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GSCHIS-A018 Hubert Gabrielse *Cordilleran Office of the Geological Survey of Canada*

Biography:

Hubert Gabrielse, BASc, MASc UBC 1950, PhD Columbia Univ, 1955, FRSC.

Dr. Gabrielse devoted his entire career with the Geological Survey of Canada (GSC) in regional geological studies of the Cordilleran of north-central British Columbia and adjacent southeastern Yukon and southwestern Northwest Territories beginning in 1947 as a student assistant on a field party, retirement from GSC 46 years later in 1993, followed by emeritus status for 15 years. With more than 100 published papers on the stratigraphic, structural and tectonic evolution of the northern Cordilleran papers, he became the acknowledged expert and delivered many requested lectures at several B.C. universities and Kiwanis meetings as well as at formal meetings of geoscientist associations.

Dr. Gabrielse was appointed head of the GSC Cordilleran office in 1970 and served for nine years. In addition to being elected a fellow of the Royal Society of Canada in 1975, the Geological Association of Canada, Canada's most prestigious geoscientific organization, awarded him both the Ambrose Medal (for sustained dedicated service to the Canadian earth science community) and, its highest award, the Logan Medal (for sustained distinguished achievement in Canadian earth science).

CORDILLERAN OFFICE OF THE GEOLOGICAL SURVEY OF CANADA

OVERVIEW

The main focus of the Vancouver Office for its entire existence has been the geological mapping of the western Cordilleran region. This work had evolved markedly over the years with both increased access to study areas and great advances in paleontological, radiometric age determinations, aeromagnetic and other airborne techniques, geochemical surveys, etc. Since 1970 helicopter supported mapping has been carried out in a number regions throughout the Cordillera. These studies have benefitted from participation of experts in several disciplines and by increasing refinement of the expertise in these disciplines. For example, radiometric age determinations have been invaluable in studies of the Coast Mountains plutonic and related rocks, the age and provenance of widespread tuffaceous rocks in the Bowser Basin, the timing of young volcanic events throughout the Cordillera and the plutonic history of southern British Columbia.

Geological mapping has been invaluable to the mineral exploration industry which has depended on the geological information to focus on exploration targets for a variety of minerals. This exploration has been guided by lithology and age of potential host rocks. The Geological Survey's airborne methods have also been widely used by industry.

With its expertise in the geology of the western Cordillera the GSC has been influential in the interpretation of Plate Tectonics which was introduced to the scientific community in the late 1960s. The Cordilleran region has been a great laboratory for the application of concepts related to plate tectonics. The importance of subduction along the western continental margin, its relation with volcanism along the western margin of the continent and in the coastal and interior regions of the Cordillera and also, the relation of subduction to earthquakes has been studied by the geophysical group in Patricia Bay. Recently, exciting new research of the effects of the collision of the Yakutat block with southeastern Alaska has been related to the uplift of the eastern Alaska Range and deformation as far east as the Mackenzie Mountains. Plate tectonic mechanisms have also explained the anomalous terranes that occur in the Cordillera region, for example the oceanic Sylvester Allochthon in the Cassiar Mountains of northern British Columbia which overlies typical miogeoclinal strata over an extensive area.

Mineral exploration in the Cordillera has been guided by geological maps and concepts provided by the GSC and the British Columbia and Yukon geological surveys. Geophysical, geochemical, paleontological, and detailed mapping projects have been utilized by industry to focus on exploration targets.

EVOLUTION OF GEOLOGICAL CONCEPTS IN THE CANADIAN CORDILLERA

The evolution of geological concepts in Cordilleran geology can be viewed with respect to three simplistic questions that geologists ask when a rock exposure or outcrop is examined- what is its location? what is it? and how did it get that way? In the following discussion I will try to show how the answers to these questions have evolved over the history of geological studies in the Cordilleran region. Perhaps on a more controversial note I will also comment on the role that GSC management has played.

What we know about the geology of the Cordillera represents the cumulative knowledge gained from almost 150 years of research. Early investigations were either related to mineral districts, particularly placer gold, or involved a number of remarkable reconnaissance trips in previously unmapped terrains. This period of study can be labeled the heroic age, in large part pertaining to modes of travel. During the late 1800s A.R.C. Selwyn, G.M. Dawson and R.G. McConnell directed remarkable explorations along travel routes in the central and northern Cordillera. Obviously the results of these surveys were fragmentary but they provided some of the first information on the distribution of rock types in the region. These were very capable scientists and they had little problem with the question “what is it ?” when examining an outcrop but had a difficult problem in precisely defining “where is it ?” and probably spent very little thought on the question of “how did it get that way?”. R.G. McConnell spent several summers in the late1890s and early 1900s studying the surficial deposits of the Klondike region in response to the gold placer activity. Except for studies around gold-placer areas very little systematic mapping of surficial deposits took place in the northern Cordillera until the late 1900s. Bedrock mapping provided some information on glacial features which were incorporated into regional maps but generally broader concepts involving the distribution, character and age of surficial deposits was sparse or lacking.

R.A. Daly, attached to the Canada-U.S. boundary survey made a study of the geology along the border in the early 1900s. His work resulted in some useful local observations as did R.G. McConnell’s expedition in the Finlay River area. Generally, attempts to synthesize the geology of the Cordillera were hampered by the fragmentary distribution of the mapping until the late 1940s. Arbitrarily, the end of the heroic age can be marked at the introduction of air photos. In 1948 the Canadian Air Force undertook a project called Operation High Rise in which all of Canada was photographed, generally from an elevation of about 20, 000 feet. Previously, some air photos were made available by the U.S. Air Force for parts of the western Cordillera. Our question of “where is it “? became much less of a problem as the photos facilitated accurate locations of geological features and aided immensely in determining routes of travel.

The late 40s and early 50s saw as great burst in geological mapping in all parts of the Cordillera. I refer to this as the doctorate training age. During this time the Geological Survey hired a great number of people who had just completed their doctoral studies or were involved in studies leading to Ph. D. theses. It is interesting to note the influence of various thesis advisors from universities in many parts of North America on the products produced by their students. Many of the students used map-areas or particular features of map-areas as the topic for their studies. In 1950 about 20 mapping projects were underway in British Columbia and Yukon Territory. In the western part of the Cordillera, however, the results of these mapping projects were generally disjointed and regional syntheses not commonly attempted. Of immense value during this time, however, was the strength of the Paleontology Section in the Survey which had specialists, commonly of world renown, for most of the geological periods. Their contribution to the understanding of Cordilleran geology was enormous. Age dating of plutonic, volcanic and metamorphic rocks was in its infancy in the 50s and 60s. Most K/Ar dating was, largely under the influence of Cliff Stockwell, devoted to the Canadian Shield. This period in Cordilleran mapping produced much new information on the nature and distribution of geological elements and resulted in the production of a geological map of British Columbia authored by H.W. Little and a map of Yukon Territory produced by H.S. Bostock. The “how did it get that way?” question was little discussed. In the broadest sense the terms miogeosyncline and eugeosyncline were applied to the rocks of the eastern and western Cordillera, respectively.

