocks.

- The viability of using a small submersible to map the geology of the Pacific Continental Shelf was demonstrated. A large area of probable Jurassic volcanic rocks was recognized along the outer shelf margin west of northern Vancouver Island.

- A marked increase in sales of geological publications and topographic maps reflected increased mining exploration activity and a greater diversity of users including groups involved in environmental studies, engineering studies and so on. An important part of the sales volume was contributed by open file geological maps.

Personnel Notes

The Subdivision consists of a permanent staff of 33, comprising 20 scientists and 13 support, administrative and information services personnel. Two post-doctoral Fellows (R. Herzer and S. Gordey) were supported by the Subdivision as were a number of graduate thesis and EMR Research Agreement projects. During the year the Marine Section of the Subdivision was transferred to the Pacific Geoscience Centre in Sidney, Vancouver Island. This group includes 6 scientists and 4 support staff. There were no changes in staff during the report year.

Attendance at Meetings, Conferences, Courses

S.L. Blusson

Geological Association of Canada, Annual Meeting, Vancouver, British Columbia, April 1977.

Northern Cordillera Mineral Deposit Workshop in Whitehorse; sponsored by D.I.A.N.D., December 1977.

Northern Geoscience Conference in Whitehorse, Yukon Territory, December 1977.

Geological Association of Canada Selwyn Basin Workshop, Vancouver, British Columbia, February 1978.

R.B. Campbell

Geological Association of Canada, Annual Meeting, Vancouver, British Columbia, April 1977.

Geological Society of America, Annual Meeting, Seattle, Washington, November 1977.

"Cordilleran Geological Research", Queen's University, January 1978.

Management Development for Research Managers Public Service Commission of Canada, St. Adele, Quebec, May 1978.

G.H. Eisbacher

International Union of Geological Sciences Working Group on the Precambrian (U.S. & Mexico) Denver, Colorado, May 1977.

Penrose Conference on 'Landslides' Vail, Colorado, October 1977.

H. Gabrielse

Geological Association of Canada, Annual Meeting, Vancouver, British Columbia, April 25-27, 1977.

Geological Association of Canada, Selwyn Basin Workshop, Vancouver, British Columbia, February 1978.

Field excursion, Mohave Desert, Arizona and California, March 1978.

J. Luternauer

Geological Association of Canada, Annual Meeting, Vancouver, British Columbia, April 25, 26, 1977.

J.W.H. Monger

Informal meeting on geology of southeastern B.C., Queen's University, Kingston, Ontario, February 1978.

J.A. Roddick

Geological Society of America, Cordilleran Section Meeting, Sacramento, California, April, 1977.

Geological Association of Canada, Annual Meeting, Vancouver, British Columbia, April 1977.

J.G. Souther

Geological Association of Canada, Annual Meeting, Vancouver, British Columbia, April 1977.

G.S.A. National Meeting, Seattle, Washington, November 1977.

Geothermal Resources Council, Hilo, July 1978.

Circum-Pacific Energy and Mineral Resources Conference, Honolulu, Hawaii, August 1978.

D.J. Tempelman-Kluit

Penrose Conference on Relative Chronology of Thrusting in the Southern and Central Appalachians: Its significance and relationships to other Orogenic Processes - May 7-13, followed by field trip across the Appalachians, May 14-20.

H.W. Tipper

Field conference on the Jurassic of southern Germany, Stuttgart, Germany, September 1977.

G.J. Woodsworth

Metamorphism in the Canadian Shield, Ottawa, May 1977.

Physics of Magmatic Processes, Princeton, New Jersey, November 1977.

C. Yorath

American Commission Stratigraphic Nomenclature - Seattle, Washington, November 1977.

Membership on Committees

S.L. Blusson

Selwyn Basin Workshop Committee sponsored by the Geological Association of Canada, Member.

R.B. Campbell

Committee on Committees, Geological Society of America, 1978, Member.

Canadian Journal of Earth Sciences, Associate Editor.

G.H. Eisbacher

Canadian Working Group on the Precambrian.

U.S.-Mexico Working Group on the Precambrian.

H. Gabrielse

Geological Association of Canada, Cordilleran Section, President.

Working Group 2, Inter-Union Commission on Geodynamics, member.

Federal Interdepartmental Coordinating Committee for Yukon Territory, member.

Pacific Geology, Co-editor.

Bulletin, Canadian Petroleum Geology, Associate Editor.

Parks, Library and Education Committees, B.C.-Yukon Chamber of Mines, member.

J. Luternauer

Organizing committee for Pacific Northwest Marine Sciences Workshop, held February 20-21, 1978, member.

Federal-Provincial Fraser River Study, Habitat Working Group.

Coastal Zone Resource Subcommittee of the British Columbia Resources Steering Committee.

Environmental Assessment Committee, Public Works Canada Steveston North Jetty Restoration.

Public Works Canada Fraser River Environmental Advisory Committee for proposed improvements to Fraser River Shipping Channel.

S.F. Leaming

Library Committee, member.

British Columbia and Yukon Chamber of Mines, member.

J.W.H. Monger

Canadian Geodynamic Subcommittee, member.

J.A. Roddick

Circum-Pacific Plutonism Project, Editor.

J.G. Souther

Canadian Geothermal Resources Association, Director.

D.L. Tiffin

Pacific Sub-committee on Oceanography, Chairman.

Ship Scheduling Committee, EMR Representative.

Pacific Science Congress, Committee on Marine Sciences.

H.W. Tipper

International Subcommission on Jurassic Stratigraphy, member.

C. Yorath

American Commission on Stratigraphic Nomenclature, member.

Special Talks and Lectures

S.L. Blusson

"Pelly-Cassiar Platform and Selwyn Basin; neither without the other"; Annual Meeting, Geological Association of Canada, Vancouver, British Columbia, April 1977 (with D.J. Tempelman-Kluit).

R.B. Campbell

"Shuswap Metamorphic Complex"; with J.E. Reesor at Geological Association of America Annual Meeting, Seattle, Washington, November 1978.

"Columbia Mountains" at University of British Columbia, course on regional geology conducted by R.L. Armstrong.

G.H. Eisbacher

"Rockslides"; Penrose Conf. on Landslides Vail, Colorado, October 1977.
Geological Association of Canada - Edmonton Geotechnical Soc., February 1978.
B.C. Dept. of Highways, March 1978.

"Peru": Geological Association of Canada, Vancouver, British Columbia, October 1977.

"Proterozoic stratigraphy, Mackenzie Mountains": Dept. of Geology, Univ. of Alberta, February 1978, U.S. Geol. Surv., Denver, May 1977.

H. Gabrielse

"The Structural Significance of the Northern Rocky Mountain Trench and Related Lineaments in North-Central British Columbia"; Geological Association of Canada, Annual Meeting, Vancouver, British Columbia, April 1977.

"Major Faults and Paleogeography in the Canadian Cordillera"; Geological Association of Canada, Annual Meeting, British Columbia, April 1977.

"Selwyn Basin, A Definition", Geological Association of Canada Workshop, Cordilleran Section, February 1978.

J. Luternauer

"Applications of Side-Scan Sonar to Geo-Environmental Research off the Coast of British Columbia"; Pacific Northwest Marine Sciences Workshop, Parksville, British Columbia, February 20-21, 1978.

S.F. Leaming

"Jade"; northwest Prospector's Convention, May 9, 1977.

"Geology"; Dickson School, Richmond, British Columbia, May 24, 1977.

"Jade"; Port Coquitlam Rock Club, March 20, 1978.

J.W.H. Monger

"The upper Paleozoic of the western Canadian Cordillera"; Queen's University, Carleton University, Waterloo, Cornell and Massachusetts Institute of Technology.

"The Evolution of the Canadian Cordillera"; Logan Club, Ottawa University, and at C.P.E.M.R. Conference in Honolulu, Cornell University, Massachusetts Institute of Technology.

J.A. Roddick

"The Relationship between Plutonism, Metamorphism and Volcanism"; 7th Meeting, Circum-Pacific Plutonism Project, Toyama, Japan, August 1977.

J.G. Souther

"Contrasting styles of Cenozoic Tectonism and Volcanicity in the St. Elias and Stikine Regions of the Northern Cordillera"; Geological Association of Canada, Annual Meeting, Vancouver, April 1977.

"Late Cenozoic Volcanism and Tectonics of the West Central Cordillera"; Geological Society of America, Annual Meeting, Seattle, Washington, November 1977.

"Cenozoic Geology of the Western Cordillera"; University of British Columbia seminar, March 1978.

"Geothermal Studies at Meager Creek", with T. Lewis, Geological Association of Canada, Annual Meeting, Vancouver, April 1977.

"Possible Geothermal Resources in the Coast Plutonic Complex of Southern B.C."; IASPEI/IAVCEI, Durham, August 1977 with Lewis and Judge.

"Meager Creek Geothermal System, B.C."; with Nevin, Crandall and Stauder, G.R.C. conference, Hilo.

"Canadian Geothermal Research Program"; Circum-Pacific Energy and Mineral Resources Conference, Honolulu, Hawaii.

D.J. Tempelman-Kluit

As distinguished lecturer of Canadian Institute of Mining and Metallurgy gave talks on one or more of four subjects to students and staff at University of Western Ontario, University of Toronto, Brock University, University of Waterloo, McMaster University, McGill University, University of Saskatchewan.

"Thrust Relations in the northern Omineca Crystalline Belt and Evidence for strike slip on the Tintina Trench"; Geological Association of Canada Annual Meeting, Vancouver, April 25, 1977.

"Pelly-Cassiar Platform and Selwyn Basin: Neither without the Other"; Geological Association of Canada, Annual Meeting, Vancouver, April 25, 1977.

H.W. Tipper

"The Fraser Fault System of Southwestern British Columbia"; Geological Association of Canada, Annual Meeting, Vancouver, April 1977.

"Role of Jurassic Biostratigraphy in Cordilleran Geology"; Geological Association of Canada, Annual Meeting, Vancouver, April 1977 (with H. Frebold).

"Major Faults and Paleogeography in the Canadian Cordillera"; Geological Association of Canada, Annual Meeting, Vancouver, April 1977. (with H. Gabrielse, R.B. Campbell, J.W.H. Monger and T.A. Richards).

Subdivision Manuscripts

Manuscripts for 24 GSC papers, 6 open file reports and 19 outside papers were produced by the staff of the Subdivision during 1977-78.

INFORMATION SERVICES UNIT

M.K. Akehurst, Librarian

Publications & Map Sales Office

Activities

The office is responsible for the sale and distribution of published reports and maps issued by the Dept. of Energy, Mines and Resources, the B.C. Ministry of Mines and Petroleum Resources, and the Geological Association of Canada - Cordilleran Section.

The sales statistics show that the total monies received during the past year increased from $67,402.65 to $80,845.25 (increase of $13,442.60 or 20%). This increase in sales is reflected in the increase of mail orders resulting from our yellow page advertisements in major telephone directories throughout the province.

The present policy of selling open files pertaining to the geology of the Canadian Cordillera has been well received by the public. It is interesting to note that the total sales of open file reports was $6,095.35 compared to $4,063.70 for geological maps.

The following open files were released by this office during the period April 1, 1977-March 31, 1978:

O.F. 463 - Geology of Vancouver Island by J.E. Muller.

464 - Mineral deposits Lardeau west-half, B.C. by P.B. Read.

470 - Surficial geology Kitimat, B.C. by J.J. Clague.

480 - Geology of Bute Inlet map-area, B.C. by J.A. Roddick and G.J. Woodsworth.

481 - Kootenay map-area, B.C., Alta., and the United States. Compiled by A.V. Okulitch and G.J. Woodsworth.

SALES STATISTICS

(April 1, 1977 - March 31, 1978)

	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	TOTAL
ENERGY, MINES AND RESOURCES													
CANMET (Mines Branch)	$ 3.25	10.00	2.00	10.50	25.60	1.75	-	36.00	12.75	23.25	86.25	88.25	299.60
EARTH PHYSICS BRANCH	-	-	6.00	2.50	2.00	4.00	6.00	6.00	-	5.00	6.00	-	37.50
ENERGY DEVELOPMENT	-	-	-	-	-	-	-	15.00	-	-	3.00	10.00	28.00
MINERAL DEVELOPMENT	53.25	26.50	21.25	14.25	21.00	10.75	52.75	46.75	16.75	98.50	23.00	23.10	407.85
GEOLOGICAL SURVEY OF CANADA													
- Aeromagnetic Charts	150.00	103.50	67.00	53.00	57.00	39.00	5.00	30.00	40.00	15.00	109.00	69.00	737.50
- Geological Maps	513.00	500.50	438.80	337.50	311.00	319.40	333.00	196.00	204.00	214.00	340.00	356.50	4,063.70
- Open File Reports	133.00	482.50	341.50	912.00	1,171.00	979.35	438.50	340.00	226.00	333.00	365.00	373.50	6,095.35
- Publications	1,227.84	814.35	880.60	687.60	784.45	542.03	533.30	1,005.02	624.45	1,096.75	807.15	1,691.05	10,694.59
- Intern. Geol. Cong. Pubs.	129.00	118.00	171.00	133.00	82.00	89.00	64.60	68.00	53.00	85.00	57.00	92.00	1,141.60
- Rock Samples	44.00	210.00	36.00	296.00	198.00	236.00	200.94	104.00	104.00	224.00	260.00	192.00	2,104.94
- Mineral Samples	4.00	368.00	60.00	1,008.00	654.00	318.00	472.00	222.00	178.00	258.00	196.00	144.00	3,882.00
TOTAL G.S.C.	$ 2,200.84	2,596.85	1,994.90	3,427.10	3,257.45	2,522.78	2,047.34	1,965.02	1,429.45	2,225.75	2,134.15	2,918.05	28,719.68
SURVEYS AND MAPPING BRANCH													
- Topographic Maps	$ 3,974.75	5,756.00	4,560.50	3,375.75	4,788.25	4,068.50	2,171.25	1,969.50	1,381.50	2,411.25	2,503.00	2,982.75	39,943.00
- MCR Charts	62.00	65.00	158.25	107.25	155.75	68.50	95.50	44.50	34.25	49.00	46.75	50.25	937.00
- Misc. Maps	-	-	10.00	27.50	35.50	56.00	100.50	13.75	3.50	5.50	2.00	40.50	294.75
- Publications	-	22.00	54.00	18.00	65.50	-	7.50	35.50	1.50	-	18.00	90.50	312.50
- Handling Charges	6.00	5.50	9.00	14.50	6.21	5.50	4.50	3.00	2.00	2.50	5.00	5.00	68.71
TOTAL SURVEYS & MAPPING	$ 4,042.75	5,848.50	4,791.75	3,543.00	5,051.21	4,198.50	2,379.25	2,066.25	1,422.75	2,468.25	2,574.75	3,169.00	41,555.96
TOTAL EMR SALES	$ 6,300.09	8,481.85	6,815.90	6,997.35	8,357.26	6,737.78	4,485.34	4,135.02	2,881.70	4,820.75	4,827.15	6,208.40	71,048.59
B.C. DEPT. OF MINES & PET. RES.	$ 298.00	276.00	173.00	308.50	541.50	390.00	375.50	255.00	118.50	236.50	194.50	394.50	3,561.50
GEOLOGICAL ASSOC. OF CANADA - Cordilleran Section	$ 354.50	156.50	154.50	140.50	231.00	277.00	213.00	339.00	386.50	200.00	195.00	357.00	3,004.50
TOTAL SALES	$ 6,952.59	8,914.35	7,143.40	7,446.35	9,129.76	7,404.78	5,073.84	4,729.02	3,386.70	5,257.25	5,216.65	6,959.90	77,614.59
Sales Tax	326.56	452.65	326.12	393.68	398.94	258.84	179.09	167.22	95.12	186.14	223.44	222.86	3,230.66
TOTAL MONIES RECEIVED	$ 7,279.15	9,367.00	7,469.52	7,840.03	9,528.70	7,663.62	5,252.93	4,896.24	3,481.82	5,443.39	5,440.09	7,182.76	80,845.25

481 - Kootenay map-area, B.C., Alta., and the United States. Compiled by A.V. Okulitch and G.J. Woodsworth.

482 - Geology of Pemberton map-area, B.C. by G.J. Woodsworth and J.A. Roddick.

483 - Geology of Toodoggone and Ware map-areas, B.C. by H. Gabrielse, et al.

486 - Geology of Quiet Lake and Finlayson Lake map-areas, Yukon by D. Tempelman-Kluit.

Research Library

Activities

During the recent winter work's programme two librarians and two library technicians were employed to assist in cataloguing the library's holdings of monographs, theses, and serials. The services of two other winter work's personnel were used to relocate sales stock and library materials in order to further consolidate space.

Lack of space continues to be a serious problem, particularly for the storage of our sales' stock. At present, there is no room for expansion in the sales storage areas nor in the library.

The library's plans for obtaining the National Airphoto collection on microfilm will have to be held in abeyance until space and manpower are available for assisting the public in using the material as a reference tool and in placing orders for airphotos.

PRECAMBRIAN SUBDIVISION

W.F. Fahrig

The objectives of the Precambrian Subdivision are to determine the composition, structure, origin and evolution of the Canadian Shield and to relate the mineral deposits of the region to these features. The results of this research are documented in appropriate published geological maps, reports and scientific papers.

The Subdivision is comprised of 24 research scientists and two physical scientist support staff engaged in Precambrian studies; two research scientists, one physical scientist, and two technicians engaged in paleomagnetic studies; a secretary, and a draftsman. The unit is organized into four sections: Bear-Slave, Northern Churchill, Superior-Grenville and Paleomagnetic, and three scientists are assigned to Special Projects.

24
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2
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2
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33

Highlights

- Coronation Geosyncline. A study of the development of the Coronation Geosyncline was commenced with 1:125,000 scale mapping of the Hepburn Lake sheet (86J) 65 km east of Great Bear Lake. This map-area straddles the type Hepburn Batholith and part of the Epworth Group. Two orogenies were recognized in the geosyncline. The older involved folding and thrusting of the Epworth Group followed by emplacement of the Hepburn Batholith, a discordant intrusion complex. The younger orogeny involved folding and bulk flattening of the batholith and metamorphic rocks as far west as the Wopmay fault. Mixed basic and felsic submarine volcanic rocks along the west side of the batholith may be products of rifting as a result of opening of an ocean basin and should be explored for base metals. The younger orogeny suggests a collision event as a result of the closing of the ocean basin.

- Back River Volcanic Complex. A three-year study of the Back River volcanic complex, which lies between Contwoyto River and the headwaters of Back River about 480 km northeast of Yellowknife, Northwest Territories, was completed. The volcanic complex records a history of volcanism in Archean time that began with the effusion of clastic and andesitic magma on the sea floor, producing submarine domal ridges of breccia and pillow lavas. The volcanic pile gradually emerged and voluminous felsic explosive eruptions of pyroclastics produced a subareal ash-flow field. Water-laid tuffs, possibly subaqueous ash flows, landslide debris and volcaniclastic sands accumulated in shallow margins along the flanks of the volcano. The eruptions culminated in cauldron subsidence and rise of rhyolite domes along ring fractures and in marginal shallow seas. The volcanic rocks are preserved essentially in their original attitude. They acted like a buttress in a sea of sediments that absorbed most of the strain of regional deformation.

- Ellesmere and Coburg Islands. A helicopter-supported reconnaissance of the most northerly part of the Canadian Shield was commenced. The shield areas of eastern and southern Ellesmere Island and Coburg Island were mapped on a scale of 1:250,000. The crystalline basement was found to be metamorphosed entirely in the granulite facies. Detailed work on the unmetamorphosed Proterozoic sedimentary and igneous rocks of the Thule Basin has enabled correlations to be made both between the three main areas of outcrop and with the lower part of the Wolstenholme Formation on Greenland. Minor occurrences of copper-iron sulphides and malachite are common in metasedimentary basement rocks; malachite is also found in the Thule Basin igneous rocks.

- Northwestern Baffin Island. Upper Proterozoic sedimentary and volcanic rocks of northwestern Baffin Island were remapped as part of a study to clarify stratigraphic problems, to understand the sedimentary history and provide data for a basin analysis of the area, and to evaluate the economic potential of northern Baffin and Bylot Islands. About 4500-6000 m of Neohelikian strata consisting of quartzarenite, shale, carbonate, commonly containing stromatolites and/or bioherms, greywacke, arkose and conglomerate outcrop east of Admiralty Inlet. These strata were deposited in environments that ranged from fluvial to subtidal and may include a submarine channel-fan complex in the upper part. About 90-150 m of tholeiitic plateau basalt occurs near the base of the sequence. Faulting was active during the deposition that took place in a rift zone, which may be aulacogen related to early development of the Franklinian Geosyncline.

- Metamorphism in the Canadian Shield. A major program involving a large part of the Precambrian Subdivision staff and the cooperation of twenty-four scientists from provincial surveys and universities resulted in the accumulation of data for the preparation of the first metamorphic map of the Canadian Shield. The map was presented May 5-6, 1977 at a special symposium on Metamorphism in the Canadian Shield, at which 23 papers were presented. A symposium volume consisting of 29 papers, comprising 367 pages, were edited in preparation for publication later in 1978. The map and papers lead to a better understanding of the pressure and thermal regimes that existed during the development of the Precambrian Shield. An understanding of the metamorphic history will influence our thinking on the tectonic and metallogenic development of the shield and its mineral potential.