The golden age of Cordilleran mapping began in the late 1950s and extended, perhaps, into the mid 1980s. Mapping of large tracts of country was facilitated by the use of helicopters and fixed wing aircraft. Large multidisciplinary operations, including Operations Stikine, Mackenzie, Nahanni, Pelly, Finlay, Dease, St. Elias and some in the Rocky Mountains led to an immense inventory of geological data . Concurrently, a number of traditional four-mile mapping projects were being carried out elsewhere in the Cordillera. Concurrently with this golden age of mapping the GSC's budget increased from about $1, 200, 000 in 1950 to around $15,000,000 in 1970 and personnel increased from 150 to 565.

With the large amount of data available some attempts were made to apply some sort of tectonic framework for the regional geology. John Wheeler and I made an attempt to apply such a framework for parts of southern Yukon Territory and adjacent northern British Columbia. Armed with the results of Operations Mackenzie and Nahanni I wrote a paper naming a number of the prominent tectonic features in the region, some of which, amazingly have survived to this day albeit with various refinements by those with more recent insights. Of great significance John Wheeler introduced the concept of two crystalline belts which were named the Omineca and Coast Plutonic. Tuzo Wilson concluded that these two belt, extending essentially the full length of the Cordillera suggested the evolution of two eugeosynclines.

All of our thinking about the history of the Cordilleran region evolved dramatically in the late 1960s and 1970s. The concepts of Plate Tectonics revolutionized ideas of the relationships between geological elements and resulted in the preparation of tectonic assemblage and terrain maps and a number of papers dealing with plate-tectonic concepts. Our awakening to the significance of plate tectonics came when John Wheeler, Jim Roddick , Bill Hutchison, Jack Souther and I were invited to the second Penrose Conference, chaired by Bill Dickinson, held in Asilomar in California. It became clear that American geologists working in western North America were already applying plate-tectonic concepts in an attempt to explain their regional geology. The GSC introduced these ideas to the geological community in Vancouver at GAC meetings which Bill Hutchison and John Wheeler had initiated by playing major roles in starting a Cordilleran Section about 1970. Jim Monger, Jack Souther and I wrote a paper published in the American Journal of Science applying plate-tectonic concepts to Cordilleran geology. In the mid 70s Dirk Tempelman-Kluit wrote a paper attributing a number of geological elements in the southwestern Yukon Territory to the opening and closing of an oceanic basin leading to his recognition by the GAC award of the outstanding young scientist medal.

In the 1970s the Cordilleran Subdivision was enlarged with the addition of a marine unit led by Don Tiffin. The four positions for this group was supplied by transfer from the Department of Fisheries and Oceans. Later in the decade they were transferred to Patricia Bay where they had ready access to ships. When these people moved to the new facility in Patricia Bay they were joined by Chris Yorath and John Luternauer.

Another revolution in Cordilleran geology took place in the 1970s with the enormous success of GAC meetings which led by the Survey brought together Survey geologists, mineral exploration personnel, academics and invited speakers. One two-day meeting had more than 1000 attendees. A theme for many of these meetings was the relationship between tectonic assemblages and mineral deposits. This resulted in the GSC's preparation of a Tectonic Assemblage map published in 1980 with input from almost all staff members and contributions from a great number of winter-works people provided by federal government largesse. The map was later updated by the current version edited by John Wheeler. The program facilitated an enormous amount of compilation activity during the 1970s. Data on the surficial geology of the Vancouver region was researched and compiled.

Geri Eisbacher's research into the sedimentology of the Sustut Basin in north-central B.C. and of the Rapitan Group in the Mackenzie Mountains were significant contributions during the 1970s. Geri recognized the glaciogenic origin of diamictites in the Mackenzies and wrote papers on sedimentation and tectonics related to the interior clastic, sedimentary basins.

A new dimension to the paleontology support was facilitated in the 70s by the hiring of Bruce Cameron,- a conodont specialist. With dating provided by conodonts and later by radiolaria, previously large tracts of poorly dated geological units were assigned ages. Mike Orchard contributed critical dating of many fine-grained clastic units and Fabrice Cordey utilized radiolaria to refine the dating of chert assemblages.

In the 1980s and 1990s advances in age determination methods including Ar39/Ar40, Zircon, etc. helped define plutonic and volcanic suites. Seismic reflection and refraction studies increased our understanding of the structure of the earth's crust. Concepts on the nature and origin of regional faults focused attention on the interaction of crustal plates. Multidisciplinary studies of pericratonic terranes sparked much speculation on the relationships between these terranes and Ancestral North America. Much new data on the stratigraphy and structure of the pericratonic terranes marked major advances is our knowledge of Cordilleran geology. GAC publications on the pericratonic terranes and on an analysis of paleomagnetic and transcurrent fault data contained modern views on stratigraphy and structure.

Cordilleran Subdivision and GSC Management

Until 1961 the Cordilleran Section and the current ISPG were based in Ottawa. The move to Vancouver by seven geologists, joining Jack Armstrong who was the resident geologist at the time made liaison between them and the four Cordilleran geologists remaining in Ottawa difficult. Hew Little became the Section Head in Vancouver and Hugh Bostock continued to administer those left in Ottawa. I don't recall ever having a discussion about the Cordilleran program with Hew during the 1960s. In 1969 the Section was brought together in the Sun Tower Building where it remained until the move to the Vancouver Building, its present location, in 1996 (check). Hew Little's position was taken over by John Wheeler when Hew was moved to Ottawa to lead the Survey's uranium program. The Vancouver group was reinforced during the 1960s by the addition of Bill Hutchison, Aleck Baer and later, Geri Eisbacher.

John Wheeler was transferred to Ottawa late in 1970 and I took over as Head of the Pacific and Cordilleran Section (later to become a Subdivision of Regional and Economic Geology). The management organization during the 1970s and into the 1980s was extremely favourable for our group in Vancouver. J. O. was the Head of our Division, Cliff Lord was the Chief Geologist, and Yves Fortier the Director. Later, John Reesor became our Division Chief, J.O. assumed the role of Chief Geologist and Digby McLaren the role of Director. Having knowledgable friends in the senior management positions in Ottawa was a bonus for us. Later, Ray Price became Director, continuing a strong liaison with the Cordilleran groups.