Personnel Notes

R.H. Ridler resigned in May to become exploration manager for Newmont Mining Corporation of Canada.

A. Davidson was appointed section head of Superior-Grenville section replacing R.H. Ridler.

K.D. Card, formerly of Ontario Division of Mines, joined the Precambrian Subdivision in June and commenced field work on a regional synthesis of central Superior Province. In September he organized and led a GSC field trip to the Kirkland Lake-Noranda area. Approximately 30 geologists participated, including GSC members from Precambrian and Economic Subdivisions, Geophysics and Geochemistry Division, Ontario Geological Survey and University of Quebec, Chicoutimi.

I.F. Ermanovics returned in July from secondment to Botswana as CIDA expert (July, 1975 to June, 1977) filling an existing position in the Geological Survey of Botswana in the field mapping Division. He commenced a 4-year investigation of the Archean rocks in the Nain Province in east-central Labrador.

P.F. Hoffman spent January to mid-May lecturing at the University of Texas, Dallas.

J.B. Henderson and J.W.H. Monger of the Vancouver Office exchanged offices and houses in July for a period of 10 months.

Peter Thompson was a post-doctorate fellow from October 1975 until October 1977, during which time he worked on the origin of quartz-andalusite segregations in the Piling Group, Baffin Island, and on a synthesis of the regional metamorphism in the Slave Province.

Attendance at Meetings, Conferences and Courses

W.R.A. Baragar

Archean Granite-Greenstone Relationships Conference, Mont Ste. Marie, Quebec, October 11-14, 1977.

Penrose Conference on the geology of subaqueous volcanic rocks, Santa Barbara, California, November 28-December 1, 1977.

J.H. Bourne

Metamorphism in the Canadian Shield Symposium, Ottawa, Ontario, May 5-6, 1977.

F.H.A. Campbell

GAC-MAC Annual Meeting, Vancouver, British Columbia, April 25-27, 1977.

ISPG field trip on modern carbonate sedimentation, Yucatan Peninsula, Mexico, October 23-30, 1977.

K.D. Card

Metamorphism in the Canadian Shield Symposium, Ottawa, Ontario, May 5-6, 1977.

Ontario Division of Mines Workshop, Toronto, Ontario, February 1978.

A. Davidson

Friends of the Grenville Field trip, Adirondack Mountains, New York State, October 1977.

The Physics of Magmatic Processes Conference, Princeton University, Princeton, N.J., November 3-4, 1977.

Ontario Division of Mines Workshop, Toronto, Ontario, February 1978.

K.E. Eade

Metamorphism in the Canadian Shield Symposium, Ottawa, Ontario, May 5-6, 1977.

Management Development for Research Managers, course at Ste. Adèle, Québec, October 17-28, 1977.

I. Ermanovics

Metamorphism in the Canadian Shield Symposium, Ottawa, Ontario, May 5-6, 1977.

Archean Granite-Greenstone Relationships Conference, Mont Ste. Marie, Québec, October 11-14, 1977.

W.F. Fahrig

Metamorphism in the Canadian Shield Symposium, Ottawa, Ontario, May 5-6, 1977.

M.J. Frarey

International Union of Geological Sciences Subcommission on Precambrian Stratigraphy meeting, Capetown, South Africa, July 11-15, 1977.

J.A. Fraser

Metamorphism in the Canadian Shield Symposium, Ottawa, Ontario, May 5-6, 1977.

T. Frisch

Geoscience Forum, Yellowknife, N.W.T., December 1977.

R.A. Frith

GAC-MAC Annual Meeting, Vancouver, B.C., April 25-27, 1977.

Metamorphism in the Canadian Shield Symposium, Ottawa, Ontario, May 5-6, 1977.

Archean Granite-Greenstone Relationships Conference, Mont Ste. Marie, Québec, October 11-14, 1977.

J.B. Henderson

Geological Society of America annual meeting, Seattle, Washington, November 7-9, 1977 and field trip - Tertiary Stratigraphy of the Central Cascades, November 4-6, 1977.

IUGS-UNESCO-IGCP - Archean Geochemistry - the origin and evolution of the continental crust, Hyderabad, India, November 15-19, 1977 and field trip - geology of greenstone-granite terrain (craton) of Karnataka, November 21-28, 1977.

ISPG spring field trip - Waterton - Glacier National Parks, Alberta - Montana, June 1977.

W.W. Heyood

Metamorphism in the Canadian Shield Symposium, Ottawa, Ontario, May 5-6, 1977.

P.F. Hoffman

GAC-MAC Annual Meeting, Vancouver, British Columbia, April 25-27, 1977.

Penrose Conference, tectonic significance of metamorphic core complexes in the North American Cordillera, Tucson, Arizona, May 2-6, 1977.

M.B. Lambert

Archean Granite-Greenstone Relationships Conference, Mont Ste. Marie, Québec, October 11-14, 1977.

Penrose Conference on the geology of subaqueous volcanic rocks, Santa Barbara, California, November 28-December 1, 1977.

A.N. LeCheminant

GAC-MAC Annual Meeting, Vancouver, British Columbia, April 25-27, 1977

The Physics of Magmatic Processes Conference, Princeton University, Princeton, N.J., November 3-4, 1977.

Prospectors and Developers Association Convention, Toronto, Ontario, March 6-8, 1978.

J.C. McGlynn

Archean Granite-Greenstone Relationships Conference, Mont Ste. Marie, Québec, October 11-14, 1977.

W.C. Morgan

Metamorphism in the Canadian Shield Symposium, Ottawa, Ontario, May 5-6, 1977.

M. Schau

Metamorphism in the Canadian Shield Symposium, Ottawa, Ontario, May 5-6, 1977.

Archean Granite-Greenstone Relationships Conference, Mont. Ste. Marie, Québec, October 11-14, 1977.

The Physics of Magmatic Processes Conference, Princeton University, Princeton, N.J., November 3-4, 1977.

Penrose Conference on the geology of subaqueous volcanic rocks, Santa Barbara, California, November 28-December 1, 1977.

F.C. Taylor

Archean Granite-Greenstone Relationships Conference, Mont Ste. Marie, Québec, October 11-14, 1977.

Prospectors and Developers Association Convention, Toronto, Ontario, March 5-8, 1978.

Membership on Committees

W.R.A. Baragar

Canadian National Committee for International Union of Geodosy and Geophysics, Member.

Volcanology Division, Geological Association of Canada, representative for volcanology on CNC/IUGG (see above).

Graduate Studies Committee, Geology Department, Université de Québec à Chicoutimi.

F.H.A. Campbell

Geoscience Canada, Associate Editor.

Precambrian Division, Geological Association of Canada, Chairman.

International Geological Correlation Programme, Corresponding Member for Precambrian.

Relocation Project Team, Space Requirements, Precambrian Institute Move to Thunder Bay.

K.D. Card

Precambrian Division, Geological Association of Canada, Vice-president.

A. Davidson

International Union of Geological Sciences Working Group on Nomenclature on Granitoid Rocks.

I. Ermanovics

Geological Mapping Subcommittee of the Management Committee, Canada-Newfoundland Mineral Development Sub-Agreement (EMR-NFLD-DME-DREE).

M.J. Frarey

Subcommission on Precambrian Stratigraphy, International Union of Geological Sciences, Member.

Canadian Working Group on Precambrian Correlation, Chairman.

GSC Committee on Precambrian Nomenclature, Chairman.

Federal-Provincial Committee on Huronian Stratigraphy, Member.

J.A. Fraser

G.S.C. Metamorphic Map Committee, Chairman.

T. Frisch

G.S.C. Library Committee, Member.

Thunder Bay Institute Library Committee, Member.

Committee on General Instructions for Field Parties, Member.

R.A. Frith

Precambrian Subdivision Geochronology Committee.

E.M.R. Representative, Research Scientist Group, Professional Institute of the Public Service of Canada.

J.B. Henderson

American Commission on Stratigraphic Nomenclature, G.S.C. Representative.

P.F. Hoffman

Subcommission on Precambrian Stratigraphy, International Union of Geological Sciences, Correspondent.

M.B. Lambert

Volcanology Division, Geological Association of Canada, Secretary-Treasurer.

Departmental Field Equipment Committee, G.S.C. Representative.

A.N. LeCheminant

G.S.C. Safety Committee, Member.

Precambrian Subdivision Committee on Geochronology, Member.

Air Charter Sub-Committee of Departmental Field Equipment Committee, Member.

J.C. McGlynn

Subcommission on Precambrian Stratigraphy, International Union of Geological Sciences, Correspondent.

Northwest Territories Coordinating Committee on work in the North, Member.

Canadian Working Group on Precambrian Stratigraphy, Member.

M. Schau

Precambrian Subdivision Geochronology Committee, Member.

F.C. Taylor

Departmental Field Equipment Committee, Chairman.

Special Talks and Lectures

W.R.A. Baragar

"Diagnetic and post-diagenetic changes in the composition of an Archean Pillow", Penrose Conference on the geology of subaqueous volcanic rocks, Santa Barbara, California, November 28-December 1, 1977.

K.D. Card

"Regional metamorphism of the middle Precambrian Aphebian rocks of the eastern Southern Province", Metamorphism in the Canadian Shield Symposium, Ottawa, Ontario, May 5-6, 1977.

"Geology of the Southern Province", Logan Club, Ottawa, March 1978, and Université du Québec à Chicoutimi.

I. Ermanovics

"Comparison of South African cratons and northwestern Superior Province", Archean Granite-Greenstone Relationships Conference, Mont Ste. Marie, Québec, October 11-14, 1977.

"Geology and mineral resources of Botswana", Logan Club, Ottawa, March 1978.

M.J. Frarey

"Precambrian stratigraphy for selected Canadian regions", IUGS Subcommission on Precambrian Stratigraphy, Capetown, South Africa, July 11-15, 1977.

J.A. Fraser

"A Metamorphic Map of the Canadian Shield", Metamorphism in the Canadian Shield Symposium, Ottawa, Ontario, May 5-6, 1977.

T. Frisch

"Reconnaissance mapping of the Precambrian Shield on Ellesmere and Coburg Islands, Arctic Archipelago", Geoscience Forum, Yellowknife, N.W.T., December 8, 1977.

R.A. Frith

"Tectonism and Metamorphism in the Western Slave Province", Metamorphism in the Canadian Shield Symposium, Ottawa, Ontario, May 5-6, 1977.

W.W. Heywood

"A Metamorphic Map of the Canadian Shield", Metamorphism in the Canadian Shield Symposium, Ottawa, Ontario, May 5-6, 1977.

P.F. Hoffman

"Nappe Tectonics in the Athapuscow Aulacogen, East Arm of Great Slave Lake, N.W.T.", GAC-MAC Annual Meeting, Vancouver, British Columbia, April 25-27, 1977, Logan Club, Ottawa, and several western U.S. universities.

M.B. Lambert

"Volcanic Eruption in Iceland, 1973".

"Volcanoes of New Zealand".

"Ash Flow Tuffs", all at Université du Québec à Chicoutimi, April 6 and 7, 1977.

"Volcanoes and Geothermal Energy in New Zealand", University of Ottawa, April 13, 1977.

"Caldera Complexes in Archean Greenstone Belts", Archean Granite-Greenstone Relationships Conference, Mont Ste. Marie, Québec, October 11-14, 1977.

"Stratigraphy of an Archean Volcanic Complex at Land-Sea Transition", Penrose Conference, Santa Barbara, California, December 2, 1977.

"The Back River Felsic Volcanic Complex", Geoscience Forum, Yellowknife, N.W.T., December 8, 1977.

"The Eldfell Eruption", Charles Camsell Geological Society, Yellowknife, N.W.T., December 8, 1977.

Mikkel Schau

"Metamorphism of the Prince Albert Group, District of Keewatin", Metamorphism in the Canadian Shield Symposium, Ottawa, Ontario, May 5-6, 1977.

"Volcanological history of Thera", "Volcanoes and their interaction with man" and "Role of natural resources in neolithic Europe", all at Carleton University, Ottawa, Ontario.

Subdivision Manuscripts

Manuscripts for 21 'A' Series Maps, 20 GSC Papers, 14 outside papers, 3 "abstracts only" and 20 open file maps were produced by the staff of the Subdivision during 1977-78.

Paleomagnetic Section. The Section continued its program of conducting major paleomagnetic studies in conjunction with geological field studies on the Precambrian Shield (Baker Lake, Baffin Island). The other major paleomagnetic study - on the Circum-Ungava Belt - was extended into the northern part of Richmond Gulf. The work on separation of superimposed remanence components received new impetus by the arrival of Dr. K.L. Buchan, as post-doctorate fellow. At present, concentration is on resetting of remanence directions in contact zones, which in some cases yields a depth of erosion-since-intrusion estimate.

J. Foster resigned to join the Department of Supply and Services.

Special Talks or Lectures

E.J. Schwarz

"Propriétées magnétiques des sulphures et la méthode magnétique de prospection", Ecole Polytechnique, Montréal.

Manuscripts Submitted

The Section submitted manuscripts for two G.S.C. papers and two outside papers during the report-year.

CORRELATION AND STANDARDS SUBDIVISION

W.H. Poole

The Correlation and Standards Subdivision provides isotopic geochronological, biochronological and petrological standards by which age relations and processes of formation of rock assemblages are established. Application of these criteria leads to an understanding of igneous and metamorphic processes of rock genesis and transformation, and an understanding of time, both essential components in geological mapping of Canada and ultimately of evaluation of economic mineral potential. The Subdivision in addition has responsibility for geological studies in the Appalachian Orogen and eastern Canada Paleozoic platforms.

The Subdivision is organized by discipline into four sections. The Geochronology Section undertakes isotopic analyses required for the determination of geological age of rocks and minerals based on the K-Ar, Rb-Sr and U-Pb isotopic systems. The Section is discontinuing stable sulphur isotopic analyses and has completed the last during the fiscal year. The Eastern Paleontology Section is responsible for scientific and field research in paleontology and biostratigraphy, primarily of the Appalachian Orogen and St. Lawrence-Great Lakes and Hudson-Foxe basins. Also, stratigraphic and morphologic studies of Paleozoic microfossils (ostracodes, conodonts and palynomorphs) and Cambrian trilobites are undertaken throughout Canada. The Petrography-Paleontology Service Unit was transferred to Eastern Paleontology Section in July 1977. The Petrology Section undertakes to elucidate and quantify the complex rock-forming processes by which the rocks comprising the igneous and metamorphic parts of the earth's crust were formed, deformed and metamorphosed. The Appalachian Section conducts special studies in the Appalachian Orogen, eastern platforms and red bed sedimentology of the Canadian Shield.

The Subdivision has an establishment of 37 positions, which at the end of the fiscal year were distributed as follows:

Subdivision office (3): 1 REM, 1 PC, 1 CR.
Geochronology Section (11): 1 RES, 3 PC, 1 CH, 1 EL, 5 ESS.
Eastern Paleontology Section (11): 4 RES, 3 ESS, 3 PRW, 1 SCY.
Petrology Section (5): 5 RES.
Appalachian Section (7): 7 RES.

Highlights

- Renovations to the isotopic geochronological laboratory space resulted in an increase of about 600 sq. ft. Analytical work was severely curtailed. The argon extraction apparatus was rebuilt and a new, larger, more powerful, high frequency induction heating unit was installed. Rubidium and strontium analyses were improved by the installation of a new 10-inch radius analyser tube in the solid

source mass spectrometer. A new in-line valve permits rapid change of samples without loss of vacuum. Transistorized components replaced components originally designed in 1957. A Faraday collector permits more precise analyses of rocks with low rubidium and strontium ranges. The on-line computer receives data directly from the five mass spectrometers.

- Zircon dates have confirmed the presence of 3600 Ma rocks on the Labrador coast, the oldest in Canada and equivalent to those in west Greenland. Very ancient rocks yielding 3400 Ma zircon dates have been identified from the Churchill Province.

- Reported during the fiscal year were 172 K-Ar ages and 19 Rb-Sr projects. Analysed were 51 zircon fractions which contributed to 19 zircon age projects.

- Late Silurian trilete spores were recovered and described from the Arctic. They are the oldest known spores from Canada and are clearly from primitive land plants. They occur with a rich marine fauna and together could provide a valuable standard for correlation.

- Mapping at 1:50,000 scale of 19,500 square kilometres of the Foxe Fold Belt of Melville Peninsula, begun in 1973, was completed. Aphebian quartzite, marble and paragneiss of the Penrhyn Group unconformably overlie Archean Prince Albert basement rocks. The assemblage has undergone complex multiple deformation involving thrusting and metamorphism. Segments of basement may be allochthonous nappes. The structural style may provide a key to understanding the structure in areas on trend to the east and west.

- Studies of high grade metamorphic rocks and intrusions of the anorthosite suite continued in the Grenville Province of southern Labrador. The Ptarmigan complex consists of intrusions and granulite-grade metamorphic works in which sapphirine is common. The complex was thrust northward over amphibolite-grade gneisses, which in turn were faulted against supracrustal Neohelikian strata along the Grenville Front. Thus the enigmatic Front there is a zone of reversed faults along the northern edge of a wedge-shaped salient of amphibolitic gneiss cored with granulite gneiss.

- Studies in the Gander and Botwood zones of northeastern Newfoundland have led to a major revision in interpretations of ages and sequences of events in this eastern margin of Iapetus (proto-Atlantic) ocean. Gander River ultramafic rocks were thrust eastward as superficial slices during early Middle Ordovician. Olistostromes bearing large blocks of ultramafics and volcanics slid westward down the continental slope in later Middle Ordovician. All phases of medium grade regional metamorphism and anatexis are probably Acadian rather than pre-Middle Ordovician, and all major granitic intrusions are probably Acadian rather than only some being Acadian.

Personnel Notes

B.J. Botte retired as Chief Paleontological Preparator in October 1977 after 32 years of service.

W.T. Dean resigned from Eastern Paleontology Section in September 1977 to join the staff of University College, Cardiff, U.K.

C.G. Reithmeier resigned from the Geochronology Laboratory in February 1978 to join the Ottawa laboratories of Eldorado Nuclear Ltd.

W.W. ter Haar Romeny transferred from Correlation and Standards Subdivision to Central Laboratories and Administration Services Division in April 1977.

R.K. Herd transferred from Precambrian Subdivision to Appalachian Section in June 1977.

G.P. Martin joined the permanent staff of Paleontology Laboratory in August 1977.

G.S. Nowlan joined the Eastern Paleontology Section in October 1977.

Attendance at Meetings, Conferences and Courses

H.H. Bostock

Penrose Conference on subaqueous volcanic rocks, Santa Barbara, California, November 27-December 1, 1977.

M.J. Copeland

North American Paleontological Convention II, Lawrence, Kansas, August 8-10, 1977.

Eastern Canada Paleontology and Biostratigraphy Seminar, Waterloo, Ontario, October 21-22, 1977.

L.M. Cumming

Canadian Institute of Mining and Metallurgy, 79th Annual General Meeting, Ottawa, Ontario, April 17-20, 1977.

Exploration '77, Ottawa, Ontario, October 17-20, 1977.

Youth Science Foundation of Canada, annual meeting, Ottawa, Ontario, December 5, 1977.

K.L. Currie

Geological Association of Canada, annual meeting, Vancouver, British Columbia, April 25-27, 1977.

W.H. Fritz

Precambrian-Cambrian Boundary Working Group, meeting, Cambridge University, Cambridge, U.K., January 9-13, 1978.

Geological Association of Canada, Cordilleran Section, Symposium on Selwyn Basin, Vancouver, British Columbia, February 10, 1978.

E. Froese

Mineralogical Association of Canada, short course on application of thermodynamics to petrology and ore deposits, Vancouver, British Columbia, April 23-24, 1977.

Geological Association of Canada, annual meeting, Vancouver, British Columbia, April 25-27, 1977.

H.H.J. Geldsetzer

Atlantic Geoscience Society, biennial symposium, Fredericton, New Brunswick, January 21-22, 1978.

Workshop on Pb-Zn mineralization, McGill University, Montreal, Quebec, February 24, 1978.

T.M. Gordon

Symposium, Applications of Geographic Information Processing, University of Ottawa, April 1, 1977.

Mineralogical Association of Canada, short course on application of thermodynamics to petrology and ore deposits, Vancouver, British Columbia, April 23-24, 1977.

R.K. Herd

Geological Association of Canada, Newfoundland Section, November 3, 1977 and March 3, 1978.

J. MacManus

EMR, Managing Personal Growth Course, Ottawa, Ontario, May 9-10, 1977.

Carleton University, Department of Geology, undergraduate courses in crystallography and optical mineralogy and in petrology I, Ottawa, Ontario, September 1977 to April 1978.

D.C. McGregor

Coloquio Internacional de Palinologia, Leon, Spain, September 4-12, 1977; field excursion to Devonian of the Cantabrian Mountains.

IUGS Subcommission for Devonian Stratigraphy, field conference in Barrandian region of Czechoslovakia, October 2-9, 1977.

Geological Survey of Canada palynologists, annual meeting, Calgary, Alberta, January 16-19, 1978.

G.S. Nowlan

Eastern Canada Paleontology and Biostratigraphy Seminar, Waterloo, Ontario, October 21-22, 1977.

A.V. Okulitch

Geological Association of Canada, annual meeting, Vancouver, British Columbia, April 25-27, 1977. Co-leader of field trip on structure of southern Canadian Cordillera.

Penrose Conference on tectonic significance of metamorphic core complexes in the North American Cordillera, Tucson, Arizona, May 2-6, 1977.

Workshop on southeastern Cordillera, Queen's University, Kingston, Ontario, January 20-21, 1978.

W.H. Poole

Geological Association of Canada, Newfoundland Section, November 3, 1977.

Atlantic Geoscience Society, biennial symposium, Fredericton, New Brunswick, January 21-22, 1978.

Geological Society of America, Northeastern Section, Boston, Massachusetts, March 9-11, 1978.

B.V. Sanford

Workshop on Canadian and United States salt deposits as potential host rocks for disposal of radioactive wastes, Baton Rouge, Louisiana, April 25-27, 1977.

International workshop on radioactive waste disposal in salt deposits, Germantown (Washington, D.C.), Maryland, February 7-8, 1978.

R.K. Wanless

Geological Association of Canada, annual meeting, Vancouver, British Columbia, April 25-27, 1977.

Membership on Committees

B.J. Botte

Departmental occupational health and safety committee, first aid coordinator.

F.W. Chandler

Geological Association of Canada, Precambrian Division, secretary-treasurer.

M.J. Copeland

Geological Survey of Canada, Earth Science Education Committee, Chairman.

Geological Survey of Canada, internal newsletter (GEOGRAM) Committee, Member.

Geological Survey of Canada, Library Policy Committee, Member.

International Union of Geological Sciences, Representative of Paleozoic Ostracode Working Group to International Paleontological Association.

L.M. Cumming

EMR Field Equipment Committee, Member.

Canadian Institute of Mining and Metallurgy, Organizing Committee for 79th Annual General Meeting, Member.

Canadian Institute of Mining and Metallurgy, Ottawa Branch, Education Committee, Member.

K.L. Currie

Canadian Mineralogist, Associate Editor.

W.H. Fritz

International Union of Geological Sciences, Precambrian-Cambrian Boundary Working Group, Corresponding Member.

T.M. Gordon

Geological Survey of Canada, Committee on Computer Facilities, Member.

National Capital Geographical Information Processing Group, Member.

R.K. Herd

Canada-Newfoundland Mineral Development Subsidiary Agreement, Geological Mapping Subcommittee, Member.

Thesis committee, Carleton University, M.J. Casselman, M.Sc., Member.

Mineralogical Abstracts, Economic Minerals and Ore Deposits Section, Sub-editor.

D.C. McGregor

International Union of Geological Sciences, Subcommission on Devonian Stratigraphy, Titular Member.

International Commission for Palynology, Member of Council and Associate Editor of newsletter.

Commission Internationale de Microflore du Paléozoïque, Executive Committee, North American secretary, Member of Hystricospore Working Group.

American Association of Stratigraphic palynologists, official Representative to Council of International Commission for Palynology.

A.V. Okulitch

Geological Association of Canada, Structural Geology and Tectonics Division, Secretary-Treasurer.

W.H. Poole

Canada-Newfoundland Mineral Development Subsidiary Agreement, Subcommittee on Geological Mapping, Member.

Canada-Nova Scotia Mineral Development Subsidiary Agreement, Geotechnical Subcommittee, Member.

International Geological Correlation Program, Canadian, Caledonide Orogen Project, Working Committee, Member.

Geological Society of America, Northeastern Section, Chairman, 1978-79

Queen's University, Advisory Council on Engineering, Subcommittee on Geological Engineering, Member.

B.V. Sanford

Canadian Permanent Committee on Geographic Names, Advisory Subcommittee on Undersea Features, Member.

Canadian Society of Petroleum Geologists, Medal of Merit Award Committee, Member, and Cross-Section Committee, Member.

Special Talks and Lectures

H.H. Bostock

"Some chemical variations and their implications regarding tectonic setting in the Roberts Arm Group, Newfoundland"; Penrose Conference on subaqueous volcanic rocks, Santa Barbara, California, November 1977.

F.W. Chandler

"Geological environment of Aphebian red beds of the north half of Richmond Gulf, New Quebec"; to geology students, Concordia University, Montreal, Quebec, March 1978, and to sedimentology students, Carleton and Ottawa Universities combined, Ottawa, Ontario, March 1978.

M.J. Copeland

"An ounce of prevention"; Eastern Canada Paleontology and Biostratigraphy Seminar, Waterloo, Ontario, October 1977.

L.M. Cumming

"Geology of the Strait of Belle Isle tunnel project"; Canadian Institute of Mining and Metallurgy, Ottawa, Ontario, April 1977.

"Careers in geology"; Carleton Heights Public School, Ottawa, Ontario, February 1978.

K.L. Currie

"Origin, evolution and significance of alkaline complexes of the Cordillera"; Geological Association of Canada, Cordilleran Section, symposium on alkaline magmatism and ore deposits, Vancouver, British Columbia, April 1977.

"Feldspar geothermometry"; Department of Geology, University of Ottawa, Ontario, December 1977.

"The Ice River alkaline complex"; Ottawa Field Naturalist Club Ottawa, Ontario, February 1978.

R.F. Emslie

"Proterozoic continental rifting"; Department of Geology, University of Regina, Regina, Saskatchewan, March 1978.

W.H. Fritz

"Late Precambrian and Early Cambrian strata in western North America"; Precambrian-Cambrian Boundary Working Group, Cambridge, United Kingdom, January 1978.

"Lower Cambrian of the Mackenzie Mountains"; Geological Association of Canada, Cordilleran Section, symposium on Selwyn Basin, Vancouver, British Columbia, February 1978.

E. Froese

"Oxidation and sulphidation reactions"; Mineralogical Association of Canada, short course on application of thermodynamics to petrology and ore deposits, Vancouver, British Columbia, April 1977.

"Oxidation and sulphidation reactions" and "The concept of metamorphic grade"; Department of Geological Sciences, Queen's University, Kingston, Ontario, March 1978.

"The metamorphism of sulphide-bearing rocks"; Department of Geology, Carleton University, Ottawa, Ontario, March 1978.

H.H.J. Geldsetzer

"The Windsor Group: thoughts on the origin and paleogeography"; Atlantic Geoscience Society, biennial symposium, Fredericton, New Brunswick, January 1978.

"The depositional environment of the Windsor Group, Lower Carboniferous, Atlantic Provinces"; Carleton and Ottawa Universities combined, Ottawa, Ontario, February 1978.

"The Windsor Group in the Maritime Provinces of eastern Canada: an Early Carboniferous evaporite basin of the Zechstein type?: Geological Society of America, Northeastern Section, annual meeting, Boston, Massachusetts, March 1978 (read by E.S. Belt).

T.M. Gordon

"Derivation of internally consistent thermodynamic data from phase equilibria"; Mineralogical Association of Canada, short course on application of thermodynamics to petrology and ore deposits, Vancouver, British Columbia, April 1977.

R.K. Herd

"Metamorphism in New Quebec"; Geological Survey of Canada, symposium on metamorphism in the Canadian Shield, Ottawa, Ontario, May 1977.

Poster session on geology of Puddle Pond map-area, Newfoundland; Mines Branch, Newfoundland Department of Mines and Energy, Review of Activities, St. John's, Newfoundland, November 1977.

A.V. Okulitch

"Geologic history of the late Paleozoic - early Mesozoic eugeocline in southern British Columbia and northeast Washington"; Geological Association of Canada, Cordilleran Section, Vancouver, British Columbia, April 1977, and Penrose Conference on tectonic significance of metamorphic core complexes in the North America Cordillera, Tucson, Arizona, May 1977.

B.V. Sanford

"The salt program in Canada: an investigation into possible sites for radioactive waste storage/disposal"; Canada-United States workshop, Baton Rouge, Louisiana, April 1977, and to international workshop, Germantown, Maryland, February 1978.

Subdivision Manuscripts

Manuscripts for 1 GSC Memoir, 1 "A series" Map, 16 GSC Papers, 17 outside papers, 7 abstracts only, 12 open file maps, 3 open file reports, 2 internal reports, and 33 fossil reports were completed during 1977-78 by staff of the Subdivision.

Laboratory Statistics

Geochronology Laboratory

Argon extractions	185
Argon analyses	192
Potassium isotope dilution analyses	39
K-Ar ages reported	172
Rubidium isotopic analyses	32
Strontium analyses	217
Rb-Sr isochron projects	19
Lead isotopic analyses	131
Uranium isotopic analyses	91
Zircon fractions analyses	51
Sulphur sampled converted to SO_2	38
SO_2 isotopic analyses	58

Petrology Laboratory

The petrology laboratory provides equipment and assistance for petrographic investigations. Service available on request include specific gravity determination, mineral composition determination, mineral staining, mineral separation, determination of optical properties, and special petrographic services. An X-ray powder diffractometer is availble to GSC scientists wishing to make their own determinations. The laboratory was partly inoperative during the fiscal year as a result of space re-allocation.

Services provided during 1977-78 included:

12 petrographic descriptions of thin sections for Terrain Sciences Division (specimens from Northwest Territories)

115 mineral staining of polished rock surfaces for Resource Geophysics and Geochemistry Division (specimens from British Columbia).

4 mineral identifications by x-ray diffractometer for Precambrian Subdivision (specimens from Northwest Territories).

Paleontology Laboratory

Name	Saw Cuts	Thin Sections	Polished Surfaces	Rubber Molds	Plaster Casts	Plaques & Presentation Pieces	Repairs to Specimens	Totals
Bolton, T.E.		1123			22			1145
Copeland, M.J.		9			3			12
Frebold, H.	10			10	3			23
Jeletzky, J.A.				15				15
Departmental and outside services	912	3	902	2		64	16	1899
Totals	922	1135	902	27	28	64	16	3094

Parcels received	77
Parcels shipped	549
Fossil localities recorded (94948-95603)	655
Lots received from Calgary (ISPG)	89

By J.J. Callahan under contract to ISPG:

Molds of fossils	150
Plaster casts of fossils	600

Paleopalynology Laboratory

Samples processed	236
Slides prepared	871

Lapidary Laboratory

	Standard	Standard oriented	Large	Polished	Grain and stained	(man hours) All sizes	Trim	Number of specimens	(machine hours) Slab	TOTAL
Thin sections	4050	14	75	328	47					4514
Polished surfaces						43 (13 1/2 hrs.)				43
Saw cuts							3105 (97 1/4 hrs.)		61 (43 1/4 hrs.)	3166
Other duties								2477 (98 hrs.)		2477
Total all activities										10200

Special projects:

1. Resurfacing ceramic discs.
2. Grinding glass equipment and quartz rods for Analytical Chemistry Section.
3. Preparation of samples of jade for Economic Geology Subdivision, Embassy and National Film Board collections.
4. Preparation of rock specimens to exact specifications for electrical rock property studies.
5. Preparation of samples for auto-radiographs.
6. Stripping of specimens prior to chemical analysis, isotopic analysis and staining.
7. Polishing surfaces to be photographed and displayed.
8. Cutting of gravel blocks impregnated with epoxy.
9. Preparation of presentation pieces.
10. 81 polished thin sections were purchased by contract in addition to the 328 produced by the laboratory.

Report on fossil collections, 1977

Staff of Eastern Paleontology Section and (Outside Contract)

	Cambrian	Ordovician	Silurian	Devonian	Carboniferous	Jurassic	Total Collections		
							Staff	Contract	Combined
Newfoundland	12 (4)	(2)		26			38	6	44
Nova Scotia	1	(1)	7	5	33		46	1	47
New Brunswick				4 (49)			4	49	53
Québec			1	1			2		2
British Columbia	5					(204)	5	204	209
Yukon Territory	17						17		17
D. of Mackenzie	1	1					2		2
D. of Keewatin		1					1		1
D. of Franklin	46		34	100	(1)	(16)	180	17	197
Foreign				2			2		2
Totals	82 (4)	2 (3)	42 -	138 (49)	33 (1)	- (220)	297	277	574

Type Specimens catalogued 1977

Publications	PC.	Camb.	Ord.	Sil.	Dev.	Carb.-Perm.	Jur.	Cret.	Tert.-Rec.	Total	Nfld.	E. Coast	Que.	Ont.	Alt.	B.C.	Yukon-NWT
GSC Publications:																	
Bull. 261 (Brachiopods)			139							139	X						
Bull. 269 (Corals, ostracodes, conodonts, sponges)			306							306				X			X
Bull. 274 (Corals)					120					120				X			X
Bull. 275 (Ostracodes)			20	193	108					321							X
Bull. 279 (Acritarchs)					239					239				X			
Bull. 281 (Microplankton)							106			106							X
Paper 76-9 (Pelecypods)								62		62						X	
Paper 76-33 (Trilobites)			4							4					X		
Paper 77-1B (Corals, ostracodes, conodonts, spores)			37	21	19		27			104	X		X				X
Sub-total	-	-	506	214	486	-	133	62	-	1401							
Outside Papers:																	
Can. J. Earth Sci. (General)			113	292	119	1	32			557	X		X				X
J. Pal. (Algae, brachiopods, trilobites, ammonites)	64			22		61				147					X	X	X
Other (General)	24	9	22	31	9		14	11	284	404		X	X	X	X	X	X
Sub-total	88	9	135	345	128	62	46	11	284	1108							
Total	88	9	641	559	614	62	179	73	284	2509							

Type Fossil Collection

Thomas E. Bolton continued as Curator of the National Type Collection of Invertebrate and Plant fossils. A total of 2509 type specimens described in both Geological Survey of Canada (1401) and outside (1108) publications were added to the collection in 1977. This represents an increase of 720 over 1976, principally in early Paleozoic studies.

ECONOMIC GEOLOGY SUBDIVISION

D.C. Findlay

The objectives of the Economic Geology Subdivision are: to develop a national data base on the nature and distribution of the country's non-hydrocarbon mineral deposits; to develop and test concepts for use as guides in the search for new mineral deposits and that provide a base for assessing the potential of the various regions of Canada to contain undiscovered deposits; and, to conduct appraisals of geological terranes to estimate the kinds, quantities and distribution of mineral resources they may contain.

The Subdivision contains three main groups - the Mineral Deposits Geology Section, the Uranium Resource Evaluation Section and the Geomathematics Section - as well as a Mineral Data Bank Unit and a Special Projects Unit. The Mineral Deposits Geology Section documents and interprets the metallogeny of Canadian mineral deposits and, importantly, maintains an awareness of developments in mineral deposits studies in other countries. The Uranium Resource Evaluation Section conducts similar research in uranium, thorium and associated resources and provides, on an annual basis, estimates of Canada's resources additional to reserves of uranium and thorium for publication by the Department of Energy, Mines and Resources. The Geomathematics Section develops and applies statistical methods for mineral resource estimations and for the mathematical treatment of various geological parameters. The Data Bank Unit is the repository for metallogenic information on Canadian mineral deposits and is developing and maintaining, in cooperation with the provinces, a broad computer-processible mineral deposit index file system called CANMINDEX. Under Special Projects, a number of studies are carried out, including investigation of iron ore resources of Canada, and the monitoring of scientific aspects of developments in deep ocean mining.

Highlights

- Field operations were conducted by Subdivision personnel in all provinces except Alberta and Prince Edward Island, and in Yukon and Northwest Territories. Areas of particular emphasis included: investigations of potential uranium environments on Ellesmere and Baffin Islands; studies of uranium-bearing strata of Wernecke and Ogilvie Mountains area, Yukon, Great Bear Lake area, Northwest Territories, Beaverdell area, British Columbia, Sibley Basin, northwestern Ontario and Richardson Gulf area of northern Quebec; general metallogenic studies in Bear-Slave province, Northwest Territories and southwest Shield; studies of the geological environments of new zinc and zinc-lead discoveries in Selwyn Basin, Yukon, and of skarn-associated tungsten-copper and lead-zinc-silver mineralization in Yukon and northern British Columbia; and, investigation of porphyry copper deposits in Yukon and northern British Columbia, and of stratabound copper environments in Mackenzie Mountains, Northwest Territories and in the maritime provinces.

- In other areas of metallogenic research, work continuedon the computer-assisted modelling directed at the understanding of nickel partition in low grade ores such as those of the Dumont deposit, northwestern Quebec and on similar investigations in the thermo-dynamic modelling of aqueous systems related to hydrothermal lead-zinc deposition. Work continued on the investigation of relationships between compositions of Canadian massive sulphide ores and their host rocks and on the analysis and interpretation of sulphur and lead isotope data from Canadian mineral deposits. Detailed mineralogical studies were completed on the uranium ores of the Rabbit Lake deposit in Saskatchewan and similar investigations of a number of other deposits continued. In mathematical and statistical techniques in geology, work continued on the development and applications of probability models in resource studies and - with the collaboration of the National Research Council - on the development of automated image analysis ("picture processing") methods that can have applications in the quantification of geological parameters.

- A preliminary appraisal of mineral resource potential (excluding oil and gas) of the Western Arctic Region was prepared in response to a request from the Committee for Original Peoples' Entitlement (COPE). This was published as GSC Open File Report 492.

- An appraisal of the nickel potential of African countries was prepared for use as background technical information by the Canadian delegation to the Law-of-the-Sea Conference.

- Major Economic Geology Series manuscripts on the geology of Canadian tungsten deposits, on the geology of Canadian barium, fluorine and strontium deposits, and on the geology of Canadian rare earth deposits were submitted for editing.

Personnel Notes

The Subdivision consists of a permanent staff of 22 research scientists, 16 physical scientists and 5 others (1 research manager, 1 mathematician, 1 secretary, 1 clerk, 1 precision worker). The Subdivision supported two doctoral students (L. Dick, W. Pearson) and monitored 12 EMR Research Agreement contracts.

D.F. Sangster left in June to begin a year as an exchange scientist at the Australian Bureau of Mineral Resources, Canberra.

G.B. Leech temporarily relinquished duties as Subdivision Head in July to work on completion of the Canadian contribution to the Metallogenic Map of North America (Subcommission for the Metallogenic Map of the World) and of a geological map of part of the Canadian Cordillera.

D.C. Findlay completed his secondment to the office of the A.D.M. (Science and Technology) in June and commenced duties as Acting Head of the Subdivision in July.

K. Shewbridge resigned from the Subdivision to take a position with EMR Computer Science Centre.

R. Bretzlaff joined the Subdivision in April as a member of the Mineral Data Bank.

S. Green joined the Subdivision in April as a member of the Mineral Deposits Geology Section.

The Subdivision is currently staffing one vacant support position which will bring its complement to its full authorized strength.

Attendance at Meetings, Conferences and Courses

G.B. Leech

Canadian Institute of Mining and Metallurgy Annual Meeting, Ottawa, April 1, 1977.

Royal Society of Canada Annual Meeting, Fredericton, New Brunswick, June 1977.

Exploration '77, Ottawa, October 1977.

Workshop on tectonics of southeastern British Columbia, Kingston, Ontario, January 1978.

Commission for the Geological Map of the World, Paris, Franch, March 1978.

F.D. Anderson

Exploration '77, Ottawa, October 1977.

D.C. Findlay

Public Service Commission, Staff Development Branch, course on Management Development for Resource Managers, Ste. Adele, Quebec, June 1977.

Manitoba Mineral Resources Division, Winnipeg, and Saskatchewan Geological Survey, Regina annual reportings of activities, November 1977.

Public Service Commission, Staff Development Branch, seminar on Science and Public Pol cy, Ottawa, November 1977.

Geoscience Forum, Whitehorse, Yukon and Yellowknife, Northwest Territories, De ember 1977.

Resources Policy Conference '78, Oxford, United Kingdom, March 1978.

Canadian Institute of Mining and Metallurgy, Annual Meeting, Ottawa, April 1977.

G.A. Gross

Canadian Institute of Mining and Metallurgy, Annual General Meeting, Ottawa, April 1977.

Society of Economic Geologists and Geological Society of America Annual Meetings, Seattle, Washington, November 1977.

Eighth Underwater Mining Institute, Seattle, Washington, November 1977.

P. Moyd

Canadian Institute of Mining and Metallurgy Annual Meeting, Ottawa, April 1977.

Exploration '77, Ottawa, October 1977.

AIME-SEG, Denver, February 1978.

Mineral Deposits Geology Section

O.R. Eckstrand

International Geological Correlation Program, Project 98, Taita Hills Conference, Kenya, November 1977.

K.M. Dawson

International Circum Pacific Map Committee Meeting, United States Geological Survey, Reston, Virginia, May 1977.

Geological Association of Canada, Vancouver, British Columbia, October 1977.

Geoscience Forum, Department of Indian and Northern Affairs, Whitehorse, Yukon, December 1977.