During this time the Cordilleran Subdivision had a reasonably stable budget for its field projects. The program was organized in Vancouver and defended in Ottawa at Division meetings. The projects were driven by several initiatives including regional studies of tectonic assemblages that were of economic interest (Jim Monger's Takla project), regional studies to better understand large tracts of geology in the Omineca and Cassiar Mountains which were being actively explored by mining companies (H. Gabrielse, H.W. Tipper, Jim Monger, Stan Leaming, Chris Dodds) , studies in the actively explored mineral areas along and near the Skeena Arch where porphyry copper deposits were common (Tipper, Richards, Woodsworth), St. Elias Mountains , a multidisciplinary study led by R.B. Campbell and including Jim Monger, Chris Dodds, Geri Eisbacher, and Jack Souther. Jack Souther applied his volcanological expertise in the Mount Meager area of southern B.C. in a project aimed at exploring the power potential of the geothermal system.

A serious blow to the Cordilleran Subdivision occurred with the downsizing of the Federal Government in the early 90s when Paul Martin assumed the position of Finance Minister. This led to a proposal that the Vancouver Office personnel be moved to Victoria. The move was clearly little researched because the two suggested venues- Pacific Geoscience Centre and a Forestry complex north of Victoria did not have sufficient accommodation for the Vancouver staff. A strong campaign by the Mineral Industry in Vancouver finally resulted in the Vancouver staff remaining in Vancouver. Unfortunately, the turmoil caused by this event led to the resignation of four senior geologists, two with widely recognized mineral deposit expertise. Further, a distinct loss of morale occurred throughout the organization.

The strength of the Cordilleran Subdivision in the late 1960s and into the 1980s was the enthusiasm and interaction of its members. Coffee breaks were attended by most people and geological discussions were vigorous and informative. A close liaison between Survey geologists and their clientele, mainly exploration geologists, kept the staff aware of exploration developments and fostered a strong use of our library facilities. Projects that involved a large number of the staff including the compilation for the Tectonic Assemblage Map and the DNAG volume kept most geologists abreast of what others were doing and thinking. A good working relationship between knowledgeable senior management in Ottawa and management in Vancouver facilitated the planning of an integrated program of Cordilleran research.

The recent research programs focused on the geology of the pericratonic Cordilleran terranes seem to have been very productive, again involving many disciplines and cooperation of various earth science agencies. Perhaps these kinds of projects will continue to bring together the variety of expertise and enthusiasms that will further lead to our understanding of Cordilleran geology.

Geological Survey of Canada 1972 – 2010 Pacific Region

1970’s

In late 1969 five members of the Geological Survey of Canada (J.O. Wheeler, J.A. Roddick, J.G. Souther, W. Hutchison and H. Gabrielse) were invited to attend a meeting of the Geological Society of America in Asilomar, California to discuss the revolutionary new concept of plate tectonics. In 1970 the GSC introduced the new ideas to the geological fraternity in Vancouver. The effect on the academic and exploration communities was immediate thus initiating the research that has led to many new revolutionary concepts on the geological evolution of the Cordillera and bordering oceanic region. Applications of the plate tectonic concepts brought together government, academic and exploration earth scientists the length of the Cordillera to explore the many new ideas on the geologic evolution of the region. This stimulus continues to the present day. H. Gabrielse succeeded J.O. Wheeler as Head of the Cordilleran Subdivision of the GSC in Vancouver in 1970. Wheeler then became head of the Regional Geology Division in Ottawa.

Continued regional mapping of large tracts of terrain in British Columbia and Yukon Territory was supported by helicopter and fixed wing aircraft. Increasing contributions by studies focused on surficial geology and specific resources such as geothermal prospects and mineral districts. Paleontological studies of certain fossil groups including foraminifera, conodonts, radiolaria and pelecypods greatly helped refine age dating of stratified rocks aiding in correlations and the recognition of facies changes in lithologically diverse strata. The usefulness of microfossils was introduced to the Vancouver GSC subdivision by B.E.B. Cameron who brought his experience from working with an oil company. M. Orchard's research on conodonts beginning in the late 1970s facilitated dating of large tracts of rocks that were hitherto limited by the lack of identifiable fossils. Correlations of plutonic and volcanic rocks became more numerous and focused thus refining concepts of the geological history of the region. Detailed investigations of young volcanic rocks (J.G. Souther) provided data on the tectonic setting of various lithologies and aided in the prospecting for geothermal targets. Studies in the difficult terrain and complex plutonic evolution of the Coast Mountains were continued by J.A. Roddick and W. Hutchison. Research into the nature an origin of Upper Paleozoic strata by W.H. Monger continued to shed light on the plate-tectonic setting of the concerned rocks. D. J. Tempelman Kluit continued regional mapping in the south-central Yukon Territory relating the geology to the active mineral district. H.W. Tippers's mapping in central and south-central British Columbia provided an overview of the regional geology and of the movement of Pleistocene ice sheets in the region. R.B. Campbell and H.W. Tipper mapped the Bonaparte Lake area and Campbell the McBride area with E.W. Mountjoy and F.G. Young. With helicopter support H. Gabrielse carried out regional studies in the Stikine region of Cassiar and Omineca Mountains employing large field parties including specialists in a variety of disciplines and supervision of a number of graduate theses. J.G. Souther completed his regional mapping in the Tulsequah and Telegraph Creek areas of northwestern British Columbia and began his research on young volcanic rocks in the Cordillera. G. H. Eisbacher made pioneering studies of sedimentation in the Bowser and Sustut basins in northern British Columbia. He also wrote several papers on sedimentation and tectonic evolution of several Mesozoic and Cenozoic basins in the northern British Columbia and southwestern Yukon Territory. During the 1970s a study by J.L. Mansy, a student from the University of Lille, France contributed an overview of Upper Proterozoic and Cambrian rocks in the Cassiar and Omineca Mountains which formed the basis for his doctorate degree. R.B. Detailed mapping in the eastern part of Cry Lake map area in north-central British Columbia documented the age, complex internal structure and allochthonous nature of the Sylvester Allochthon, a large oceanic sheet emplaced on miogeosynclinal rocks. H.W. Tipper and T.A. Richards published a bulletin on the Jurassic stratigraphy and history of north-central British Columbia

In the mid-1970s a marine group of four scientists, led by Don Tiffin was based in Vancouver with the Geological Survey. Their studies focused on the sea floor on the west side of Vancouver Island. They were joined in the late 1970s by
C. J. Yorath who carried out pioneering studies on the stratigraphy of Mesozoic and Cenozoic rocks along the coastal margin of British Columbia with the use of submersible transport. The marine component moved to Patricia Bay on Vancouver Island in 1977 the year before the Pacific Geoscience Center opened.