Geoscience Workshop, Department of Indian and Northern Affairs, Whitehorse, Yukon, December 1977.

Selwyn Basin Workshop, February 1978.

Prospectors and Developers Association Annual Meeting, Toronto, March 1978.

J.M. Duke

Gordon Research Conference on the Inorogenic Geochemistry of Ore Deposits, (invited speaker) July 1977, Andover, New Hampshire.

J.M. Franklin

Lake Superior Institute, Thunder Bay, May 1977.

Manitoba and Saskatchewan annual reportings of activities meetings, November 1977.

Metallogeny of Southern Churchill Province Symposium, University of Manitoba, March 1978.

Prospectors and Developers Association Annual Meeting, Toronto, March 1978.

J.W. Lydon

Gordon Research Conference on Inorganic geochemistry of ore deposits, Andover, New Hampshire, July 1977.

C.R. McLeod

Department of Energy, Mines and Resources SPSS Computer Course.

S.M. Roscoe

Geoscience Forum, Yellowknife, Northwest Territories, December 1978.

Canadian Institute of Mining and Metallurgy, Annual Meeting, Ottawa, April 1977.

D.F. Sangster

Geological Association of Canada, Annual Meeting, Vancouver, April 1977.

Commonwealth Scientific & Industrial Research Organization Symposium on volcanogenic massive sulphide deposits, Perth, Australia, January 1978.

W.D. Sinclair

Northern Cordillera Mineral Deposit Workshop, Whitehorse, Yukon, December 1977.

Geoscience Forum, Whitehorse, Yukon, December 1977.

Uranium Resource Evaluation Section

V. Ruzicka

Meeting of European Economic Community and Canadian groups of experts on uranium exploration (invited speaker), Ottawa, June 1977.

Meeting of the Joint Nuclear Energy Association/International Atomic Energy Association Steering Group on uranium resources (International Uranium Resource Evaluation Project), Paris, September 1977.

R.T. Bell

Prospectors and Developers Annual Meeting, Toronto, March 1978.

Geological Association of Canada, Vancouver, April 1977.

Geoscience Forum, Department of Indian and Northern Affairs, Whitehorse, December 1977.

Geoscience Workshop, Department of Indian and Northern Affairs, Whitehorse, December 1977.

H.E. Dunsmore

Prospectors and Developers Annual Meeting, Toronto, March 1978.

United States Department of Energy/United States Geological Survey Workshop on Potential Resource Estimation Methodologies for Uranium - Present Methods and Alternatives; Grand Junction, Colorado, December 1977.

1977 National Uranium Resource Evaluation Uranium Geology Symposium, Grand Junction, Colorado, December 1977.

S.S. Gandhi

The second Uranium and Thorium Research and Resources Conference, Colorado School of Mines, Golden, Colorado, April 1977.

Geological Society of America, Society of Economic Geologists Annual Meeting, Seattle, Washington, November 1977.

J.A. Kerswill

Prospectors and Developers Association Annual Meeting, Toronto, March 1978.

Introductory Fortran course, Computer Science Centre, Department of Energy, Mines and Resources, Ottawa, November 1977.

A.R. Miller

Geological Association of Canada/Mineralogical Association of Canada Annual Meeting, Vancouver, April 1977.

Department of Indian and Northern Affairs, Geoscience Forum, Yellowknife, December 1977 (paper presented).

N. Prasad

Department of Energy, Mines and Resources Course on Systems Dynamics, Ottawa, September 1977.

Seminar on microprocessor and its applications, Department of Energy, Mines and Resources, Ottawa, November 1977.

J.Y.H. Rimsaite

Joint Clay Minerals Society and International Bauxite Association Meeting, Kingston, Jamaica, August 1977 (including field trip).

L.P. Tremblay

Short course on Uranium, McGill University, Montreal, January 1978.

Mineral Resources Division, Winnipeg and Saskatchewan Geological Survey, Regina annual reportings of activities, November 1977.

Prospectors and Developers Association Annual Meeting, March 1978.

Canadian Institute of Mining and Metallurgy, Annual Meeting, Ottawa, April 1977.

Geomathematics Section

F.P. Agterberg

Scientific Colloquium on Earth Sciences and Measurement in honour of Professor J. Goquel, Paris, Orleans, France, May 1977.

Siberian Seminar on Application of Mathematical Methods and Computers for Mineral Search and Prospecting, Novosibirsk, Union of Soviet Socialist Republics, May 1977.

Penrose Conference on Geostatistical Concepts and stochastic Methods in Hydro-geology, Harrison Hot Springs, British Columbia, August 1977.

Sixth Geochautauqua, Syracuse University, Syracuse, New York, October 1977.

United States Department of Energy/United States Geological Survey Workshop on Potential Resource Estimation Methodologies for Uranium, Grand Junction, Colorado, December 1977.

United States Department of Energy Workshop on Application of Kriging Methods to Oil and Gas Resource Estimation, Washington, District of Columbia, March 1978.

C.F. Chung

The 10th Annual Symposium on the Interface, Computer Science and Statistics.

Operations Research, Carleton University, Fall Term, 1977-78.

Econometrics, Carleton University, Winter Term, 1977-78.

Mineral Deposits, University of Ottawa, Fall Term, 1977-78.

A.G. Fabbri

Computer Science and Statistics, 10th Annual Symposium on the Interface, April 1977.

Fourth Geochautauqua on Quantitative Stratigraphic correlation and catastrophy theory in geology, October 1977, Syracuse University, Syracuse, New York.

Mineral Data Bank Unit

D.G. Rose

Prospectors and Developers Association Annual Meeting, Toronto, March 1978.

Membership on Committees

G.B. Leech

Committee for the Metallogenic Map of North America.

Commission for the Tectonics of Ore Deposits, International Association on the Genesis of Ore Deposits.

Special Committee on Mineral Economics, Canadian Institute of Mining and Metallurgy (alternate).

Uranium Resource Appraisal Group, Department of Energy, Mines and Resources (to June 1977).

D.C. Findlay

Canadian Institute of Mining and Metallurgy, Ottawa Branch, Chairman, Publicity Committee.

Geological Association of Canada, Councillor.

Uranium Resource Appraisal Group (URAG), Department of Energy, Mines and Resources (vice G.B. Leech).

G.A. Gross

Department of Energy, Mines and Resources Coordinating Committee on Ocean Mining (DCOM).

Editorial Board, Precambrian Research.

Chairman, Ottawa Branch, The Canadian Institute of Mining and Metallurgy.

Technical Program Chairman for the Annual General Meeting of the Canadian Institute of Mining and Metallurgy held in Ottawa, April 1977.

Coordinator for the Working Group in Applied Geology in Canada, Canada-Union of Soviet Socialist Republics Mixed Commission for cooperation in Science and Technology.

Canadian coordinator for International Geological Correlation Program Projects:
91 - Metallogeny of the Precambrian;
132 - Basins of Iron formation deposition;
111 - Canadian Liaison, Genesis of Manganese Ore Deposits.

P. Moyd

Chairman, Industrial Minerals Division, Canadian Institute of Mining and Metallurgy.

Member, Council and Executive Committee, Canadian Institute of Mining and Metallurgy.

Geology Division, Canadian Institute of Mining and Metallurgy, representative on Special Volumes Committee.

Member, Geology Division, Canadian Institute of Mining and Metallurgy council.

Member, Organizing Committee, Exploration '77.

Chairman, Department of Energy, Mines and Resources Interbranch Liaison, Industrial Minerals (ILIM)

Economic Geology Subdivision representative on Geological Survey of Canada Library Advisory Committee.

Mineral Deposits Geology Section

O.R. Eckstrand

Section representative, CAMINDEX committee.

K.M. Dawson

International Circumpacific Map Project, Canadian representative for metallogeny.

J.M. Duke

Secretary, Mineralogical Association of Canada (from January 1, 1978).

J.M. Franklin

Secretary-Treasurer, Ottawa Branch, Canadian Institute of Mining and Metallurgy.

Ad Hoc Committee on relocation of analytical facilities, Geological Survey of Canada.

Editorial Board, Economic Geology.

C.R. McLeod

Safety Committee, Geological Survey of Canada.

Working Group for Deep Ocean Mining, Department of Energy, Mines and Resources Coordinating Committee for Ocean Mining.

D.F. Sangster

International Association for the Genesis of Ore Deposits, Chief Treasurer.

Correlation of Caledonian Stratabound Sulphides, Canadian Leader.

Honorary Adjunct Professor, Carleton University, Ottawa.

Uranium Resource Evaluation Section

V. Ruzicka

Uranium Resource Appraisal Group (URAG) (member).

Subcommittee for Estimated Additional Resources of Uranium Resource Appraisal Group, Chairman.

Joint Nuclear Energy Agency/International Energy Agency Working Party on Uranium Resources, Member.

Joint Nuclear Energy Agency/International Energy Agency Steering Group on Uranium Resources (International Uranium Resource Evaluation Project), Member.

Departmental Uranium Coordinating Committee (alternate official representative).

R.T. Bell

Subcommittee on Uranium Resources Additional to Reserves (of the Uranium Resource Appraisal Group), Member.

H.E. Dunsmore

Subcommittee on Uranium Resources Additional to Reserves (of the Uranium Resource Appraisal Group), Member.

S.S. Gandhi

Subcommittee on Uranium Resources Additional to Reserves (of the Uranium Resource Appraisal Group), Member.

J.Y.H. Rimsaite

Editorial Committee for "Clay Minerals Handbook", The Clay Minerals Society, Member.

L.P. Tremblay

Subcommittee on Uranium Resources Additional to Reserves (of the Uranium Resource Appraisal Group), Member.

Geomathematics Section

F.P. Agterberg

Non-resident Professor, Department of Geology, University of Ottawa.

Visiting Professor of Geology, Syracuse University, October 77 to April 78.

Member of Council, International Association for Mathematical Geology.

Acting Chairman, CTOD/IAGOD Working Group Number 3, Statistical Treatment of Tectonic and Mineral Deposit Data (from December 1977).

Editorial Advisory Board, Computers and Geosciences.

Editorial Board, Geosystems (from January 1978).

Participant, International Geological Correlation Program, Project 148 (Quantitative stratigraphic correlation techniques) and Project 163 (Design and generation of World Data Base for Igneous Petrology).

C.F. Chung

Editorial Correspondent, Journal of Mathematical Geology.

Branch Computer Facilities Committee.

A.G. Fabbri

Secretary-Treasurer of Commission on tectonics of Ore Deposits (CTOD) of the International Association on the Genesis of Ore Deposits.

Secretary (acting) of Commission on tectonics of Ore Deposits (CTOD) Working Group No. 3: Statistical treatment of tectonic and mineral deposit data.

Special talks, lectures, etc.

G.B. Leech

"The European, Union of Soviet Socialist Republics and North American metallogenic legends for continental-scale maps, a comparison of their portrayals of data and concepts" - Commission for the Geological Map of the World - Paris, March 1977.

"Metallogeny of the Canadian Cordillera" - Commission for the Geological Map of the World - Paris, March 1977.

D.C. Findlay

"Notes on Canadian applications in resource analysis" (with J.H. Walsh), Resources Policy Conference, Oxford, United Kingdom, March 1977.

Presentation of Geological Survey of Canada northern programs to Geoscience Forum, Whitehorse, Yukon and Yellowknife, Northwest Territories, December 1977.

G.A. Gross

Series of orientation lectures and briefings for the Iron Ore Geology Mission from the People's Republic of China to Canada on the Iron Ore Resources in Canada, July 1977.

Briefing for Japanese Geology and Engineering Group on the iron ore geology and resources in Canada, November 1977.

P. Moyd

"A genetic classification of industrial minerals deposits" (co-author with L. Moyd), Canadian Institute of Mining and Metallurgy, Annual Meeting, Ottawa, April 1977.

Mineral Deposits Geology Section

O.R. Eckstrand

Lecture to iron ore delegation from People's Republic of China on Nickel in Canada, July 1977.

K.M. Dawson

"Tungsten and base metal-bearing skarn deposits, southeast Yukon and southwest Mackenzie", Geoscience Forum, Whitehorse, Yukon, December 1977.

"Regional metallogeny of the Selwyn Basin", Geoscience Workshop, Whitehorse, Yukon, December 1977.

"Regional metallogeny of the Selwyn Basin shale-hosted mineral deposits", Selwyn Basin Workshop, February 1978.

"Depositional models of Tom and Howard's Pass deposits", Selwyn Basin Workshop, February 1978.

Presented talks on Yukon metallogeny at Resource Associates Alaska Seminar, Fairbanks, Alaska, March 1978.

"Tungsten-bearing skarns in southeastern Yukon deposit types, distribution & prospecting guides", Prospectors & Developers Technical sessions, Toronto, March 1978 (with L.A. Dick).

J.M. Duke

Lecture, "Numerical model of the fractionation of olivine and molten sulfide from komatiite magma", Dept. of Geology, Carleton University, Ottawa, November 1977.

"A numerical model of the fractionation of olivine and sulfide from komatiite magma", Gordon Research Conference on the Inorganic Geochemistry of Ore Deposits, July 1977.

Informal lectures to Geological Survey of Canada discussion group and Mineral Deposits Geology Section on aspects of the mineralogy of the Dumont ultramafic intrusion, from April 1977 to February 1978.

J.M. Franklin

"Geochemistry of alteration associated with massive sulphide deposits", Carleton University, November 1977.

S.M. Roscoe

"Tectonic setting and sulfide deposits, Hackett River Belt, Slave Province", (with R.A. Frith) Canadian Institute of Mining and Metallogeny Annual Meeting, Ottawa, April 1977.

"Use and methods of determining density of volcanic rocks in the field", talk at Geoscience Forum, Yellowknife, Northwest Territories, December 1977.

D.F. Sangster

"Stratabound volcanogenic sulphide deposits of the Canadian Cordillera" (co-author with R.V. Kirkham and R.Y. Watanabe), Geological Association of Canada, April 1977.

"Shale-hosted lead-zinc deposits in Canada", Lecture to Mt. Isa Branch, Australian Institute of Mining and Metallurgy.

"Geological features of Precambrian massive sulphide deposits of Canada", lecture at Perth Commonwealth Scientific and Industrial Research Organization.

"Geological features of Canadian strata-bound lead-zinc deposits in sedimentary rocks with emphasis on Sullivan and Pine Point", talk, University of Melbourne.

"Geological features of Canadian volcanogenic massive sulphide deposits", talk to Sydney Mineral Exploration Discussion Group.

"Geologic features and genesis of lead-zinc deposits in volcanic rocks", talk to Australian Bureau of Mineral Resources.

"Geologic features and genesis of lead-zinc deposits in shales", talk to Australian Bureau of Mineral Resources.

"Geologic features and genesis of lead-zinc deposits in shelf sediments", talk to Australian Bureau of Mineral Resources.

"Canadian experience in mineral resource assessment", talk to Australian Bureau of Mineral Resources.

"Canadian Precambrian volcanogenic massive sulphide deposits", talk to Minerals Research Laboratory.

"Stratabound lead-zinc deposits in sedimentary rocks: A geological synopsis", talk to Sydney Mineral Exploration Discussion Group.

"Canadian experience in mineral resource assessment", led general discussion to Australian Bureau of Mineral Resources staff and selected visitors.

"Mineral deposits and plate tectonics: A perspective view", invited guest speaker at joint meeting of Australian Institute of Mining and Metallurgy (AIMM) and the Geological Society of Australia.

"Geology of lead-zinc deposits in sedimentary rocks", lecture at University of Tasmania.

"Geology of Canadian Precambrian volcanogenic massive sulphide deposits", lecture at University of Tasmania.

"Geology and grade-tonnage relationships of Canadian volcanogenic massive sulphide deposits", lecture to Rosebery Mine staff and selected geologists of the Rosebery area.

W.D. Sinclair

"Copper and molybdenum occurrences in the Yukon Crystalline Terrane", talk presented at Northern Cordillera Mineral Deposit Workshop, Whitehorse, Yukon, December 1977.

"Porphyry copper-molybdenum mineralization in the Yukon Crystalline Terrane", talk presented at Geoscience Forum, Whitehorse, Yukon, December 1977.

Uranium Resource Evaluation Section

V. Ruzicka

"Overview and classification of uranium deposits", McGill University, lecture, Montreal, February 1978.

"Geology of some Canadian uranium deposits" (with L.P. Tremblay), Prospectors and Developers Association Annual Meeting, Toronto, March 1978.

R.T. Bell

"Uranium in the Yukon", Geoscience Workshop, Department of Indian and Northern Affairs, (2 1/2 hours), Whitehorse, Yukon, December 1977 (invited speaker).

"Uranium in the Yukon" Geoscience Forum, Department of Indian and Northern Affairs, Whitehorse, Yukon, December 1977 (invited speaker).

"Mineralized breccias of Wernecke Mountains, Yukon", (with Archer, Delaney and Godwin) Geological Association of Canada, Vancouver, April 1977.

"Uranium in the Cordillera", lecture at Brock University, January 1978.

S.S. Gandhi

"Uranium occurrences in Labrador", Society of Economic Geologists, Seattle, Washington, November 1977.

J.Y.H. Rimsaite

"Layer silicates (and clays) in the Rabbit Lake uranium deposit, Saskatchewan, Canada", Joint Clay Mineral Society/International Bauxite Association, Kingston, Jamaica, August 1977.

L.P. Tremblay

"Geology of some Canadian uranium deposits", (with V. Ruzicka), Prospectors and Developer's Association Annual Meeting, Toronto, March 1978.

"Uranium veins deposits in Canada", Short course on uranium, McGill University, Montreal, January 1978.

Geomathematics Section

F.P. Agterberg

"Quantification and statistical analysis of geological variables for mineral resource evaluation", Goguel Colloquim, Orleans, France, May 1977.

"Probabilistic approach to the mineral resource evaluation problem", Siberian Seminar, Novosibirsk, May 1977.

"Three lectures on resource estimation given during National Research Council Exchange visit to Union of Soviet Socialist Republics, May-June 1977.

"Regional mineral potential evaluation at seminar sponsored by Czech Bureau of Geology, Geoindustria, Prague, Czechoslovakia, June 1977.

"Relationship between frequency distributions and spatial autocorrelation functions of geological parameters", Penrose Conference, Harrison Hot Springs, British Columbia, August 1977.

"Spatial correlation of stratigraphic units quantified from geological maps" (with A.G. Fabbri), Geochautauqua, Syracuse, New York, October 1977.

"Spatial analysis using the lognormal distribution", United States Department of Energy/United States Geological Survey Workshop, Grand Junction, Colorado, December 1977.

Lecture, GOL 860 on "Spatial analysis" Syracuse University, October 1977-April 1978.

Lecture, GEO 3100 on "Statistics in geology", University of Ottawa, January-April 1978.

C.F. Chung

"An interactive graphic program for simulating the distribution of transformations of several independent random variables", at the 10th Annual Symposium on the interface: Computer Science and Statistics.

A.G. Fabbri

"Spatial correlation of stratigraphic units quantified from geological maps", (with F.P. Agterberg), Geochantanqua, Syracuse, New York, October 1977.

"Methods of pattern recognition applied to geological images", (lecture) Department of Geology, University of Ottawa, February 1978.

Subdivision Manuscripts

Manuscripts of three Economic Geology Series reports were received from the Subdivision staff during 1977-78. Three Geological Survey of Canada Paper Series Reports were published and one Open File Report released. Three departmental (EMR) reports were published in which Subdivision staff had major or contributing authorship. Approval for publication was given for 13 outside papers (with abstracts), 3 abstracts only and 4 reviews. In addition, a number of internal reports for departmental use were produced.

Laboratory and Technical Services

Mineral Deposits Laboratory

During 1977/78 the laboratory was renovated and improved and new fixtures and furniture installed. The laboratory, maintained by C.R. McLeod and R.D. Burke, contains 4 rock saws, 4 polishing machines, mineral separation facilities, microscopes and photomicrography equipment.

Production statistics for the year were:

Polished sections prepared for -	
Regional and Economic Geology Division	
Economic Geology Subdivision	112
Precambrian Subdivision	2
Resource Geophysics and Geochemistry Division	7
Central Laboratories and Administrative Services	1
Total	122
Specimens slabbed for	
Regional and Economic Geology Division	
Economic Geology Subdivision	663
Precambrian Subdivision	6
Resource Geophysics and Geochemistry Division	59
Central Laboratories and Administrative Services	2
Total	730
Specimens polished for	
Regional and Economic Geology Division	
Economic Geology Subdivision	150
Precambrian Subdivision	8
Resource Geophysics and Geochemistry Division	28
Central Laboratories and Administrative Services	3
Total	189

RESOURCE GEOPHYSICS AND GEOCHEMISTRY DIVISION

A. G. Darnley, Director

The principal objective of the Resource Geophysics and Geochemistry Division is to provide geophysical and geochemical information which is required to facilitate the discovery and evaluation of Canada's uranium and mineral resources. A secondary objective is to contribute to the detection and delineation of associated environmental hazards. The activities of the Division include the acquisition, interpretation and use of geophysical and geochemical data; the development, testing, calibration and standardization of the relevant methods and instrumentation; and the integration of such data with available geological information.