In the latter part of the 1970s the GSC in Vancouver benefitted from a federal employment program that permitted the hiring of a number of geologists, mainly graduate students, who were assigned to various projects. Of particular note were the compilations of data for geological and tectonic maps of the Cordilleran region.

In the late 1970s the Vancouver Office was enhanced with the transfer of two economic geologists from Ottawa (R. Kirkham, a specialist in the study of copper deposits, and Ken Dawson widely experienced in the study of regional metallogeny). Also added to the staff at this time were M. Orchard, a specialist in conodont studies and J. Clague who carried out regional investigations of surficial deposits throughout the Cordillera. The paleontological group was strengthened by the transfer of Tim Tozer, a world renowned paleontologist in the study of Triassic faunas, to the Vancouver Office. Thus by the early 1980s the staff of the Vancouver Office had not only been increased considerably in size but also in the scope of its expertise. R.B. Campbell took over as head of the Cordilleran Subdivision in late 1979. In the late 1970s he led large parties in a multidisciplinary study of the southern St. Elias Mountains region. Included were J.G. Souther (volcanic rocks), J.W.H. Monger (Upper Paleozoic and Triassic stratigraphy and faunas), G.H. Eisbacher, and C. Dodds.

1980s

The staff of the Vancouver GSC was involved in the preparation of a Cordilleran Volume on the geology of Canada throughout much of the 1980s. The resulting volume was edited by H. Gabrielse and C.J. Yorath. Contributions were made by many of the geologists in the Vancouver Office but also by members of the Pacific Geoscience Center in Patricia Bay with expertise in paleomagnetic determinations (E. Irving and P.J. Wynne). J.O. Wheeler and P. McFeely compiled updated tectonic and geological maps for the Cordilleran region. A physiographic map of the Cordillera was prepared by W.H. Mathews of the University of British Columbia. A new metamorphic map was coauthored by P.B. Read (consultant), G.H. Greenwood, (University of British Columbia), E.D. Ghent (University of Calgary) and C.A. Evenchik. Structural cross sections of the region were prepared by H. Gabrielse and A.J. Brookfield. A map showing the distribution of and relationship of mineral deposits with various terranes was compiled by K.M. Dawson. A map showing the distribution of Proterozoic to Miocene plutonic suites was prepared by G.J. Woodsworth and R.G. Anderson with assistance of A. Brookfield and P. Tercier. Stratigraphic columns were prepared by the staff of the Cordilleran Subdivision and compiled by H. Gabrielse and A. Brookfield.

In the mid-1980s C.E. Evenchik began a detailed study of the Sustut and northern Bowser basins in northern British Columbia which resulted in a much greater understanding of the sedimentation and tectonic history of a large area of the province and the relationships between the sedimentation and tectonics of this region and correlative events in the Foreland Belt of the Cordilleran region to the east. R.G. Anderson completed his studies of the Mesozoic plutonism and volcanism along the Stikine Arch in northwestern British Columbia. A doctoral thesis by L. Struik refined the stratigraphic and structural understanding of the Cariboo region. Studies of the lithology, structure, age and correlation of Upper Proterozoic and Lower Cambrian strata in the Cariboo, Omineca and Cassiar mountains were presented by J.L. Mansy in a doctoral thesis for the University of Lille, France. J.G. Souther with C.J. Hickson continued studies of selected young volcanoes and volcanic terranes in central and southern areas of British Columbia. This work included an appraisal of geothermal energy in the southern Coast Mountains by Souther. S. Gordey mapped areas in southwestern Yukon Territory and in the Mackenzie Mountains. M. Orchard began his regional studies of conodonts in various Cordilleran Terranes making significant correlations of hitherto poorly dated sedimentary rocks. T. Tozer made detailed biostratigraphic studies of Triassic strata in the northern Rocky Mountains. J.J. Clague presented evidence documenting the history of historic, giant earthquakes related to the Cascadia Subduction zone off the west coast of North America. J.W. Haggart studied the lithology and faunas of Cretaceous strata in the Queen Charlotte Islands. H.W. Tipper and

B.E.B. Cameron completed a study of Jurassic strata of the Queen Charlotte Islands. E.T. Tozer published a benchmark report on Triassic ammonoids and the evolution of a time scale. G.J. Woodsworth and university colleagues continued investigations of the north-central Coast Plutonic Complex. M.J. Orchard's studies of conodonts supported stratigraphic mapping of Cordilleran workers and helped form a basis for correlations of terranes difficult to date because of a lack of macrofossils.

In the late 1980s R.B. Campbell was succeeded by D.J. Tempelman-Kluit as Head of the Cordilleran Subdivision in Vancouver.

1990s

In the early 1990s the staff of the Vancouver GSC lost the two economic geology positions it had gained about a decade earlier. Also, D.J. Tempelman-Kluit left the Survey and was succeeded by C.J. Hickson in 1993. J.O Wheeler, J.W.H. Monger, H.W. Tipper and H. Gabrielse assumed emeritus roles with the Vancouver group. Offices of the Survey were moved from the landmark Sun Tower Building on the corner of Beatty and Pender streets to a new structure on the corner of Seymour and Robson streets. The new quarters accommodated a popular book store with a comprehensive collection of GSC and Natural History publications mainly concerned with the Cordilleran region. An understanding of the relationship between oceanic and continental tectonics was greatly advanced by the studies of geophysicists at Patricia Bay including R.D. Hyndman, J. Cassidy, H. Dragert, R.P. Riddihough, G.C. Rogers and others. In particular, studies of the interaction between oceanic and crustal plates along the Cascadia subduction zone and Queen Charlotte transform fault have provided explanations for many of the major tectonic features along the western margin of the continent.

S.P. Gordey and E.J. Makepeace compiled a geological map of Yukon Territory published in 2000 incorporating Gordey's mapping in the Teslin area of southwestern Yukon Territory and Mackenzie Mountains and including data provided by members of the GSC and staff of the Yukon Geological Survey. This compilation was incorporated in a new geological map of Canada coordinated by J.O. Wheeler.

Deep crustal structural elements of the Cordillera were examined by geophysical techniques in a project referred to as Lithoprobe which examined crustal structure along a number of cross sections accessible by highways.

R. Turner began compilation of a popular series of Geoscape maps depicting the geology of the British Columbia for use by travelers along the main highway transportation routes through the Cordillera. D.J. Tempelman-Kluit retired from the GSC in l995 and was succeeded as Subdivision Head by Catherine Hickson. The Vancouver Office was combined with the Patricia Bay Geoscience Centre in 1996 to form the Pacific Division of the G.S.C. with S. Colvine as director. Catherine Hickson was succeeded as Subdivision Head of the Vancouver Office by S. Irving in 2005.