The Division serves as a national centre for research and development into geophysical and geochemical methods relating to metalliferous exploration technology, terrain investigations, and regional geology. As such it provides advice on these matters at national and international levels. The Division is responsible for the design, management and interpretation of appropriate geophysical and geochemical surveys, which range from the national to the local scale according to need.

ORGANIZATION

The Division's activities during the report year have been grouped under four subprograms relating to specific aspects of the above objectives. These are:

1. The Resource Exploration Subprogram which has the objective of identifying and evaluating regions of Canada favourable for the discovery of economic concentrations of uranium and other metallic commodities and of developing more effective methods for the purpose. This subprogram is divided into two parts, Geochemistry and Radioactivity.

2. The Regional Geophysics Subprogram has the objective of developing and using geophysical methods which aid bedrock geological mapping.

3. The Terrain Geophysics Subprogram develops and uses geophysical methods which are pertinent to engineering geology and surficial geological mapping; development and testing of new electrical and electromagnetic methods of mineral exploration are also under the umbrella of this subprogram.

4. The CIDA Subprogram coordinates geoscience services provided by GSC to various aid projects of the Canadian International Development Agency.

The manpower of the Division is divided between 9 sections, each relating to a specific task or discipline. Work requirements and funding are controlled by the subprogram heads, quality control is provided by section heads, and

day to day operations are supervised by project leaders. Administrative and financial control of the Division is provided by the Division Director's office. The manpower allocation within each subprogram is listed in Table I.

The Division played the major part in arrangements for Exploration '77, an International Symposium on Geophysics and Geochemistry Applied to the Search for Metallic Ores, which was held in the Skyline Hotel, Ottawa, from 16th to 20th October 1977. The meeting was attended by 770 participants from 36 countries.

The Division was responsible for the principal Canadian scientific involvement in the search for radioactive debris from Cosmos 954. Staff and equipment were actively engaged in the search within 24 hours of the satellite's breakup on 24th January, 1978. Twelve members of staff from four sections contributed in various substantial ways to Operation Morning Light. The centrepiece of the activity was the new multi-channel gamma-ray spectrometer designed by and constructed under the supervision of Quentin Bristow.

Attendance at Meetings

A. G. Darnley
- USGS Uranium-Thorium Symposium, Golden, Colorado, April 26, 1977.
- NEA/IAEA Uranium Exploration R & D Group, IAEA, Vienna, June 6-8, 1977.
- IAEA Consultants Meeting on Radiometric Surveys, Denver, Colorado, June 20-22, 1977.
- Provincial Mines' Ministers Meeting, Quebec City, September 11-13, 1977.
- Exploration '77, Ottawa, October 15-19, 1977.
- Royal Society Meeting on Aspects of Uranium Geology, London, U.K. December 7-8, 1977.
- NEA/IAEA Uranium Exploration R & D Group OECD, Paris, December 12-14, 1977.
- NEA Fuel Cycle Committee, OECD Paris, March 13-15, 1978.

A. Larochelle
- CIDA Project Review Meeting, Abidjan, Ivory Coast, March 25-April 15, 1977.
- Exploration '77, Ottawa, October 15-19, 1977.

Papers Presented

A. G. Darnley
- New and recent results from the Canadian Uranium Reconnaissance Program. U.S.G.S. Uranium-Thorium Symposium, Golden, Colorado, April 26, 1977.

Membership on Committees

A. G. Darnley

- Chairman, Organizing Committee for Canadian Geoscience Council Symposium "Exploration '77".
- Co-chairman, Uranium Reconnaissance Program Federal-Provincial Management Committees for Ontario, Manitoba, Saskatchewan, British Columbia, Newfoundland and New Brunswick.
- Member of Board, Mineral Exploration Research Institute, Montreal.
- Chairman, IAEA Consultants Committee on Radiometric Surveys in Uranium Exploration.
- Chairman, NEA/IAEA Uranium Exploration R & D Group.
- EMR URAG Committee.

Division productivity in 1977/78 can be summarized as follows:

14 outside papers
5 GSC papers
14 GSC Open File releases
13 Current Research reports
182 Aeromagnetic maps
31 NTS quarter-million sheets radiometric coverage
18 NTS quarter-million sheets geochemical coverage
1 Patent application.

1977 - 78 : MAN POWER ALLOCATION PER CATEGORY (MAN-MONTHS)

UNIT	RM	RS	PC	CH	CS	EL	ESS	DD	AS	CR	SEC	GL-E	TOTAL	SA GA
RESOURCE EXPLORATION GEOCHEMISTRY	-	60	126	24	-	12	96	-	-	12	12	-	342	(33)
RADIOACTIVITY	-	45	66	-	14	12	37	-	-	12	-	-	186	(15)
REGIONAL GEOPHYSICS	-	63	24	-	46	36	72	24	-	12	-	-	277	(9)
TERRAIN GEOPHYSICS	-	72	24	-	-	48	59	12	-	12	-	-	227	(24)
C I D A	-	-	12	-	-	-	-	-	-	-	-	-	12	-
ADMINISTRATION	24	-	-	-	-	-	-	-	12	36	-	12	84	-
TOTALS:	24	240	252	24	60	108	264	36	12	84	12	12	1128	(81)

RESOURCE EXPLORATION (GEOCHEMISTRY)

E. M. Cameron

The geochemistry component of the Resource Exploration subprogram is concerned with the search for and the appraisal of mineral resources. Nationally consistent, systematic, geochemical data are gathered from a variety of sampling media. These data are used by industry for mineral exploration; by governments for resource appraisal and to assist in geological mapping; and for environmental health and other purposes. This data gathering activity is complemented by research on geochemical processes; by development of new methods of mineral exploration and resources appraisal; by study of new analytical techniques and geochemical instrumentation; and by software developed to facilitate interpretation. During the report period the principal activity was the Federal-Provincial Uranium Reconnaissance Program (U.R.P.).

The subprogram is administered in three components: Method Development, Regional Surveys, and Geochemical Laboratories.

HIGHLIGHTS

Geochemical surveys in support of the U.R.P. were carried out in four provinces and the two territories. A total of 160,000 km^2 was sampled for lake sediments and waters and 91,000 km^2 for stream sediments and waters. This provided 40,000 samples that were analysed for a variety of elements, providing data on most metallic mineral commodities, in addition to uranium. Release of the data was during the following spring and summer. In most instances this caused immediate local economic activity with follow-up exploration by several companies in each survey area.

Geochemists have carried out across Canada detailed evaluation of U.R.P. results, often in cooperation with Provincial geologists. These studies emphasize the relationship between geochemical results and geology and on understanding the complex processes of element dispersion. The work allows much more effective interpretation of reconnaissance geochemical data.

A portable helium analyser was assembled and tested at the location of the Key Lake uranium deposit, Saskatchewan. Significant anomalies were found in lake bottom waters that lie more than 100 m above uranium mineralization.

The clay-covered areas of the southern Shield have been a frustrating region for mineral exploration. Field and laboratory studies carried out in the subdivision, and cooperatively with industry, indicate that anions migrate through the clay cover from underlying mineralization, while cations do not. This is being further investigated as a possible method of exploration for concealed deposits.

For most geochemical surveys it is not possible to estimate precision at the different sampling and analytical levels. For the first time for any major geochemical exploration survey, a sampling design providing these estimates was developed and applied to all U.R.P. surveys in the Shield carried out in 1977.

For the first time, a crustal abundance model was published for appraising Canada's mineral resources.

The nature and composition of potential igneous source rocks for Tertiary sandstone uranium deposits in British Columbia was established and an understanding gained of the processes leading to the formation of the deposits.

Work in Bancroft Ontario and northern Saskatchewan showed that primary haloes may be extensive around certain uranium deposits and thus provide a means of locating hidden deposits.

Certain shale successions in the Yukon were evaluated as a possible host of low grade, high tonnage uranium, or as a source for uranium concentrated in stratigraphic or structural traps.

Cooperative geological/geochemical studies in the Arctic Islands revealed extensive uranium mineralization breccias associated with evaporite diapirs.

In response to the difficulties found by the mineral industry in using uranium in waters (at the sub-parts per billion level) as an exploration tool, field and laboratory studies were begun in six provinces and territories comparing different analytical methods and alternative techniques of sample preparation and preservation.

Analytical methods were developed to measure various species of arsenic in waters.

Cooperative R & D was carried out with Scintrex Ltd. on a portable uranium analyser and a portable base metal analyser; with Barringer Ltd. on anion analysis; and with Inax Instruments on a field-portable XRF analyser.

An international workshop was hosted in Ottawa on October 24-26 on the use of gases in uranium exploration.

Personnel Notes

R. Horton	- Left the subdivision in September 1977, to take a position at CANMET.
I. R. Jonasson	- Was appointed an Adjunct Professor at Carleton University.
J. Lee	- Joined the subdivision coming from New Zealand as a Post-Doctoral Fellow.
E. Moore	- Left in March 1978 for six months maternity leave. This position was temporarily filled by C. Wilkinson.

Attendance at Meetings, Conferences and Courses

S. B. Ballantyne	- Exploration '77 Symposium, Ottawa
D. R. Boyle	- Exploration '77 Symposium, Ottawa
	- Field excursion to Washington and southern B.C.

	- Workshop on uranium exploration, University of Toronto, March 1-2, 1978.
R. W. Boyle	- Exploration '77 Symposium, Ottawa
E. M. Cameron	- Exploration '77 Symposium, Ottawa
	- Prospectors and Developers Association Annual Meeting, Toronto.
W. B. Coker	- 3rd Annual Meeting of Lake Superior Institute of Geology, Thunder Bay, Ontario, May 2-4, 1977.
	- Manitoba Mines Branch, annual meeting, Winnipeg, November 1977.
	- Saskatchewan Geological Society, annual meeting, Regina, November 1977.
	- Ontario Dept. of Mines, annual workshop, Toronto, February 1-2, 1978.
	- Exploration '77 Symposium, Ottawa.
W. Dyck	- NEA/IAEA workshop on the relevance of gases in uranium exploration, Ottawa, October 24-26, 1977.
	- Exploration '77 Symposium, Ottawa.
R. G. Garrett	- IGCP Project 98 workshop, Taita Hills, Kenya, November 8-15, 1977.
	- Royal Society Meeting, London, December 7-8, 1977.
	- Exploration '77 Symposium, Ottawa.
W. D. Goodfellow	- Mineral Deposit Workshop, December 2-4, 1977.
	- Geoscience Forum, Whitehorse, December 5-6, 1977.
	- Selwyn Basin Workshop, Vancouver, Fabruary 10, 1978.
G. E. M. Hall	- Field excursion to USGS Denver Colorado, and the ERDA laboratory, Los Alamos, New Mexico.
E. H. W. Hornbrook	- Exploration '77 Symposium, Ottawa
I. R. Jonasson	- Exploration '77 Symposium, Ottawa
J. J. Lynch	Exploration '77 Symposium, Ottawa
Y. T. Maurice	- 79th Annual General Meeting of the C.I.M.M., Ottawa, April 17-21, 1977.
	- Second U and Th research and resource conference, Golden, Colorado, April 27-29, 1977.
	- Exploration '77 Symposium, Ottawa.

B. W. Smee
- Prospectors and Developers Convention, Toronto.
- Exploration '77 Symposium, Ottawa.

Special Talks and Lectures

D. R. Boyle
- Uranium Exploration Course, University of Toronto.

R. W. Boyle
- Series of lectures on Geochemical Prospecting for Gold at the McGill Short Course on Geochemical Prospecting, January 1977.

W. B. Coker
- Talk given at Exploration '77 Symposium, "Lake Sediment geochemistry applied to mineral exploration".

W. Dyck
- Talk on Radon and helium methods in uranium exploration at the University of Toronto Radioactivity Workshop.
- Talk and paper to Exploration '77 - Application of Hydrogeochemistry to the search for uranium.

Y. T. Maurice
- L'utilisation de la geochemie des sols en prospection geochemique en Irlande. Presented at l'Universite du Quebec a Chicoutimi, February 10, 1978.

Membership on Committees

R. W. Boyle
- National Research Council subcommittee on Scientific Criteria for Environmental Quality.
- North American Councillor International Association Genesis Ore Deposits
- Committee, Geological Association of Canada, Inorganic Geochemistry Section.

E. M. Cameron
- Ex-officio member of Council, Association of Exploration Geochemists.
- Editor-in-Chief, Journal of Geochemical Exploration Organizing Committee, IGES Denver.
- U.R.P. Management Committees: British Columbia, Saskatchewan, Ontario, Newfoundland.

R. G. Garrett
- Chairman of Branch Committee Facilities Committee and Departmental Computer Working Committee, also represented the user community on the Departmental Policy Committee.
- Technical Committees supporting Federal-Provincial DREE agreements with Nova Scotia and Saskatchewan.
- Association of Exploration Geochemists, Councillor.

G.E.M. Hall
- Organizing Committee for "GeoAnalysis '78".

E. H. W. Hornbrook - U.R.P. Management Committees for Newfoundland, Ontario, Saskatchewan and British Columbia.

I. R. Jonasson - Journal of Geochemical Exploration, Member of Editorial Board.

B. W. Smee - Organizing Committee, Exploration '77 Symposium, Ottawa.

Sample Preparation Laboratory

Samples Prepared	4,125
Crushing/Grinding/Ball milling	2,100
Sieving	2,300
Super panner	100
Frantz	100

Emission Spectrometry Laboratory

Samples completed D.C. Arc	1,792
Samples completed A.C. Spark	200
Total Determinations	45,008

Trace Element Laboratory

Water Samples completed	7,900
Total Determinations on water samples	63,500
Solid samples completed	2,960
Total determinations on solid samples	31,040

URANIUM RECONNAISSANCE PROGRAM, CONTRACT ANALYSES

SAMPLE AREA	SEDIMENT SAMPLES		WATER SAMPLES	
	Samples Analysed	Determinations	Samples Analysed	Determin.
Ontario	2169	28197	2168	6504
Saskatchewan	2382	30786	2382	7146
Labrador	5079	70937	5076	5228
Melville Peninsula	2611	33679	2607	7821
S.E. British Columbia	3614	39544	3501	10503
Atlin, British Columbia	1260	15021	1262	3786
Yukon, Reconnaissance	3899	50771	3744	11232
Yukon, Detail	1450	18406	-	-
Arctic Islands	119	1547	-	-
Key Lake, Saskatchewan	462	5970	-	-
Miscellaneous	60	780	-	-
Total	23105	196338	20740	62220

RESOURCE EXPLORATION (RADIOACTIVITY)

K. A. Richardson

The objectives of this subprogram are directed toward the development, application and evaluation of radiometric methods of geophysics to mineral exploration and geological mapping. Activities include development and investigation of airborne, surface and borehole methods and instrumentation and management of the Federal-Provincial Uranium Reconnaissance Program.

Highlights

A major highlight of the year was the participation of most of the staff of the subidivision and the use of much of the spectrometric instrumentation of the subdivision in Operation Morning Light, the search for debris from the Russian Satellite Cosmos 954. During February, March and April 1978, more than 18,000 line km of search data were collected.

Contract uranium reconnaissance surveys were flown over all or parts of 48 1:250,000 map sheets in Ontario, Manitoba, Saskatchewan and Northwest Territories, and results were published for 28 map sheets in New Brunswick, Ontario, Manitoba, Saskatchewan and Northwest Territories.

The Skyvan aircraft flew reconnaissance, orientation and follow-up spectrometer surveys in Quebec, Alberta, British Columbia and Ontario. A new computer-based airborne spectrometer was developed, and test flown in the autumn of 1977, and a similar computer-based, truck mounted borehole logging system was completed in February 1978.

Gamma-ray calibration facilities were constructed at Bells Corners, Ottawa (10 calibration pads, 27 model boreholes), Fredericton (2 model boreholes) and Calgary (7 calibration pads).

Techniques were developed for computer classification of airborne spectrometer data into sets corresponding to different lithological units.

Ground investigations of anomalous areas located by the Uranium Reconnaissance Program were carried out in Ontario, Nova Scotia and New Brunswick. New uranium occurrences were discovered in the South Maitland area of Nova Scotia.

Attendance at Meetings, Conferences, Courses

G. W. Cameron
- Annual Meeting, GAC, MAC, SEG, CGU, Vancouver, April 25-27, 1977.

R. L. Grasty
- Society Exploration Geophysicists Meeting, Calgary, Alberta, September 19-21, 1977.
- IAEA Working Group, Harwell, England, November 1977.
- U.S. ERDA Working Group. Grand Junction, Colorado, November 8-11, 1977.

P. G. Killeen
- Society Exploration Geophysicists Meeting, Calgary, Alberta, September 19-21, 1977.
- Canadian Exploration Geophysics Society, Toronto, November 8, 1977.
- NEA/IAEA Workshop on Borehole Logging for Uranium, Grand Junction, Colorado, February 13-17, 1978.
- Prospectors and Developers Association, Toronto, March 6-8, 1978.

K. A. Richardson
- Geological Society of America Annual Meeting and Society of Economic Geology Symposium on Geology of Uranium Deposits, Seattle, Washington, November 5-8, 1977.

V. R. Slaney
- Meeting of SEASAT SAR Team, Miami, Florida, April 19-20, 1977.
- Geoscience Working Group Meeting, Toronto May 19-20, 1977.

  Geoscience Working Group Meeting, Edmonton, Nov. 17-18, 1977.
- Meeting of SEASAT SAR Experiment Team, Tacoma, Washington, January 25-26, 1978.
- U.S. National Working Group of IGCP Project 143 (Remote Sensing and Mineral Exploration), Stanford, California, February 7-8, 1978.

- Course on Digital Image Processing of Earth Observation Data, Washington, February 27-March 3, 1978.

Membership on Committees

R. L. Grasty
- IAEA Working Group on Instrumentation for Uranium Exploration.

P. G. Killeen
- IAEA Working Group on Drilling and Logging for Uranium Exploration.

V. R. Slaney
- Chairman, Geoscience Working Group of Canadian Advisory Council on Remote Sensing.
- Member IGCP Project 143 (Remote Sensing and Mineral Exploration (US Committee)).
- Member Technical Subcommittee, Interdepartmental Committee on Air Surveys.

Special Talks and Lectures

R. L. Grasty
- "Upward and Downward Continuation of Gamma-radiation fields" to 47th Annual Meeting of the Society of Exploration Geophysicists, Calgary, September 1977.
- "Fields of view of gamma-ray spectrometers" to 47th Annual Meeting of the Society of Exploration Geophysicists, Calgary, September 1977.

P. G. Killeen
- "Calibration facilities for downhole uranium assay with a borehole gamma-ray spectral logger" to 47th Annual Meeting of the Society of Exploration Geophysicists, Calgary, September 1977.
- "Gamma-ray spectrometric methods in uranium exploration, part 3, application and interpretation" to Exploration '77, Ottawa, 1977.
- "Gamma-ray spectral logging for uranium assay" to Canadian Exploration Geophysicists Society, Toronto, November 1977.

Subdivision Manuscripts

G.S.C. papers	7
Geophysical Series Maps	28
G.S.C. Open Files	1
Outside papers	4
Abstracts only	3

A.E.C.B. Report on Elliot Lake Contamination Survey

CACRS Annual Report on a Canadian Remote Sensing Training Centre.

REGIONAL GEOPHYSICS

P. J. Hood

The primary objective of the Regional Geophysics subprogram is to improve the understanding of the geological framework of Canada and to facilitate mineral exploration and development programs by providing a regional framework of basic geophysical data. The subprogram develops new survey instrumentation and techniques, conducts experimental surveys, devises new techniques for the computer treatment, presentation and interpretation of resultant data, prepares specifications for surveys carried out under contract, monitors their execution, and supervises the publication of results. Geological interpretations of the results are provided to the extent possible with available staff.

The program mainly involves four sections: Contract Aeromagnetic Surveys, Experimental Airborne Operations, Geophysical Data Processing and Regional Geophysical Interpretation.

Highlights

Standard sensitivity aeromagnetic surveys were carried out in three provinces and the Northwest Territories during 1977. Line kilometrage flown was 172,478 km bringing the grand total to 7,856,809 line km. 219 aeromagnetic maps were issued to bring the total number of such maps issued to 7715.

Evaluation of the vertical gradient technique as an aid to geological mapping and mineral exploration continues and 20,472 line kilometres were flown in 5 separate areas by the GSC Queenair aeromagnetic survey aircraft.

The 1977 survey of Chats Falls on behalf of Ontario Hydro was a new application of the aeromagnetic gradiometer technique for detailed structural investigations in the location of a nuclear power site. The survey was flown at half the normal line spacing, namely 150 metres and the survey itself, compilation of the maps and a preliminary interpretation were completed within six weeks.

The 1976 aeromagnetic gradiometer survey carried out over the Athabasca Basin has permitted a better extrapolation of the Precambrian basement geology and its depth configuration and facilitated the recognition of structural features such as fault zones.

Further improvements to the aeromagnetic gradiometer system itself concentrated on the navigational aspects and the design and fabrication of new sensing heads. Modifications to the Doppler navigation presentation has improved the ability of the pilot to fly survey lines with much greater precision than before.

A third edition of the Magnetic Anomaly Map of Canada was issued which included the new coverage in British Columbia, District of Keewatin, Central Canada, southern Labrador, southern Newfoundland and Baffin Island.

Evaluation of the Caribbean profile data obtained by the NAE North Star aircraft has shown that the IGRF model field is too high in this area by several hundred gammas due in part to the poor secular variation coefficients chosen.

Results of wide angle seismic investigations of the Sverdrup Basin, Arctic Islands have not supported the postulated extension of the Boothia Arch as far north as Ellef Ringnes Island. The seismic cross-sections show both broad regional structures and local features associated with diapirs. The seismic refraction technique has proven to be very effective in mapping early Paleozoic carbonates and could be used to map the areal extent of such carbonate belts.

Personnel Notes

M. B. Chretien - retired in mid-September 1977 after more than 28 years with the GSC.

E. J. Derouin - died April 10, 1978; he had completed 28½ years service with the GSC.

P. J. Hood - completed French language training on May 11, 1977.

Andrew Verney - joined the Digital Compilation Section as a programmer-analyst in September 1977.

Attendance at Meetings, Conferences and Courses

P. J. Hood - IAGA Assembly, Seattle, August 22-September 3, 1977. Convenor for Session SI-10, Relation of Petrology to Observed Geomagnetic Anomalies held on September 2.

- Prospectors and Developers Meeting, Toronto, Mar.6-8, 1978.

- Exploration '77 Symposium, Ottawa, October 17, 1977 (with M.T. Holroyd and P.H. McGrath) presented paper entitled "Magnetic Methods Applied to Base Metal Exploration".

A. Overton - 47th Annual International Meeting, Society of Exploration Geophysicists, Calgary, September 18-24, 1977. Presented paper entitled "Seismic reconnaissance profiles across the Sverdrup Basin, Canadian Arctic Islands".

Most members of the subdivision attended the Exploration '77 Symposium held in Ottawa, October 16-20, 1977.

Membership on Committees

S. D. Dods - Member, Data Display Users Group, Computer Science Centre.

M. T. Holroyd - Member, Branch Computer Facilities Committee.

P. J. Hood - Chairman, Program Committee and member, Organizing Committee, Exploration '77 Symposium.

- Convenor, Session SI-10 (Relation of Petrology to Observed Geomagnetic Anomalies) IAGA Meeting, Seattle, August 22-September 3, 1977.

- Member, Working Group 3 (Geomagnetic Instruments and Standards), Division 5 (Observatories, Instruments, Indices and Data), International Association of Geomagnetism and Aeronomy.
- Member, Geomagnetic Reference Field Committee, Society of Exploration Geophysicists, Tulsa, Oklahoma.
- Associate Member, Committee for a (US) National Magnetic Anomaly Map.

V. R. Slaney - Member Geoscience Working Group, Canadian Advisory Committee on Remote Sensing.

A. Verney - Data Management Users Group, Computer Science Centre.

Subdivision Manuscripts

As end products of the Federal/Provincial aeromagnetic survey scheme, 165 aeromagnetic maps were issued; of these 149 were 1:63,360/1:50,000 standard sensitivity and sixteen were 1:250,000 scale aeromagnetic maps. A cumulative total of 5,515 1:63,360/1:50,000, 502 1:250,000/1,253,440 and 563 aeromagnetic maps at other scales have been published.

Regional Geophysics Statistics

The status of contract aeromagnetic surveys is summarized in the following table:

Survey Area	Kilometres Flown 1977/78	Kilometres Remaining	% Flying Complete	Maps Published in 1977/78	
				*1:63,360 1:50,000	1:250,000
1. Labrador-Quebec	0	180,533	64%	16	0
Melville Pen.	0	0	100%	21	0
Coppermine-Gt.Bear Lake	106,795	0	100%	0	0
2. MacKenzie-Keewatin	0	0	All requirements of contract completed	*20	16
3. New Quebec	51,033	43,893	93%	92	0
4. British Columbia	4,000 + 10,640 (104I ext)	0	100%	0	0
	172,478	224,426		149	16

Aeromagnetic gradiometer surveys were flown in the following areas 1) Chats Falls, Ontario (1995 line km) on behalf of Ontario Hydro; 2) Kasmere Lake, Manitoba (6920 line km) as part of URP; 3) Key Lake, 4) Ahenshew Lake and 5) Rabbit Lake, Saskatchewan (2584 line km) as part of URP and 6) Antigonish, Nova Scotia (8973 line km) for Nova Scotia Department of Mines. Thus 20,472 line kilometres were flown by the GSC Queenair aeromagnetic survey aircraft during 1977.

The third edition of the Magnetic Anomaly Map of Canada (1255A) was published in October 1977. Previous editions of this 1:5,000,000 scale map were published in 1967 and 1971 and more than 17,000 copies of these maps were sold. The third edition was recompiled on a revised base-map and recently published aeromagnetic data from British Columbia, the District of Keewatin, Central Canada, southern Labrador, southern Newfoundland and Baffin Island has been included in the new edition. Sales of this map to the end of the report year has been 1100 copies which indicates its usefulness and popularity as one of the 1:5,000,000 geoscientific map series of Canada.

During the report year one hundred and twenty-eight 1:25,000 aeromagnetic total field and gradiometric map sheets resulting from the survey operations of the GSC Queenair aircraft were compiled and contoured, of which sixteen reached the printing and publication state before the end of the report year.

TERRAIN GEOPHYSICS

L. S. Collett

The objective of this subprogram is the application of geophysical techniques to the solution of problems in geological engineering and surficial mapping and selected problems in mineral exploration. Activities are mainly concerned with electrical and seismic methods. The main thrusts of the activities during this report period are in on-shore and off-shore permafrost, radar development and borehole mineral exploration. This knowledge-base is disseminated mainly as geophysical papers, reports and open files, and through advice to other departments.

Highlights

Terrain Geophysics became heavily involved in R & D aspects of the AECL radioactive waste disposal program during the year.

Seismic and jet-drilling of holes in the Beaufort Sea supported the seismic interpretation of the depth to permafrost map of the Beaufort Sea. Geophysical logging in the drill hole and seismic refraction helped to obtain properties of sub-bottom materials for pipeline corridors off-shore.

Four Unsolicited Proposals (UP) were in various stages of assessment during the year, namely the Huntec Induced Polarization Receiver using a microprocessor, the Geoprobe Multi-frequency Electromagnetic Deep Sounding system, the Crone Borehole Pulse Electromagnetic System, and the Borehole VLF Logging System being developed by the Mineral Exploration Research Institute.

The ground probing radar system was further developed and antennas were designed for use in boreholes. An evaluation of the radar system was made in some Saskatchewan potash mines with commendable success. Tests in boreholes at White Lake were attempted with reasonable success. The latter technique is being developed for A.E.C.L. radioactive waste disposal program.

The electrical rock property project was expanded to include acoustical and electrochemical parameters for the pending study on rock sites for radioactive waste disposal program.

Personnel Notes

L. S. Collett - completed French Language Training on August 3, 1977.

A. V. Dyck - commenced education leave (Ph.D.) at University of Toronto September 1, 1977.

J. A. Hunter - moved family to Inuvik, N.W.T. on March 1, 1978.

K. G. Neave - on secondment from PCSP to Seismic Methods Section starting October 1, 1977.

J. Otorowski - joined Electrical Methods Section on October 1, 1977.

W. J. Scott - A/Head, Terrain Geophysics Program to August 3, 1977.

S. Washkurak - seconded to CCRS, March 1, 1978.

Seconded from A.E.C.L.

C. Chaplin - October 1977 to May 30, 1978
A. Kay - September 9, 1977 to March 31, 1978
L. Rosnuk - September 20, 1977 to January 20, 1978.

F.L.I.P. (Federal Labour Intensive Program)

G. Morley - January 16, 1978 to September 30, 1978
R. Rayner - January 16, 1978 to September 30, 1978

Trainee through C.I.D.A. Program

M. Pinheiro - Brazilian geophysicist trained under W. J. Scott

Attendance at Meetings, Conferences and Courses

A. P. Annan
- Permafrost Geophysics Symposium, National Research Council, Saskatoon, October 3-4, 1977.
- Society of Exploration Geophysicists, Calgary, Alberta, September 18-22, 1977.
- Exploration '77, Ottawa, October 17-20, 1977.

L. S. Collett	- Permafrost Geophysics Symposium, National Research Council, Saskatoon, October 3-4, 1977.
	- Prospectors and Developers Association, Toronto, March 5-8, 1978.
	- Exploration '77, Ottawa, October 17-20, 1977.
J. L. Davis	- Permafrost Geophysics Symposium, National Research Council, Saskatoon, October 3-4, 1977.
	- Society of Exploration Geophysicists, Calgary, Alberta, September 18-22, 1977.
	- Exploration '77, Ottawa, October 17-20, 1977.
J. A. Hunter	- Permafrost Geophysics Symposium, National Research Council, Saskatoon, October 3-4, 1977.
	- Exploration '77, Ottawa, October 17-20, 1977.
	- Geological Association of Canada, Vancouver, B.C. April 25-29, 1977.
	- Member of Permafrost Delegation to the People's Republic of China, July 5 - August 10, 1978.
T. J. Katsube	- Permafrost Geophysics Symposium, National Research Council, Saskatoon, October 3-4, 1977.
	- Exploration '77, Ottawa, October 17-20, 1977.
J. Lobach	- Exploration '77, Ottawa, October 17-20, 1977.
H. A. MacAulay	- Permafrost Geophysics Symposium, National Research Council, Saskatoon, October 3-4, 1977.
K. G. Neave	- Workshop on Permafrost, U.S. National Committee on Permafrost, U.S. Academy of Science, San Francisco, California, December 5-6, 1977.
W. J. Scott	- Society of Exploration Geophysicists, Calgary, Alberta, September 18-22, 1977.
	- Exploration '77, Ottawa, October 17-20, 1977.
	- Permafrost Geophysics Symposium, Saskatoon, October 3-4, 1977.
	- Prospectors and Developers Association, Toronto, March 5-8, 1977.
A. K. Sinha	- Society of Exploration Geophysicists, Calgary, Alberta, September 18-22, 1977.
	- Attended 3-day course on Digital Signal Processing, Dallas, Texas, June 1-3, 1977.
R. J. Sloka	- Logic I, Algonquin College, Fall Term.

Special Talks and Lectures

A. P. Annan and J. L. Davis -
- Lectured on Ground Probing Radar Methods at C-CORE, Memorial University of Newfoundland, St. John's, Newfoundland, January 9-11, 1978.
- "Radar soundings in coarse-grained permafrost materials in the Yukon Territory" at Permafrost Geophysics Symposium, Saskatoon, Saskatchewan, October 3-4, 1977.

J. A. Hunter (with H. A. MacAulay, K. G. Neave and G. D. Hobson)
- "Seismic mapping of sub-bottom permafrost in the Beaufort Sea - Recent Interpretations", Geological Association of Canada, April 25-29, 1977.
- "Permafrost Geophysics" at the Glacier, Desert and Permafrost Research Institute, Lanchow, The People's Republic of China, July 20, 1977.

(with A. S. Judge and K. G. Neave)
- "Offshore permafrost distribution in the Beaufort Sea from temperature and seismic results" at Permafrost Geophysics Symposium, Saskatoon, October 4, 1977.

T. J. Katsube - "Low temperature effect on porewater in rocks and soils" at Permafrost Geophysics Symposium, Saskatoon, Oct.4,1977.

H. A. MacAulay - "The use of hydraulic drilling methods to study offshore bottom permafrost" at Permafrost Geophysics Symposium, Saskatoon, October 3, 1977.

A. K. Sinha (with A. V. Dyck)
- "A study of electrical and EM techniques for geologic mapping" at Society of Exploration Geophysicists, Calgary, Alberta, September 18-22, 1977.

W. J. Scott - "Geophysics in the Canadian Radioactive Waste Disposal Program" - Seminar in Joint McGill-Ecole Polytechnique Series, Montreal, Quebec, March 17, 1978.

Membership on Committees

L. S. Collett
- Member, Departmental Classification Committee.
- Associate member, SEASAT/SAR Experiment Team, NASA
- Member SURSAT Advisory Committee
- Member, GSC Library Policy Committee
- Member, Technical Committee on CIDA/Brazil.

C. Gauvreau - SC Safety Committee

J. A. Hunter - Member on Mining, Engineering and Groundwater Geophysics Committee, Society of Exploration Geophysicists.

T. J. Katsube - Member, Nominating Committee, Spectroscopy Society of Canada, Ottawa Valley Section.

W. J. Scott - Member, Technical Evaluation Group, National Science Foundation (USA) re Site Evaluation by Borehole Geophysics.

- Member, Subcommittee on Reporting of Electrical Standards, Committee on Mining Geophysics.

A. K. Sinha - Member, Reviews Committee, Society of Exploration Geophysicists, Tulsa, Oklahoma.

C I D A

B. E. Manistre

Highlights

Liaison and project coordination with the following countries:

Brazil - continued function as technical advisers to DNPM on the Goias mineral project for CIDA. Completion of ground geophysical instrument purchase program. Supervision of ground geophysical and geochemical surveys.

Pakistan - Technical supervision of airborne magnetic survey.

Kenya - Inspection of airborne magnetic survey maps.

Botswana - Inspection of interpretation of airborne magnetic survey and participation in planning for next phase of project.

Ivory Coast - Inspection and supervision of photogeological mapping project. Advisory function on continuing phases of follow up to airborne magnetic survey.

Membership on Committees

B. E. Manistre - Ad Hoc interdepartmental committee for the Commonwealth Science Council.

Attendance at Meetings

B. E. Manistre - Exploration '77, Ottawa, October 17-20, 1977.

TERRAIN SCIENCES DIVISION

J.S. Scott, Director

Introduction

Responsibilities of the Division are directed toward the provision of geoscientific data and interpretive information on the surficial geology and geomorphic processes of the Canadian landmass and adjacent offshore areas and for such geotechnical aspects of the bedrock geology as may have a bearing on engineering use of the terrain.

The objectives of the Division are: to provide a systematic coverage of surficial geology of the Canadian landmass consistent with the information requirements for effective use of the terrain and for their interpretation of Quaternary and Holocene geological events; to acquire an understanding of past and present geomorphic processes; to identify and assess the occurrence and magnitude of natural terrain hazards; to provide geoscience information to assist in the use, maintenance and restoration of the physical environment; and to provide standards, controls, and reference materials to ensure consistency of correlation between geological events of the Pleistocene and Holocene Epochs and to develop and maintain standards of mapping of surficial geology appropriate to national needs.

The Division is organized into six sections, to some extent based on discipline, although many projects are interdisciplinary in nature and their objectives may relate to those of more than one section. The Special Projects Unit comprises senior scientific staff with special expertise who are involved in regional compilations, studies of unique Quaternary geological features and the provision of scientific and technical advice to the Division and other government agencies. Regional Projects Section activities are largely directed toward providing a Canada-wide inventory of unconsolidated deposits and landforms and establishing their stratigraphic and environmental history. Paleoecology and Geochronology Section is responsible for paleontological and paleoecological investigations of Quaternary fossil materials and for the provision of ^{14}C dates on various organic materials. Marine and Coastal Section is concerned with the nature, distribution, stratigraphy and environmental history of sediments on the seafloor in Arctic and Pacific coastal regions, on the past- and present-day processes affecting the coastal zone and near shore areas, and on fluvial hydrology and geomorphology. Engineering and Environmental Geology Section has broadly-based responsibilities for studies of physical and engineering characteristics of geological materials for engineering and/or terrain use purposes. Sedimentology and Mineral Tracing Section is concerned with the study of active geomorphological and sedimentological processes and with the development of mineral prospecting techniques that use glacial drift as the prospecting medium.

At the end of the report-period the staff comprised 2 Research Managers, 22 Research Scientists, 32 Physical Scientists (10 term), 16 technical support (7 term) and 7 administrative support (2 term). Staff of the Division are based primarily in Ottawa with small operational units in Calgary at the Institute of Sedimentary and Petroleum Geology and in the Vancouver Office of the Geological Survey. During the year all administrative arrangements were made for the transfer of two Research Scientists and one technician to Cordilleran and Pacific Margin Subdivision, R.E.G. Division and two Research Scientists, two Physical Scientists and one technician to Atlantic Geoscience Centre to become effective April 1, 1978. Because of these transfers, the increasing involvement in the A.E.C.L.-funded radiocarbon waste disposal program and the termination of the urban geology program plans were made for modification of the organizational structure of the Division, also to become effective April 1, 1978. Specifically, these modifications are: (a) the separation of the Engineering and Environmental Geology Section into two sections, viz. Engineering Geology Section and Geomorphic Processes Section; and (b) elimination of the Special Projects Section and the Marine and Coastal Section.

During the year the Division approved 63 Internal Reports comprising: 6 Papers; 1 Bulletin; 14 Open Files; and 6 contributions to Report of Activities, 77-1 (Pt. C), 25 contributions to Current Research, 78-1 (Pt. A), and 11 contributions to Current Research, 78-1 (Pt. B). In addition 34 papers were approved for Outside Publication.

REPORTS ON SECTIONS

DIVISIONAL HEADQUARTERS

Divisional Headquarters, in addition to the Director's office, comprises the Scientific and Technical Services Unit, which provides photogrammetric, cartographic, editorial and computer programming services, the Administrative and Financial Services Unit, and the Secretarial and Clerical Services Unit. Credit is due Miss L.S. Morency for the assembly and compilation of much of the subsequent material in this report.

Personnel Notes

Divisional Headquarters consists of a permanent staff of 2 Research Managers, 3 Physical Scientists, and 6 support staff.

M.R. Cade resigned her position in September 1977 to take up residence in Calgary, Alberta.

J. Cox joined the Division in December 1977 after completing her education, and is working for our Secretarial and Clerical Services Unit.

P.A. McLeish transferred to the Division in October 1977 from the staff Relations Division of the Personnel Branch of this Department, and is working for our Administrative and Financial Services Unit.

D.M. Meheden resigned her position in July 1977 to take up residence in Masset, British Columbia.

J.S. Scott completed National Defence College Course XXX and returned to full-time duty as Division Director in mid-August.

Attendance at Meetings, Conferences and Courses

J.S. Scott

Porter Commission Hearings on Electrical Energy in Ontario, Toronto, November 1977.

Advisory Group on the Future I.A.E.A. Program Concerning the Disposal of Radioactive Waste into Geological Formations, Vienna, January 1978.

Membership on Committees

B.G. Craig

PC Classification Review Committee, Branch Representative

J.S. Scott

North America, International Association of Engineering Geologists, Vice-President

Subcommittee on Foundations, Canadian Advisory Committee on Rock Mechanics, Member

Departmental Committee on Radioactive Waste Disposal, Chairman

Subcommittee on Urban Engineering Terrain Problems, Associate Committee on Geotechnical Research, Member (ex officio)

Working Group on Engineering Geology of Karst Terrain, International Association of Engineering Geologists, Member

Interdepartmental Group on National Land Use Policy, Departmental Representative

Departmental Committee for Research Manager Classification, Member

Special Talks or Lectures

J.S. Scott

"Nuclear waste disposal management" at Association of Professional Engineers of Ontario, Brockville, March 1978.

Quaternary Discussion Group

The Quaternary Discussion Group was chaired by J-S. Vincent prior to the appointment of R.A. Klassen in October 1977. The following papers were given during April 1977 to March 1978.

Dr. J.J. Clague, Terrain Sciences Division, Vancouver - Late Pleistocene sediments and geologic history, coastal southwest British Columbia.

Mr. R.B. Taylor, Terrain Sciences Division, GSC, Ottawa - The occurrence of ice ridges along the northern coast of Somerset Island, N.W.T.

Dr. C.F.M. Lewis, Terrain Sciences Division, GSC, Ottawa - Scouring of the Continental Shelf by drift-ice; the Beaufort Sea case.

Dr. Ann Wintle, Simon Fraser University - Thermoluminescence dating: potential for determining the age of sediments.

Mr. J-S. Vincent, Terrain Sciences Division, GSC, Ottawa - (i) A new interpretation of the lacustrine phases of glacial lakes Barlow and Ojibway in Quebec; (ii) Report on a visit to the Centre de géomorphologie of Caen with special emphasis on Quaternary studies in Normandie.

Dr. L.E. Jackson, Terrain Sciences Division, Calgary - Environmental impact assessment of coal development in the Rocky Mountain ranges and foothills.

Dr. A.M. Stalker, Terrain Sciences Division, GSC, Ottawa - Some facets of INQUA and of its X Congress.

Dr. A.G. Plant and Mr. D.A. Walker, CLAS Division, GSC - Microbeam analysis techniques and their applications.

Mr. S.M. Blasco, Terrain Sciences Division, GSC, Ottawa - Unmanned submersible used in high arctic seabed studies - Sverdrup Basin.

Dr. J.V. Matthews, Jr., Terrain Sciences Division, GSC, Ottawa - What you've always wanted to know about fossil beetles - but were afraid to ask!