APPENDIX 1: RECOGNITION

A number of the staff at the Pacific Geoscience Centre have been recognized for their contributions to the earth sciences scientific community.

Logan Medal, Geological Association of Canada

1988 J.O. Wheeler

2000 H. Gabrielse

2002 J.W.H. Monger

2007 John Clague

Ambrose Medal

1990 H. Gabrielse

W.W. Hutchison Medal

1981 D.J. Tempelman-Kluit

E.R.W. Neale Medal

2002 R. Turner
2006 J. J. Clague

Best Paper Award, Geological Society of America

1984 J.W.H. Monger with P. Coney and D. Jones

Award for outstanding contribution to Canadian Cordilleran Geology

2000 H. Gabrielse

APPENDIX 2: GSC CONTRIBUTIONS TO THE ADVANCEMENT OF SCIENCE – POST-1970

CORDILLERAN DIVISION -VANCOUVER OFFICE

A.

1. Concepts of Plate Tectonics. Introduction of Plate Tectonic concepts to the Cordilleran geoscience community.

2. Four members of the Cordilleran Subdivision (J.O. Wheeler, J.G. Souther, J.R. Roddick and H. Gabrielse) were invited to a Geological Society of America Penrose Conference on Plate Tectonics held at Asilomar, California in the fall of 1969. The concepts obtained at the meeting formed the basis for a Geological Association of Canada meeting in Vancouver in the spring of 1970. The Plate Tectonics paradigm was outlined to the geoscience community including academic personnel and mineral explorationists. This led to a profound shift in the views of Cordilleran geological evolution. It also led to a series of highly successful symposia during the 1970s involving an analysis of the relationship of mineral deposits to plate tectonic elements.

3. The analysis of geological elements relative to plate tectonic concepts played a large role in topics of research in academia, industry and government within the Cordilleran region.

4. An appreciation of plate tectonic processes focused mineral exploration and resulted in a much closer liaison between industry, government and academic geologist than had formerly existed.

5. Many GSC personnel in the Vancouver Office were involved in exploring plate tectonic concepts during the 1970s. Playing a significant role were J.W.H. Monger, H.W. Tipper, J.G. Woodsworth, J.G. Souther, D.J Tempelman-Kluit, G.H. Eisbacher and H. Gabrielse. R.L. Armstrong of U.B.C. made important contributions with isotopic age determinations and insights into geodynamics.

6. Key references include:

- 1971: Monger, J.W.H. and Ross, C.A.: Distribution of fusulinaceans in the western Canadian Cordillera; Canadian Journal of Earth Sciences, v. 8. p. 259-278

- 1972: Monger, J.W.H., Souther, J.G. and Gabrielse, H.: Evolution of the Canadian Cordillera: a plate tectonic model; American Journal of Science, v. 272, p. 577-602.

- 1979: Tempelman-Kluit, D.J.: Transported cataclasite, ophiolite and granodiorite in Yukon: evidence of arc-continent collision; Geological Survey of Canada, Paper 79-14, 27 p.

- Also many references in the chapter on Tectonic Framework, Geology of the Cordilleran Orogen in Canada; Geology of Canada, no. 4, 1992.

B.

1. Tectonic Assemblage map, Canadian Cordillera. A map portraying the distribution of lithotectonic elements linked by their lithological character and setting rather than strictly by age.

2. This map shows the distribution of lithological assemblages which reflect specific tectonic or depositional environments in the Cordilleran region on Canada. It was compiled by the Cordilleran staff of the Geological Survey during the latter part of the 1970s. In contrast to typical geological maps which delineate rock units on the basis of age and lithology the tectonic assemblage map focuses on the distribution of lithological units which emphasize the tectonic behaviour of regions in the Cordillera during specific intervals of time.

3. The map drew attention to the variety of tectonic settings that are represented by the multitude of rock assemblages in the Cordillera. This contributed to analyses of the geological evolution of the orogen by simplifying the distribution of rock assemblages of constrained ages that have similar tectonic histories. The two editions of the tectonic assemblage map have formed the basis for much of the research by geoscientists in the Cordilleran region since the early 1980s.

4. The mineral exploration community has used the tectonic assemblage maps as a basis for planning exploration programs. Academics have utilized the maps for planning research programs.

5. Compilation of the first edition of the tectonic assemblage map was carried out by winter works staff supervised by the geologists of the Geological Survey in the Vancouver Office. Many of the Survey geologists contributed to the concept and format of the final product. Overall supervision was carried out by H. W. Tipper, G.J. Woodsworth and H. Gabrielse. The second and revised version of the map was produced by J.O. Wheeler and included a number of significant modifications and additions.

6. Key references:

- 1981: H. W. Tipper, G.J. Woodsworth and H. Gabrielse: Tectonic Assemblage Map of the Canadian Cordillera; Geological Survey of Canada, Map1505 A.
- 1991: Wheeler, J.O. And McFeely, P.: Tectonic Assemblage Map of the Canadian Cordillera and adjacent parts of the United States of America; Geological Survey of Canada Map 1712A, scale 1:2,000,000, 3 sheets.

C.

1. Micropaleontological research. Significant advances in the understanding of stratigraphic sequences in the Canadian Cordillera.

2. In the late 1970s B.E.B. Cameron was hired by the Geological Survey to provide expertise on conodont faunas found in Cordilleran stratigraphic units that had hitherto yielded no or little macrofaunas. In the light of Cameron's contribution the Survey hired M. Orchard in the early1980s to carry on the conodont research. His impact on Cordilleran geological research has been immense and has led to the dating of many units formerly of unknown age or age range as well as providing information on terrane affinities of enclosing strata.

3. The impact of the micropaleontology on Cordilleran geological research has been of fundamental importance. The expertise has provided strong support for the Cordilleran Division's explorations and has also greatly supported studies by universities and industry. In particular the dating of strata of oceanic affinity (Cache Creek, Slide Mountain, Bridge River, etc.) has been mainly provided by radiolarian fauna. This has provided not only the ages of often structurally separated units but facilitated the determinations of structural relationships between these units. In particular the common intense structural imbrication of oceanic chert assemblages has been documented. The lengthy time span of the oceanic lithologies (documented examples of Mississippian through Middle Jurassic) was revealed by the paleontological record. In addition, many argillaceous units that had yielded no useful macrofaunas were dated throughout the Cordillera.

4. For exploration geologists the paleontological support for dating of rock units provided information on stratigraphic and structural relationships important for analysis of geological units critical for exploration targets.

5. Key GSC personnel involved in micropaleontological research on conodonts have been B.E.B. Cameron in the 1970s and M. Orchard during the 1980s to the present.
Several academics involved with the GSC in studies of microfaunas include Fabrice Cordey (radiolaria), Beth Carter (radiolaria) and B. Murchey (radiolaria).