SPECIAL PROJECTS UNIT

Highlights

- Reinterpretation and revision of 1:250,000 maps of central Mackenzie Valley for publication in B-series, and synthesis of data for eventual publication at 1:500,000 A-series continuing.

- Provision of Quaternary geological input into Archaeological Survey of Canada, Museum of Natural Sciences "Yukon Refugium Project".

- Marine Science Atlas of the Beaufort Sea, a co-operative project with Canadian Hydrographic Service, D.F.E., is nearing completion.

- Compilation of data on bottom sediments and their dispersal trends and bottom morphology of the Beaufort Sea continuing.

- Additional geochronologic control for deposits in southern Alberta that span most of Quaternary time is being provided by fission track and amino acid dating techniques.

Personnel Notes

The Special Projects Unit consists of a permanent staff of 3 Research Scientists. The Unit also supported 1 EMR Research Agreement.

B.R. Pelletier gave a short course (5 hrs.) in "geological oceanography" to a training school for the Canadian Hydrographic Service, Ottawa, during a three-week period in March 1978.

V.K. Prest retired in December 1977 after a 28-year career with the Geological Survey of Canada.

Attendance at Meetings, Conferences and Courses

O.L. Hughes

Tenth Congress of the International Union for Quaternary Research (INQUA), Birmingham, England, August 1977.

Meeting of the Geological Advisory Committee to Alberta Research Council, Edmonton, October 1977.

Meeting of the Archaeological Survey of Canada Yukon Refugium Project, Edmonton, November 1977.

B.R. Pelletier

Chaired a session and presented a paper at Annual Meeting of the Geological Association of Canada, Vancouver, April 1977.

V.K. Prest

Tenth Congress of the International Union for Quaternary Research (INQUA), Birmingham, England, August 1977; participated in the pre- and post-conference field trips re Quaternary geology.

A.M. Stalker

Tenth Congress of the International Union for Quaternary Research (INQUA), Birmingham, England, August 1977; participated in field trips A-8 and C-10.

Membership on Committees

O.L. Hughes

Permafrost Subcommittee, National Research Council, Member

B.R. Pelletier

Working Group on Geoscience - Canadian Advisory Committee on Remote Sensing, Member

Intergovernmental Committee on Submersibles, Member

Maritime Sediments, Editor

V.K. Prest

INQUA Subcommission on North American Quaternary Stratigraphy, Member

Commission on Paleogeographic Atlas of the Quaternary, Member

Organizing Committee of the Symposium on Glacier Beds, Member

A.M. Stalker

Associate Committee on Quaternary Research of the National Research Council of Canada, Chairman

INQUA Subcommittee on North American Quaternary Stratigraphy, Member

Canadian National Committee for INQUA, Chairman

Special Talks or Lectures

B.R. Pelletier

"Marine geology, sedimentology" to Geology Department, Queen's University, Kingston, November 1977.

"Bottom sampling and marine geological principles" at Hydrographer's Training Course, Department of Fisheries and Environment, Ottawa, November 1977.

A.M. Stalker

"Quaternary mammals and stratigraphy of the Canadian Great Plains" to Department of Geology, University of Ottawa, February 1978.

REGIONAL PROJECTS SECTION

R.J. Fulton (Head)

The prime objectives of the Regional Projects Section are to provide a Canada-wide inventory of surficial materials and landforms and to establish the stratigraphy and environmental history of Quaternary deposits. Projects are designed to provide information on the nature and distribution of surficial materials and on terrain conditions, to determine the geologic history of the Quaternary period and to furnish an understanding of the genesis of deposits and landforms. Terrain and surficial geology information is required for all land use activities in order to ensure that land resources are used economically, and that development will proceed without unacceptable deterioration of the environment. Important adjuncts of this work are preparation of regional syntheses, which explain the general nature and environmental history of Canada, and the development of expertise in terrain and environmental matters that can be tapped by other agencies.

Highlights

- A major mapping project was started in the Yukon. The objective of this work is to provide surficial geology, terrain and stratigraphic information for the area south of 64°. This area is crossed by the proposed routes of the ALCAN Pipeline and the Dempster Spur and encompasses much of the part of the Yukon that will be subject to development pressures over the next decade.

- An inventory mapping program was started in northern Manitoba in the area between the mouth of the Nelson River and the territorial boundary. This area lies on the proposed route of the Polar Gas Pipeline and could provide important geological information relative to formation of the Keewatin ice divide and break up of the ice in Hudson Bay.

- Field mapping was completed in the Skeena River area of British Columbia, the Bathurst area of New Brunswick, and the Ringnes Island area of District of Franklin. Follow-up work on earlier mapping was conducted on Somerset Island, Banks Island and in Northern Keewatin. The prime goal of this work was to obtain stratigraphic and Quaternary history information that could not be obtained during the main mapping phase of the work and to gather addition map-unit characterization data.

Personnel Notes

The Regional Projects Section consists of a permanent staff of 5 Research Scientists, 6 Physical Scientists, and 1 technician. The Section also supported 1 doctoral student, 4 EMR Research Agreements, and 1 contract project.

D.M. Barnett transferred from the Department in September 1977 to take a position with the Department of Indian and Northern Affairs as an Environmental Geologist.

L.A. Dredge joined the permanent staff of our Regional Projects Section in September 1977. She received her Ph.D. from the University of Waterloo in May 1977.

J-S. Vincent visited the Centre de géomorphologie of Caen in Normandie for 5 weeks in the fall of 1977 under the France-Canada Scientific Exchange Program.

Attendance at Meetings, Conferences and Courses

J.J. Clague

Presented a paper at the Annual Meeting of the Geological Association of Canada, Vancouver, April 1977.

Presented a paper at the Tenth Congress of the International Union of Quarternary Research (INQUA), Birmingham, England, August 1977.

R.J. Fulton

Annual Meeting of the Geological Association of Canada, Vancouver, April 1977.

Research Managers Course, Ste-Adéle, October 1977.

Canadian Working Group IGCP Project Quaternary Glaciations in Northern Hemisphere, March 1978; he was subgroup leader for Western Canada.

D.R. Grant

Presented a paper at the Symposium on Earth Rheology and Late Cenozoic Isostatic Movements, Stockholm, Sweden, August 1977.

Presented a paper at the Tenth Congress, International Association for Quaternary Research, Birmingham, U.K., August 1977.

Membership on Committees

D.M. Barnett

Ontario Association of Geomorphologists, Liaison member for federal government

R.J. Fulton

Subcommittee on the Classification of Landforms of the Canada Soils Survey Committee, Member

Geological Survey of Canada Radiocarbon Dating Committee, Member

Working Group, UNESCO-IGCP Project, Member

Ad Hoc Committee on Bio-physical Classification, Member

D.R. Grant

INQUA Shorelines Commission, Secretary

Atlantic Provinces Soil Survey Co-ordinating Committee, Member

Working Group, UNESCO-IGCP Project 61, Member

North American Working Group of the IAG Commission on Recent Crustal Movements, Member

Atlantic Provinces Subgroup, IGCP Project 24, Leader

Special Talks or Lectures

S.A. Edlund

"Plant communities in the Arctic" to University of Kansas Plant Ecology class, Lawrence, Kansas, April 1977.

D.R. Grant

"Synopsis of Quaternary crustal delevelling and sealevel changes in Atlantic Canada" to staff and students, programme de maîtrise, Département des Science de la Terre, Université de Québec, February 1978.

J.J. Veillette

"The role of Terrain Sciences Division within G.S.C." (in French) to students from Quebec universities visiting the G.S.C., February 1978.

J-S. Vincent

"The role of Terrain Sciences Division within G.S.C." (in French) to students from Quebec universities visiting the G.S.C., February 1978.

"Moraines de "De Geer" dans la région à l'est de la Baie James" at the Département des Sciences de la Terre, Université de Québec, Montrèal, March 1978.

PALEOECOLOGY AND GEOCHRONOLOGY SECTION

W. Blake, Jr. (Head)

The work of the Paleoecology and Geochronology Section is mainly of a laboratory nature. However, specialized field studies such as the coring of lake sediments are carried out by staff members; in 1977 such studies were undertaken in the Yukon, British Columbia, Ontario, New Brunswick and on Ellesmere Island in the Arctic Archipelago. These field and laboratory investigations provide information on past environments throughout Canada, and, because the analyses of fossil diatoms, insects, marine invertebrates, pollen, seeds and wood are often coupled with radiocarbon age determinations, an appreciation is gained of the rates at which the environment is changing and of the rates at which processes are occurring.

Highlights

- The Yukon Refugium Project, in which the Section continues to participate, is a major interdisciplinary study involving G.S.C. staff members as well as personnel from the National Museum of Man, the National Museum of Natural Sciences, and the University of Alberta.

- A second interdisciplinary project, also concerned with the extent of ice during the last glaciation, is focused on the east coast of Ellesmere Island; archeological studies by the Arctic Institute of North America are being carried out concurrently with studies of glacial history.

Personnel Notes

The Paleoecology and Geochronology Section consists of a permanent staff of 4 Research Scientists, 3 Physical Scientists, and 2 technicians. The Section also supported 7 EMR Research Agreements, and three contract projects; the results from these contracts are tabulated at the end of this report.

Attendance at Meetings, Conferences and Courses

T.W. Anderson

Tenth Congress of the International Union for Quaternary Research (INQUA), Birmingham, England; participated in the field trip to East Anglia, August 1977.

W. Blake, Jr.

Symposium on "The deglaciation of Scandinavia, 15,000 to 10,000 years B.P.", Uppsala, Sweden, March 1978.

J.A. Lowdon

Continued on full-time French language training until September 1977. In his absence I.M. Robertson assumed responsibility for the operation of the Radiocarbon Dating Laboratory.

J.V. Matthews, Jr.

Participated in a field excursion in connection with the annual meeting of the Geological Society of America, Seattle, Washington, November 1977.

R.J. Mott

Continued on full-time French language training until April 1977. L.D. Gill managed the Paleoecology Laboratory prior to his return.

Membership on Committees

T.W. Anderson

Geological Survey of Canada Radiocarbon Dating Committee, Member

W. Blake, Jr.

Canadian National Committee for the International Geological Correlation Programme, Member

Holocene Sub-Commission for the Americas and Greenland (INQUA), Member

Geological Survey of Canada Radiocarbon Dating Committee, Chairman

Geological Survey of Canada Library Policy Committee, Member

Terrain Sciences Committee on Sea Level Changes, Chairman

J.A. Lowdon

Geological Survey of Canada Radiocarbon Dating Committee, Member

J.V. Matthews, Jr.

Beringian Committee, Member

Program Committee, 1978 Meeting of the American Quaternary Association (AMQUA), Member

AMQUA Council, Member

Scientific Committee for a Biological Survey of the Insects of Canada, Member

Special Talks or Lectures

W. Blake, Jr.

"New data on the glacial history of Ellesmere Island, Arctic Canada" to the faculty and graduate students, Department of Geography, University of Stockholm, March 1978.

J.V. Matthews, Jr.

"Arctic Steppe environment" and "Paleoecological and stratigraphic value of fossil insects of Quaternary and Tertiary age" to a general audience of botanists and zoologists and to a specialized audience of paleoecologists and graduate students, Limnological Research Center, University of Minnesota, Minneapolis, April 1977.

"Arctic Steppe environment" and "Paleoecological and stratigraphic value of fossil insects of Quaternary and Tertiary age" at the U.S. Geological Survey, Menlo Park, California, May 1977.

"Arctic Steppe environment" at the Quaternary Research Institute, University of Washington, Seattle, May 1977.

Laboratory and Technical Services Statistics

Paleoecology

Reports completed:

Diatom	32
Fossil Arthropod	2
Palynological	15
Plant Macrofossils	-
Wood	70

Geochronology

Determinations completed:

Radiocarbon ages (GSC)	
Geological samples	166
Archeological samples	5
Geochemical samples	14
Radiocarbon ages (Saskatchewan Research Council - contract)	20
Carbon 13-Carbon 12 ratios (Univ. of Waterloo - contract)	130
Amino acid ages (Univ. of Colorado - contract)	23

MARINE AND COASTAL SECTION

C.F.M. Lewis (Head)

The objectives of the Marine and Coastal Section concern the development of a knowledge base for the fluvial, coastal and seabed regions of Canada's landmass, principally in the Arctic and Pacific Ocean regions. Studies are directed to the regional reconnaissance of the morphology, sediment distribution and fluid dynamics as well as to specific geological, geomorphic and sedimentological processes that cause long and short term changes in these regions. These investigations develop our understanding of terrain performance and provide a basis for assessing the physical impact of various resource developments within the Pacific and Arctic regions.

The Marine and Coastal Section is organized into two units; one that deals with matters in the Pacific region is headquartered in Vancouver, and a second that works on Arctic problems is headquartered in Ottawa. During the year decisions were taken to reorganize and relocate the Section within oceanographic institutes on the east and west coast. As a result the Pacific unit joined the Regional and Economic Geology Division in September 1977 and in 1978 will become part of the Pacific Geoscience Centre at the Institute of Ocean Sciences, Sidney, British Columbia. Most of the Ottawa unit became part of the Atlantic Geoscience Centre at Bedford Institute of Oceanography, Dartmouth, Nova Scotia on April 1, 1978; the fluvial geomorphology component remains with Terrain Sciences Division.

Highlights

- Section members organized and contributed to two one-day symposiums on the Beaufort Sea and Fraser Delta at the April 1977 meeting (Vancouver) of the Geological Association of Canada. These sessions presented recent advances in current knowledge about the marine surficial geology and geophysics of two areas underlying intensive development.

- Review and assessment work was undertaken during the year to assist the government departments directly. For example a technical review was completed of a proposal to establish an oil tanker port and pipeline terminal at Kitimat, B.C.

- A massive compilation of existing and new coastal knowledge in the central high Arctic led to a preliminary draft identification of potential marine terminal sites. This work, part of an MOT planning study of the transportation of potential hydrocarbons out of the Sverdrup Basin, produced 1:250,000 maps of slope, bathymetry, geomorphology and rock type in the coastal zones together with coastal photographic atlases and extensive report-text.

- The field work for a reconnaissance of the coastal morphology and processes of Atlantic Labrador was completed in 1977. The survey perfected the application of diving and geophysical techniques for the acquisition of nearshore data at representative coastal sites. This work will contribute to oil spill contingency and countermeasure planning of the government's Arctic Marine Oil Spill Program.

- Summary results on seabed ice scouring studies in the Beaufort Sea were published during the year. These results, based on seabed geomorphology and sedimentation data were used by the Department of Indian and Northern Affairs to specify "burial" depths for the protection of offshore wellheads from the ice keel impact hazard.

- The Banks Island fluvial geomorphology studies were completed. This work, a systematic study of selected river sections, provides a significant addition to our knowledge of the hydrological and geomorphological processes of high arctic coastal plain rivers.

- A 4-year study of arctic beach morphology and geomorphic processes in the Barrow Strait area was nearly completed. Results were published on local climate and beach sediment movement; further papers on coastal morphology, shore ice organic and coastal processes are in preparation. The knowledge generated by these studies are particularly useful for the practical assessment of potential pipeline crossings and oil spill contingency plans in high arctic ice-infested channels.

- High resolution seismic profiling equipment was acquired and successfully applied in the Beaufort Sea, revealing shallow gas occurrences, buried ice scours, slumping structures and other features in extreme detail. The understanding of seabed environmental processes obtained from data of this kind is essential for a valid assessment of the evolution of the Beaufort seabed terrain and its effect on offshore engineering structures.

Personnel Notes

The Marine and Coastal Section consists of a permanent staff of 3 Research Scientists, 2 Physical Scientists, and 1 technician. The Section also supported one contract project.

B.D. Bornhold, J.L. Luternauer and L.M. Simpson transferred to Marine Geology Section, Cordilleran and Pacific Margin Sudivision, Regional and Economic Geology Division in September 1977.

Attendance at Meetings, Conferences and Courses

S.M. Blasco

Offshore Technology Conference, Houston, Texas, May 1977.

Geophysics Course on Seismic Signal Processing, Calgary, January 1978.

B.D. Bornhold

Presented a paper at the Annual Meeting of the Geological Association of Canada, Vancouver, April 1977.

C.F.M. Lewis

Presented a paper and was co-chairman of a session at the Annual Meeting of the Geological Association of Canada, Vancouver, April 1977.

Presented a paper at the Fourth International Conference on Port and Ocean Engineering Under Arctic Conditions, St. John's, Newfoundland, September 1977.

DFE/EMR Guiding Committee on Offshore Surveys, Dartmouth, November 1977.

Acted as rapporteur at the Labrador Coastal Workshop, Dartmouth, January 1978.

J.L. Luternauer

Presented a paper and was co-chairman of a session at the Annual Meeting of the Geological Association of Canada, Vancouver, April 1977.

P. McLaren

Labrador Coast Workshop, Dartmouth, January 1978.

Presented a paper at the Arctic Marine Oilspill Program Seminar, Calgary, March 1978.

R.B. Taylor

Presented a paper at the Fourth International Conference on Port and Ocean Engineering Under Arctic Conditions, St. John's, Newfoundland, September 1977.

Membership on Committees

T.J. Day

Hydrotechnical Research Committee, Canadian Society of Civil Engineers, Member

Mackenzie Valley Working Group Committee, Member

C.F.M. Lewis

Joint DOE/EMR Guiding Committee on Offshore Surveys, Member

J.L. Luternauer

Coastal Zone Resource Subcommittee of B.C. Land Resources Committee, Member

Estuary Working Group, Member

Special Talks or Lectures

T.J. Day

"Armouring in glacial stream beds" to Department of Geological Sciences, Brock University, February 1978.

C.F.M. Lewis

"Aspects of Arctic shorelines with respect to oil spill countermeasures", Arctic Petroleum Operators Association Environmental Workshop, Fairmount Hot Springs, B.C., April 1977.

P. McLaren

"Coastal geology of Labrador" to industry and government at the Bedford Institute, Dartmouth, January 1978.

"Coastal processes of a high arctic environment" to students at the University of Calgary, February 1978.

ENGINEERING AND ENVIRONMENTAL GEOLOGY SECTION

E.B. Owen (Head)

This Section is concerned with studies of the physical and engineering characteristics of geological materials for engineering and/or terrain use purposes. Also, advice and consultation is provided by the staff of the Section to various government agencies. Included in this is a major project to determine the feasibility of storing high-level radioactive wastes in plutonic crystalline rocks within the Province of Ontario. This project is being conducted in conjunction with Atomic Energy of Canada Limited who have hired and seconded to the Section four scientists to assist in the project.

Highlights

- As part of the Program for the Geological Disposal of High-Level Radioactive Wastes, a diamond drilling project was conducted at Chalk River, Ontario to provide samples of plutonic rocks for laboratory tests and for the testing of geophysical and hydrogeological equipment.

- As a back-up to the geologic data obtained from the core obtained during the drilling at Chalk River, a borehole TV camera was lowered down each hole and the bedrock exposed was photographed.

- Field investigations of potential areas for radioactive waste disposal were suspended for this year; however, office evaluations of all areas of crystalline, plutonic rocks within Ontario continued.

- A data file, in which it was proposed to place all the geologic data obtained by the various components of the Program, was initiated.

- Geologic data from boreholes have been placed on magnetic tapes and microfiche for some 28 municipalities throughout Canada, completing the urban geology component of the activities of the Section.

- A study of the geological variability of marine clay in the Ottawa-St. Lawrence Lowland is nearing completion.

- A study on slope processes and cryogenic processes in the central Arctic Island was started.

Personnel Notes

The Engineering and Environmental Geology Section consists of a permanent staff of 2 Research Scientists, 5 Physical Scientists, and 1 technician. The Section also supported 2 EMR Research Agreements.

J.A. Heginbottom returned to Terrain Sciences Division from a 2-year secondment to Department of Indian and Northern Affairs (Mackenzie Valley Pipeline Inquiry).

P.J. Kurfurst is on leave of absence for a year starting September 1, 1977 to Lawrence Berkeley Laboratory (LBL), University of California, participating in a joint radioactive waste disposal program between the United States (ERDA - Energy Research Development Administration) and Sweden (State Power Board). His duties include supervision, management, and co-ordinating the entire field program in Stripa, Sweden for five months and at LBL in Berkeley on engineering and rock mechanic problems associated with the program.

Attendance at Meetings, Conferences and Courses

P.B. Fransham

Presented a paper at 30th Canadian Geotechnical Conference, Saskatoon, October 1977.

Presented a paper at Permafrost Conference, Saskatoon, October 1977.

N.R. Gadd

69th New England Intercollegiate Geological Conference, Quebec City, September 1977.

J.A. Heginbottom

Symposium on Permafrost Field Methods and Geophysics, Saskatoon, October 1977.

Meetings of NRC/ACGR Permafrost Subcommittee and Organizing Committee for 3rd International Permafrost Conference, Saskatoon, October 1977.

30th Canadian Geotechnical Conference, Saskatoon, October 1977.

CAP Assessment, Touraine, Quebec, October 1977.

L.E. Jackson

Canadian Land Reclamation Association Second Annual Meeting, Edmonton, August 1977.