6. Key references:

- Orchard, M.J. Numerous important papers published during the past two decades dealing with fossil identifications and dating but also with the tectonic implications of the various conodont faunas in terms of terrane affiliation.

- 2006: Orchard, M.J.: Late Paleozoic and Triassic conodont faunas of Yukon and northern British Columbia and implications for the evolution of Yukon-Tanana terrane; in Maurice Colpron and JoAnne Nelson, eds., Paleozoic Evolution and Metallogeny of Pericratonic Terranes at the Ancient Pacific Margin of North America, Canadian and Alaskan Cordillera; Geological Association of Canada Special Paper 45, p. 229-260.

- 1991: Orchard, M.J. 1991: Conodonts, time and terranes: an overview of the biostratigraphic record in the western Canadian Cordillera, in Orchard, M.J. and McCracken, A. D., eds., Ordovician to Triassic Conodont Paleontology of the Canadian Cordillera: Geological Survey of Canada, Bulletin 417, p. 1-26.

D.

1. Terrane map of the Canadian Cordillera. Portrays the distribution of an assemblage or assemblages of rocks whose relationships with bordering terranes are suspect or unknown.

2. The terrane map of the Canadian Cordillera represents the results of a collegial research effort by many geologists working in the North American Cordillera. In Canada the contrast of rock assemblages within the western Cordillera came into focus with the advent of plate tectonic concepts. In the late 1960s and early 1970s mapping by J.W.H. Monger in northwestern British Columbia led to the recognition of an anomalous assemblage of rocks (Cache Creek) that not only contrasted markedly in lithology with

bordering assemblages but also in faunal content. E.M. Kindle of the Geological Survey first recognized the unusual fauna of the Permian rocks collected by F.A. Kerr in the mid 1920s west of Dease Lake in northwestern B.C. Kindle noted that the fauna was known to him only from the Guadalupian fauna in Texas and the Salt Range fauna in India. Research by C.A. Ross at the University of Western Washington confirmed that the fusulinacea fauna of the Dease Lake Cache Creek had a Tethyan aspect. Max Pitcher discovered a Permian fauna west of the Cache Creek that had a distinct North American signature and with C.A. Ross noted that in this region there were two distinct Permian faunas with the Tethyan fauna lying inboard of typical island arc assemblages. The term terrane had been used in the Klamath region of California and in Southeast Alaska but the first generally accepted definition for the Cordilleran region was proposed by P.J. Coney, D.L. Jones and J.W.H. Monger in 1980 in their paper on suspect terranes. The result of these concepts was that the region of the Cordillera west of the miogeoclinal rocks became "suspect" in terms of their tectonic relationship to the strata linked to the North American craton. Thus the terms Stikinia, Cache Creek, Wrangellia and Alexander characterized the crustal blocks that have an internal coherency but whose paleogeographic relationships with one another and to cratonal rocks are unknown or suspect. The map, as with the Tectonic Assemblage map, was compiled by the efforts of many people in the Vancouver Office under the leadership of J.O. Wheeler.

3. It is an innovative contribution in that it clearly reflects the possible mobility of crustal blocks inherent in the paradigm of plate tectonics. Brought into focus is the difficulty or impossibility of correlating stratigraphic units across terrane boundaries.

4. The recognition that a variety of mineral deposits were terrane specific provided focus for mineral exploration and identified areas where government surveys could aid in outlining regions of promising mineral potential.

5. J.W.H. Monger was probably the GSC staff member most engaged in the terrane concept in the Cordilleran region of Canada. Most of the GSC personnel in the Vancouver Office were involved in recognizing the character and extent of terranes and many government and university geologists in the United States were also involved. Among these were Peter Coney, Davey Jones, Henry Berg, Porter Irwin and perhaps the most influential over the years, Bill Dickinson.

6. Key references include:

- 1991: Terrane Map of the Canadian Cordillera; Compiled by J.O. Wheeler, A.J. Brookfield, H. Gabrielse, J.W.H. Monger, H.W. Tipper and G.J. Woodsworth: Geological Survey of Canada Map 1713 A.

- 1984: Monger, J.W.H. and Berg H.C.: Lithotectonic terrane map of western Canada and southeastern Alaska, in, Silberling, N.J. and Jones, D.L., eds., Lithotectonic Terrane Maps of the North American Cordillera, U.S. Geological Survey Open File Report 84-523, p. Bl-B31.

- 1982: Monger, J.W.H., Price, R.A. and Tempelman-Kluit, D.J.: Tectonic accretion and the origin of the two major metamorphic welts in the Canadian Cordillera; Geology, vol. 10, p. 70-75

E.

1. Age dating. The contributions of isotopic and paleontological age dating have been fundamental to understanding the evolution of the Cordilleran region.

2. Critical age dates on granitic, metamorphic and volcanic rocks by isotopic methods were essential to understanding the evolution of Cordilleran terranes. R.L. Armstrong of the University of British Columbia and the laboratories of the Geological Survey of Canada in Ottawa made great contributions in this regard as did numerous universities. Paleontologists from the Geological Survey of Canada and various universities dated sedimentary strata. Interpretations of the significance of the faunas in terms of paleogeographic implications were germane to the understanding of terrane histories and relationships.

3. The distribution of marine Triassic faunas in the Cordillera resulted in E.T. Tozer's conclusion that the westernmost terranes had moved north relative to cratonal strata. Recognition of the Tethyan affinity of the fauna in the Cache Creek rocks in contrast to bounding terranes formed a key criterion in formulating the concept of tectonic terranes. M.J. Orchard's identification of conodonts in hitherto undated sedimentary rocks was of immense value for establishing stratigraphic and structural relationships. In particular Orchard and L.C. Struik documented the intense imbrication of Slide Mountain terrane rock in the Cariboo region of British Columbia. F. Cordey extended the known stratigraphic range of Cache Creek oceanic rocks from Mississippian to Toarcian and the Bridge River ocean to the Callovian or, possibly, Callovian. On the basis of Jurassic faunas H.W. Tipper of the Geological Survey of Canada and P. L. Smith of the University of British Columbia postulated that Wrangellian Lower Jurassic strata had been displaced northerly relative to cratonal North America.

4. Age dating of granitic and volcanic rocks has been an important tool for mineral exploration in the Cordilleran region. Specific suites of granitic rocks have a distinct affinity for certain types of mineral deposits thus enabling focused exploration programs. Fossil age dating has also been crucial for the search for sedimentary hosted mineralization.

5. Playing a significant role in biostratigraphic studies in the Canadian Cordillera have been M.J. Orchard, H.W. Tipper, E.T. Tozer and J.W. Haggart of the Geological Survey of Canada, P.L. Smith of the University of British Columbia and C.A. Ross of the University of Western Washington and Fabrice Cordey of the Université Claude Bernard, France.

6. Key references include the following:

- 1988: Armstrong, R.L.: Mesozoic and Early Cenozoic magmatic evolution of the Canadian Cordillera; in Processes in continental lithospheric deformation, S.P. Clark, Jr., B.C. Burchfiel and J. Suppe, eds., Geological Society of America, Special Paper 218, p. 55-91.

- 1984: Tipper, H.W.: The allochthonous Jurassic-Lower Cretaceous terranes of the Canadian Cordillera and their relation to correlative strata of the North American craton; in Jurassic-Cretaceous Biochronology and Biogeography of North America, G.E.G. Westermann (ed.) Geological Association of Canada, Special Paper 27, p. 113-141.

- 1970: Tozer, E.T.: Marine Triassic faunas of North America; their significance for assessing plate and terrane movements; Geologische Rundschau, v. 71, p. 1077-1104.

- 2001: Orchard, M.J., Cordely, F., Rui L., Bamber, E.W., Mamet, B., Struik, L.C., Sano, H. and Taylor, H.J.: Biostratigraphic and biogeographic constraints on the Carboniferous to Jurassic Cache Creek terrane in central British Columbia; Canadian Journal of Earth Sciences, vol. 38, p. 551-578.

F.

1. Strike-slip faulting and crustal extension. Recognition of regional strike-slip faults in the northern Cordillera and their relationship to crustal extension in the south-central Cordillera.

2. Evidence for regional strike slip faulting had accumulated in the Canadian Cordillera since the 1960s. J.A. Roddick first suggested a dextral offset of about 420 km. on the Tintina Fault in Yukon Territory in 1967. St. Amand and others postulated significant dextral displacements along the Denali fault bounding the east side of the St. Elias Mountains. In the 1980s Gabrielse discussed the probable large scale dextral displacements along faults in north-central British Columbia along the Northern Rocky Mountain Trench and related faults to the west in Cassiar and Omineca Mountains. The relationship between these structures and the prominent, transverse tensional faults in the south-central Cordillera was not documented until the beginning of this century. The relationship was discovered by means of detailed mapping and insights into the tectonics of the central Cordillera and bounding areas. The research introduced an innovative way to view the dynamics of the south-central Cordillera in a continental scale context.

3. This concept has provided a new model for research on the structural style of the southern Cordilleran region in areas where extensive young volcanic cover has hindered understanding of the geology. It has also fostered an interest in the relationship between pull-apart structures and mineralization. The model can be applied also to other areas in the Cordillera where significant transverse faults have been mapped in areas traversed by regional strike-slip faults. In the northern Cordillera, a close relationship between strike-slip faults and the emplacement of batholithic bodies suggests a similar tectonic environment for these features.

4. Pull-apart and core structures related to transform faults have potential for the localization of Paleogene mineral deposits, particularly in the south-central Cordillera.

5. J.A. Roddick, D.C. Murphy, and J.K. Mortensen have published on strike-slip displacements along the Tintina Trench in Yukon Territory. H. Gabrielse has published on strike -slip faults in northern British Columbia west of the Rocky Mountains. L.C. Struik has played a key role in analyzing the structural geology of the south-central Cordilleran region. His mapping, in concert with a study of plutons by R.G. Anderson, has greatly advanced our knowledge of the structural style. His studies have incorporated those of earlier GSC and British Columbia Geological Survey mapping projects.

6 Key references include:

- 1967: Roddick, J.A.: Tintina Trench; Journal of Geology vol. 75, p. 23-33.

- 1985: Gabrielse, H.: Major dextral transcurrent displacements along the Northern Rocky Mountain Trench and related lineaments in north-central British Columbia; Geological Society of America, Bulletin 96, p. 1-14.

- 2006: Gabrielse, H., Murphy, D.C., and Mortenson, J.K.: Cretaceous and Cenozoic dextral orogen-parallel displacements, magmatism, and paleogeography, north-central Canadian Cordillera, in Haggart, J.W., Enkin, R.J., and Monger, J.W.H., eds., Paleogeography of the North American Cordillera : Evidence For and Against Large-Scale Displacements: Geological Association of Canada, Special Paper 46, p. 255-276.

- 1993a: Struik. L.C.: Intersecting intracontinental Tertiary transform fault systems in the North American Cordillera; Canadian Journal of Earth Sciences, vol. 30, p. 1262-1274.

- 2003: Struik. L.C. and Anderson, R.G.: Paleogene pull-apart core-and rind-complexes Canadian Cordillera (abstract): Geological Society of America, Annual Meeting Seattle, Program with Abstracts, p. 473.

G.

1. Sedimentation and tectonics in the Bowser Basin. An analysis of the sedimentation and structures in the Intermontane Bowser Basin has revealed a close connection between these features and the tectonic elements in the bordering Coast Mountains to the west and the Rocky Mountains to the east.

2. Detailed mapping, sedimentological studies, paleontology, age determinations and structural analysis were carried out over an extended period of research during the late 1970s, 1980s and 1990s. A synthesis of these studies has led to a much greater appreciation of the interaction between the Coast, Intermontane and Rocky Mountain Belts during Mezozoic and Early Cenozoic time.

3. The model of tectonic evolution for the northwestern Intermontane Belt has provided new insight into relationship between tectonic processes in the Intermontane region and the flanking tectonic regions. The suggestion that basal faults in the Intermontane Belt were generated by forces generated in the Coast Orogen and extended into the foreland of the Rocky Mountain region represents the first suggestion of this type (a hypothesis recently confirmed by the research of Mazotti and Hyndman at the Pacific Geoscience Center).

4 Stratigraphic and sedimentological studies in the Bowser Basin have outlined areas of anthracitic coal deposits and potential source rocks for gas and oil. Plutons in the northern part of the basin are related to a very large copper deposit (Red Chris) that is being developed for production.

5. C. A. Evenchick has led the research team working in the Bowser Basin for the past two decades. Her work developed the earlier analysis by G.H. Eisbacher and work in the southern part of the basin by H.W. Tipper and T.A. Richards of the Geological Survey. It also incorporates studies in the northern part of the basin by B.D. Ricketts and D.J. Thorkelson of the Geological Survey. Critical isotopic age determinations have been carried out by V.J. McNicholl of the GSC and field work in the southern part of the basin was aided by M.E. McMechan of the GSC in Calgary. F.A. Cook of the University of Calgary led a lithoprobe seismic reflection profiling study along the westernmost part of the Bowser Basin.