Mine Reclamation Symposium, Vernon, British Columbia, March 1978.

E.B. Owen

Meetings of the Association of Engineering Geologists, Seattle, Washington, November 1977.

Membership on Committees

J.R. Bélanger

Branch Computer Facilities Committee, Member

Terrain Sciences Divisional Computer Committee, Member

J.A. Heginbottom

International Biological Program, Ecological Sites Working Group (DINA), Member

Interdepartmental Working Group on Settlement Suitability Analysis (DFE), Member

Terrain Sciences Division Research Agreements Committee, Member

Terrain Sciences Displays Committee, Chairman

P.J. Kurfurst

Associate Committee on Rock Mechanics, Member

E.B. Owen

Mackenzie Highway Environmental Working Group, Member

Advisory Committee on Mine Tailings (Atomic Energy Control Board), Member

Committee on Nuclear Site Evaluations (Atomic Energy Control Board), Member

Radwaste Program Managers Committee, Member

Special Talks or Lectures

J.R. Bélanger

"Urban geology" to Geography students, University of Ottawa, February 1978.

P.B. Fransham

"Engineering characteristics of sensitive clay deposits" to staff and students, Carleton University, Ottawa, February 1978.

"Engineering geology of sensitive clay deposits" to staff and students, McGill University, Montreal, February 1978.

"Geology of sensitive clays of the Ottawa Valley" to staff and students, Concordia University, Montreal, March 1978.

N.R. Gadd

"Correlation problems in eastern Canada and specifically Ottawa-St. Lawrence Valleys" to Department of Geography, Carleton University, Ottawa, October 1977.

"The role of Terrain Sciences Division within G.S.C." (in French) to students from Quebec universities visiting the G.S.C., February 1978.

J.A. Heginbottom

"The role of Terrain Sciences Division within G.S.C." to students from Quebec universities visiting the G.S.C., February 1978.

E.B. Owen

"Oil and gas exploration activities and pipeline construction, Canadian Arctic" at St. Joseph's High School, Ottawa, January 1978.

SEDIMENTOLOGY AND MINERAL TRACING SECTION

W.W. Shilts (Head)

This Section is concerned with the study of geomorphological and sedimentological processes and with the development of mineral prospecting techniques that use glacial drift as the prospecting medium. Laboratory functions that support these and other analytical and technical requirements of the Division are also located in this Section.

Most of the activities of the Section relate to developing a better understanding of the mode of emplacement and post depositional changes that affect glacial and associated deposits. Work has been concentrated in the District of Keewatin and in the northeastern Baffin Island area.

Highlights

- On Bylot Island a study was initiated to investigate the sedimentology of debris in transport in modern glaciers that drain from highly metamorphosed Precambrian highlands onto poorly consolidated Mesozoic sediments. This area was chosen because (1) the distinct compositional differences between these two types of terrain allow deductions about the processes of glacial erosion and transportation (essential to developing theories to guide drift prospecting) to be made; (2) because the independent ice cap and outlet glaciers, centered on Precambrian terrain, constitute a "model" of the Canadian landmass with which many theories of glacial erosion and transport can be tested; and (3) the island is at the northeast edge of the Laurentide Ice Sheet where little is known of the glacial history. As a result of this reconnaissance and sampling, further work was planned to map the Quaternary geology and study the glaciers in more detail.

- Mapping of the surficial geology of southern Keewatin was completed by ground checking the last of 15, 1:250,000 scale map sheets ($\sim$140,000 km^2).

- Extensive sampling, seismic and S.C.U.B.A. diving surveys of a major lake basin were carried out near Ferguson Lake and adjacent to the proposed arctic islands pipeline route in southern Keewatin. This work is designed to clarify the physical, biological, and chemical processes that are peculiar to arctic lakes; although there are literally millions of lakes in the low arctic, almost no information of this sort is available for them. Work to date has confirmed or described (1) the very low rate of lacustrine sediment b ildup (<1m per 5000 years); (2) the presence of slumping on the lake bottom; (3) extensive development of manganese crusts at certain depths; (4) diatomaceous nature of modern sediment (5) thick marine sediment underlying modern sediment; and (6) highly oxidizing c nditions on the lake bottom. These findings will be

indispensible in evaluating the effects of sedimentation caused by man-made excavations (for instance during pipeline construction), for evaluating geochemical responses of lake sediments to metal input from their basins (geochemical prospecting), and to evaluating the potential ability of a typical lake to oxidize organic and inorganic wastes dumped into it.

- At the invitation of the Nova Scotia Department of Mines several till exposures were studied. These exposures were discussed and sampled to provide guidance for till sampling and analysis in support of a Federal-Provincial lake sediment sampling program.

- Instruments were installed in central Keewatin to monitor the rates and define the processes of periglacial movements in areas typical of terrain traversed by the proposed central arctic pipeline.

- Studies of "high-water events" associated with spring breakup were conducted along the Yukon River.

- A study of the nature and amounts of glacial erosion was initiated. Using the curves determined for the glacial dispersal of distinctive red beds of the Dubawnt Group in Keewatin, an estimate will be made of the amount of rock removed from the Dubawnt outcrop area during the last glaciation. Although funded by the Geological Survey and using the extensive sample collection of the Survey in 1977-78, the study will be eventually funded through Atomic Energy of Canada Limited as part of their research into geological considerations for disposal of high-level radioactive wastes.

- Studies of the relationship of trace element concentrations in tundra plants to those in glacial soils were studied under contract in Keewatin. This program was closely integrated with drift prospecting and mapping studies in central Keewatin. It is hoped that the data will provide the first insights into the movement of metals from arctic soils through the food chain in addition to providing techniques useful for biogeochemical prospecting.

- Main scientific achievements of these projects during the year were:

  (1) Refining the understanding of lacustrine sedimentation processes in arctic lakes. Sediment accumulation <1m/5000 years on average.

  (2) Dubawnt dispersal train dimensions confirm that a major part of the Laurentide Ice Sheet grew and was centered on land west of Hudson Bay. Has vital implications for climatic history, isostatic processes, and glacial stratigraphy. (National Science Foundation (U.S.) is spending vast sums on these problems, mainly attempting to extrapolate Antarctic conditions to the Canadian arctic during the last glaciation).

(3) The Keewatin ice divide swings eastward, parallel to the Manitoba border, almost to Hudson Bay at its southern end.

(4) Glaciers on Bylot Island have debris bands composed of debris that can be proven to have been derived basally, even high within the ice.

(5) Highwater events in some portions of the Mackenzie Valley can be predicted by studying the dendrochronology of trees destroyed by ice pans during floods.

(6) Trace element geochemistry of various fractions of till can be used to separate tills of different ages in some cases; it can also confirm directions of ice flow.

(7) Bulk magnetic susceptibility of the sand fraction of till was shown to be a reasonable indicator of magnetic mineral content, and can be used to determine ice flow directions and stratigraphic unit correlations (done in co-operation with the Geological Survey of Finland).

(8) The surficial geology mapping legend developed for the Kaminak Lake area has been refined and proven to be applicable, without modification to most tundra areas of the Canadian Shield. It has been applied successfully (mostly on contract) to over 140,000 km^2 of glaciated terrain, producing detailed accurate glacial geological maps.

Personnel Notes

The Sedimentology and Mineral Tracing Section consists of a permanent staff of 3 Research Scientists, 3 Physical Scientists, and 4 technicians. The Section also supported 2 doctoral students, 1 EMR Research Agreement, and 1 contract project.

Attendance at Meetings, Conferences and Courses

R.N.W. DiLabio

46th Annual Convention of the Prospectors and Developers Association, Toronto, March 1978.

R.A. Klassen

Presented a paper at the Prospecting in Areas of Glaciated Terrain Conference, sponsored by the Institution of Mining and Metallurgy Helsinki, August 1977.

International Symposium on Geophysics and Geochemistry Applied to the Search for Metallic Ores Conference, Ottawa, October 1977.

W.E. Podolak

Friends of the Pleistocene Annual Meeting, Mt. Washington, New Hampshire, May 1977.

W.W. Shilts

Friends of the Pleistocene Annual Meeting, Mt. Washington, New Hampshire, May 1977.

46th Annual Convention of the Prospectors and Developers Association, Toronto, March 1978.

Membership on Committees

W.W. Shilts

Permafrost Subcommittee of the Associate Committee on Geotechnical Research, Member

Organizing Committee for Third International Conference on Permafrost, Edmonton 1978, Member

INQUA, Commission on Genesis and Lithology of Quaternary Deposits, Corresponding Member

INQUA, Working Group 9, Glacigene Deposits as Indicators of Glacial Movements, Member

International Geological Correlation Program (Quaternary Glaciations in the Northern Hemisphere), Member

Special Talks or Lectures

R.A. Klassen

"The geological history of the Ottawa Valley" to Ottawa Kiwanis Club, December 1978.

Sedimentology-Engineering Geology Laboratory

Sample analyses and tests are carried out by the sedimentology laboratory primarily for Terrain Sciences Division staff and some research scientists contracted by the Division. Approximately twenty-five researchers submitted samples involving about 7800 operations. The budgetary expenditures for the year 1977-78 was approximately $47,400 resulting in a cost of about $6.00 per operation. The operations are summarized as follows.

	No. of Samples
Freeze Drying	1785
Sample Preparation	
Involves sieving, splitting, weighing and labelling	2233
Grain Size Analysis	
Complete Sieve and Pipette	660
Gravel, Sand, Silt, Clay	445
Sieve	216
Wet and Dry Sieving	68
Moisture Content	
Hygroscopic Moisture	1068
Natural Water Content	39
Atterberg Limits	320
Carbonate Content	
Calcite-Dolomite Ratio	161
Total Carbonate Content	466
Specific Gravity	69
Organic Matter	186
PH Determination	96

CAREER-ORIENTED SUMMER EMPLOYMENT PROGRAM (COSEP)

1978 Field Season

Although this report is concerned with employment carried out after the period covered by the 1977-78 Internal Annual Report, hiring for it was initiated prior to March 31, 1978 and it is thus appropriate to include it with the 1977-78 data.

Various summer employment programs were available to departments in 1978. Some of these programs were Non-Career Program and Summer Job Corp which were co-ordinated by Canada Manpower and the Career-Oriented Summer Employment Program (COSEP) co-ordinated by the Public Service Commission. Geological Survey of Canada hired most of its students under COSEP.

A total of 705 student applications were received by the Survey from across Canada. Nine percent (9%) of these applicants indicated nonmobility. One hundred and sixty-six students were offered summer employment, 32 refused, leaving a grand total of 134 students hired. This total included 30 females and 20 francophones.

Of the total number of offers 75 percent (75%) were made to male students (124) offers. Female offers represented 25 percent (25%) (42 offers) of the total. Sixteen percent (16%) of the total offers were made to French-speaking students (27 offers).

The largest number of students (55) were hired from Ontario; the second highest (26) from Quebec. The Ontario and Quebec figures are influenced in part by the fact that few students other than those living in the National Capital Region were willing to work in the Ottawa labs because, unlike field postings, meals and lodgings are not provided. Nine percent (9%) of all COSEP positions were in Ottawa.

The number of applications received for 1978 employment was down by 115 or 20 percent (20%) compared to 1977. For Quebec (including Ottwa University) the number of applications was up by 51 or 27 percent (51 or 27%).

About 10 percent (10%) of all applicants regardless of sex or official language indicated that they were not mobile for employment. In some ways this equivalence is surprising because 40 percent (40%) of the Quebec applicants indicated that they were conversant only in French and thus could be expected to we less willing to take a job anywhere in Canada.

The summer of 1978 Career-Oriented Summer Employment Program (COSEP) gained some significance over previous years in that the Public Service Commission delagated Staffing Authority to our Department. The Staffing Authority further empowered the Geological Survey of Canada to select, offer and appoint post-secondary students for our summer positions.

The intent of the new staffing authority was to enable Departments to complete staffing under COSEP with a minimum of delay. This objective was

indeed met in that most of our offers to students were completed by February 1978 as opposed to considerable delays in the previous year.

The result of implementing the new staffing delegation however had considerable effects on Personnel's support resources. The Post-Secondary Recruitment Program which formerly sent offers to students etc. liquidated approximately 15 man-years from its establishment upon delegation. Increased work load was in the form of typing letters of offer and contracts, creating and maintaining COSEP staffing files which are subject to audit, handling a considerable number of complaints and inquiries from students, members of parliament and university professors both orally and in writing.

To handle and respond to complaints and inquiries, indicated a need to gather comprehensive data for statistical reports for the use of our managers, Director General and ad hoc situations. These requests necessitated the creation of all kinds of control charts and internal forms to gather and retrieve the information.

The increase in work load was fortunately met through acquiring support resources through the Federal Labour and Intensive Program.

STAFF LIST

(as supplied by reporting units; August 1978)

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McLaren, D.J., Director General
Smalldridge, Mrs. J., Secretary
Wheeler, J.O., Deputy Director General
Birtch, Mrs. E.J., Secretary
Fyles, J.G. (seconded to DINA)
Hall, E., Scientific Executive Officer

Special Projects

Bolton, T.E.
Douglas, R.J.W.

Program Office

Brindle, J.E.
Carr, Mrs. E.J., Secretary
Benson, D.G.
Petre, Ms. M.A.
Stalker, D.W.

International Union of Geological Sciences

Hutchison, W.W., Secretary General
Lafferty, Mrs. V., Executive Assistant

Data Systems Group Development

Hutchison, W.W.
Aitken, Ms. L., Secretary
Martin, Ms. G.
Picklyk, D.D.
Scaga, T.

ATLANTIC GEOSCIENCE CENTRE

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MacDonald, Mrs. M.E., Secretary

Administrative

Stewart, P.G., Administrative Officer
Simmons, C.A.R., Secretary
Racine, Mrs. C., Personnel
Campbell, Mrs. D., Accounts
Henderson, T., Accounts
Younger, D.

Post-doctorate fellows

Bryant, R.
Long, B.
Rosen, P.
Carter, L.

SECONDED TO DEPARTMENT OF ENVIRONMENT

Charest, Mrs. J., Library
Hale, K.G., Drafting
Mazerall, A., Library

Environmental Marine Geology Subdivision

Buckley, D.E.
Middleton, C., Secretary
Robertson, K.R.

Coastal Geodynamics

Reinson, G.
Frobel, D.
Clattenburg, D.
McCann, S.B.
Amos, C.L.
Lewis, C.F.M.
Job, R.
Blasco, S.
McLaren, P.
Taylor, R.B.

Marine Geochemistry

Rashid, M.A.
Cranston, R.
Winters, G.
Fitzgerald, R.A.
Leblanc, K.W.G.

Paleoecology

Schafer, C.T.
Vilks, G.
Wagner, F.
Deonarine, B.
Cole, F.

Eastern Petroleum Geology Subdivision

Purcell, L.P.
Mitchell, C., Secretary

Coal Petrology

Hacquebard, P.A.
Avery, M.

Drafting

Grant, G.
Cook, G.

Labrador - Baffin Group

Umpleby, D.
Hardy, I.
Grant, A.
Jackson, A.
Gradstein, F.
Williams, G.
Thomas, F.C.

Paleozoic Basins

Howie, R.

Scotian Shelf
Grand Banks - Margin Group

Wade, J.
Jansa, L.
Ascoli, P.
Bujak, J.
Girouard, P.

Biostratigraphy

Barss, M.S.
MacMillan, W.
Crilley, B.

Regional Reconnaissance Subdivision

Ross, D.I.
Myers, Ms. J.M., Secretary

Surficial and Bedrock Geology

King, L.H.
Fader, G.
Miller, B.
Josenhans, H.

Eastern Arctic Offshore Geology

Falconer, R.
MacLean, B.

Labrador Sea Studies

Srivastava, S.
Fillon, R.
Livingstone, D.

Ocean Basins and Margins

Moores, S.
Keen, C.E.
Barrett, D.L.
Jackson, R.
Loncarevic, B.D.

Geophysical Surveys

Haworth, R.T.
MacIntyre, J.B.
Folinsbee, R.A.
Woodside, J.M.

Seismic Support

Corbett, T.J.
Nielson, J.A.
Coady, V.F.
Courtney, T.F.
Inkpen, B.F.

Gravity Support

Hughes, M.

Program Support Subdivision

Manchester, K.F.

Systems Development

Heffler, D.
Locke, D.
Boyce, W.A.

Data Systems

Fricker, A.
Shih, K.G.
Johnston, B.L.
Sparkes, R.
Beaver, D.E.
Sherin, A.

Marine Geological Technical

Gorveatt, M.E.
Ewing, F.
Murphy, R.j.
Jodrey, F.D.

CENTRAL LABORATORIES AND ADMINISTRATIVE SERVICES

Maxwell, J.A., Director
Traill, R.J., Assistant Director
Lapp, J.H., Administrative Officer
Clemmer, Mrs. J.E., Secretary

Branch Administrative Services

Casey, Mrs. M.A.F., Head
Lacelle, Mrs. K.

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Shipman, C.J.
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Salter, I.C.

Secretarial and Word Processing Centre

Legere, Miss J.
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Busby, Miss D.A.
Ford, Mrs. B.
Gilliland, Mrs. J.
Joly, Mrs. T.H.
Lalonde, Mrs. S.M.
Parnham, Mrs. S.J.

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Robillard, R.D.
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Graham, M.J.
Colterman, M.

Financial Services

Bowstead, C.C., Comptroller
Tsang, A.W.

Accounts

Going, M.I.
Deslauriers, Mrs. I.M.
MacDonald, Ms. M.
Newberry, Miss K.E.
Taylor, Miss R.S.
Casey, R.

Analytical Chemistry Section

Abbey, Sydney, Head

Chemical and X-Ray Laboratories

Bertrand, Mrs. N.
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Grushman, Mrs. V.E.
Guillas, R.J.
Lachance, G.R.
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Spectrographic Laboratories

Bélanger, P.G.
Bender, G.P.
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Church, K.A.
Meeds, C.F.
Roxburgh, Mrs. N.

Mineralogy Section

Traill, R.J., Head

Mineralogical Studies

Bonardi, M.
Delabio, R.N.
Plant, A.G.
Pringle, G.J.
Roberts, A.C.
Stenson, Mrs. A.P.
Walker, D.A.
Watson, D.M.

Mineral Separation and Sample Preparation

Paris, J.C.
Christie, R.W.
Gilmour, J.C.
Going, S.
Huot, J.M.R.
Machin, B.D.

National Collections

Steacy, H.R.
Ansell, H.G.
Littlejohn, A.C.
ter Haar Romeny, W.U.

Mineral and Rock Set Preparation

Larose, J.M.
Racine, T.H.

Technical Services Section

Meilleur, G.A., Head

Mechanical Services and Instrument Development Shop

Cregheur, A.Y.
Lalonde, J.K.
Walker, B.A.

Electronic Services

Coté, O.L.

GEOLOGICAL INFORMATION DIVISION
(effective October, 1978)

Harker, P., Director
Blackadar, R.G., Assistant Director
Claude, Y.P., Administrative Officer
Demars-Charette, Mrs. G., Secretary
Firth, L.A.
Griffin, P.J.
Kiel, M.J.
Mahoney, Mrs. L.R.
Vincent, L.-E.

Publications and Distribution

Touchette, J.L.
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Letang, E.G.
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Playford, J.W.

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Pleasant, Miss R.
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Reade, D.
Roadhouse, D.F.C.
Smith, E.A.
Tedford, D.
Wilcox, A.F.
Yee, Mrs. I.S.L.

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Roberts, J.G.
Champagne, L.
Di Millo, Mrs. M.
Knudson, Miss K.
Lavigne, G.H.
Mainville, B.
Sauvageau, J.A.R.

Drafting Unit A

Debain, P.

Subunit A-1

Williams, J.B.F.

Subunit A-1 cont.

Brown, D.G.
Ferguson, J.
Grenier, N.
Saffin, R.E.
St. Pierre, M.
Thomson, H.A.
Yelle, J.S.

Subunit A-2

Gagnon, J.G.E.
Corriveau, J.-P.
Papps, T.L.
Pratt, J.A.Y.
St. Pierre-Savard, Mrs. Y.

Drafting Unit B

Babcock, L.W.

Subunit B-1

Bill, J.
Foster, V.
Fouchard, G.W.
Froberg, Mrs. S.
Kovachic, Mrs. H.
Kurfurst, Mrs. D.
Maahs, E.

Subunit B-2

Daugherty, R.F.
Allard, R.
Corrigan, P.
Hill, R.S.
McKenzie, N.M.
Raddatz, Miss M.A.
Simonds, Mrs. B.J.

Drafting Unit C

Dumbrell, E.A.

Subunit C-1

Finn, H.J.
Bouvier, Miss G.
Daley, L.A.
Enright, M.L.
Fairfield, R.D.J.
Heney, F.J.

Subunit C-2

Barbary, G.J.
Coulthart, I.A.
King, J.A.
Perron, R.R.
Potvin, R.Y.
Renaud, L.P.
Young, W.G.

Photomechanical Unit

Buck, N.E.
de la Fontaine, M.E.
MacKenzie, R.J.G.
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