6. Key references include:

2007: Evenchick, C.A., McMechan, M.E., McNicoll, V.J. and Car, S.D.: A synthesis of the Jurassic-Cretaceous tectonic evolution of the central and southeastern Canadian Cordillera: Exploring links across the orogen, in Sears, J.W., Harms, T.A., and Evenchick C. A., eds., Whence the Mountains ? Inquiries into the Evolution of Orogenic Systems: A Volume in Honor of Raymond A. Price: Geological Society of America Special Paper 433, p. 117-145, doi: 10,1130/2007.2433(06).

1981: Eisbacher, G.H.: Late Mesozoic-Paleogene Bowser Basin molasse and Cordilleran tectonics, western Canada; in Miall, A.D., ed., Sedimentation and Tectonics in Alluvial Basins: Geological Association of Canada Special Paper 23, p. 125-151.

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H.

1. Western extent of cratonal basement. Recent geological research in the southern Cordillera has suggested that North American continental crust extends as far west as the Fraser Fault and that Mesozoic rocks, rather than being accreted as had been formerly believed, lie stratigraphically on this crust.

2. Throughout the latter part of the 1900s, the prevailing thought was that Mesozoic rocks of Mesozoic volcanic and sedimentary origin in the central part of the southern Cordillera had been accreted onto older rocks. Geological mapping in the late 1900s and early in this century has suggested, on the contrary, that these Mesozoic rocks lie in stratigraphic continuity with the underlying basement as far west as the Fraser Fault. This concept was innovative in that it proposes a continuity of Devono-Mississippian strata from the miogeocline into the “accreted” terranes long before postulated mid-Jurassic accretion.

3. The concepts introduced as a result of this research require a rethinking of the relationship between accreted terranes and continental basement in the southernmost Canadian Cordillera. The research will also focus on the perceived contrast between the stratigraphic relationships proposed in this area and the central and northern parts of the Canadian Cordillera. If the contrasts are valid where and how does the change occur?

4. The region encompassed by the research has long been a target for mineral exploration and the concepts developed in this analysis could affect mineral exploration programs.

5. R.I. Thompson of the Geological Survey of Canada led the research team in this regional survey. Key non-GSC participants were P. Glombick, P. Erdmer, L.M. Heaman and Y. Lemieux of the University of Alberta in Edmonton, and K.L. Daughtry of Discovery Consultants, Vernon, B.C.

6. A key reference is:

- 2006: Thompson, R.I., Gombick, Paul, Erdmer, Philippe, Heaman, Larry M., and Daughtry, K.L.: Evolution of the ancestral Pacific margin, southern Canadian Cordillera: Insights from new geological maps; in Colpron, M. and Nelson, J.L., eds., Paleozoic Evolution and Metallogeny of Pericratonic Terranes at the Ancient Pacific Margin of North America, Canadian and Alaskan Cordillera: Geological Association of Canada, Special Paper 45, p. 433-482 .

I.

1. Analysis of Coast Plutonic Complex. Documentation of the extent and complexities of composition, structure and age of the numerous plutonic bodies that comprise the Coast Plutonic Complex, the largest and most mafic of the circum-Pacific plutonic terranes, has involved many geologists, particularly since the early 1950s.

2. Research involving the Coast Plutonic Complex has demonstrated a complicated history extending from Jurassic to early Cenozoic time. Structural studies have documented the presence of a medial shear zone extending almost the full length of the Complex, easterly verging structures in Mesozoic strata along the eastern margin and westerly verging structures along the western margin. Mapping has shown a great variety of plutons in shape, structural style and composition. In summary, the Coast Plutonic Complex exhibits a complicated history of evolution which has important implications for the Mesozoic and early Cenozoic evolution of the Canadian Cordillera. Innovations resulting from the research include the first use of computers for recording geological data in the Cordillera region, recognition and explanation of syn-plutonic dykes in the Complex, a concept that many of the plutons were not emplaced as wholly molten fluid bodies and the application of widespread modal analyses to characterize the compositions of individual plutons.

3. Research over the past 60 years in the Coast Plutonic Complex has documented the complexities of this important plutonic terrane in the context of circum-Pacific plutonism. It has generated a number of conferences on circum-Pacific plutonism and has fostered a healthy scientific exchange of views between geologists from Chile to Australia.

4. Delineation of the plutons and, particularly, related screens of metamorphic rocks has provided focus for mineral exploration activities.

5. J.A. Roddick devoted much of his career to geological mapping in the Coast Plutonic Complex. In the 1970s he was joined by G.J. Woodsworth who has continued studies to the present. Their research has been greatly enhanced by age determinations provided by R.L. Armstrong of the University of British Columbia. Many theses projects and collaborative studies by university personnel in Canada and the United States have been promoted and supported by Roddick and Woodsworth.

6. Key references:

- 1992: Woodsworth, G.J., Anderson, R.G. and Armstrong, R.L.: in Plutonic Regimes, Chapter 15: Geology of the Cordilleran Orogen in Canada; Geological Survey of Canada, no. 4, eds. H. Gabrielse and C.J. Yorath. [Download]

- 1983: Roddick, J.A., Geophysical review and composition of the Coast Plutonic Complex south of latitude 55 degrees N; in Circum-Pacific Plutonic Terranes, ed. J.A. Roddick, Geological Society of America, Memoir 159, p. 195-211. doi: 10.1130/MEM159-p195

J.

1. Compilation of Bedrock Geology of Yukon Territory. This geological map on a scale of 1:1 000 000 with inset maps of terrane, glacial limits, physiography and aeromagnetics represents the first modern geological map of Yukon Territory.

2. The compilation represents a comprehensive review of geological research carried out in Yukon Territory over more than 100 years. It involves reinterpretations of some geological units in the light of the author's wide experience in the region. With inset maps the geological map shows the strong contrast in the structure and composition of geological units in the northern Yukon Territory, the region northeast of the Tintina Fault and the regions southwest and northeast of the Denali Fault on the northeast side of the St. Elias Mountains. The map reveals the current views of terrane distribution and of continental glaciation limits. It is innovative in analyzing and portraying an immense amount of data gathered by several governmental agencies, mainly the GSC, over many years supplemented by university research and mineral exploration studies.

3. The geological map has provided the basis for continued research on many aspects of Yukon geology for industry, university and governmental surveys.

4. The map serves as a guide to mineral exploration in Yukon Territory with the distribution of known regional metallotects depicted.

5. The compilers of the Yukon geological map were S.G. Gordey and A.J. Makepeace.

6. Key reference:

- 2001: Gordey, S.P. And Makepeace, A.J. (compilers), Bedrock Geology, Yukon Territory; Geological Survey of Canada, Open File 3754 and Exploration and Geological Services Division, Yukon Indian and Northern Affairs Canada, Open File 2000-12, scale 1:1 000 000