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Author Biography:
D.C. (Chris) Findlay is a former long-time employee of the Geological Survey of Canada. He retired in 1995 after a 30-year career, during which he served in a variety of capacities, including Technical Officer (1958-59), Field Petrologist (1960-65), Resident Geologist, Yukon Territory (1966-69), Research Scientist (1975-80), Senior Advisor (1980-82), Director, Economic Geology and Mineral Resources Divisions (1982-87) and Director General, Minerals and Continental Geoscience Branch (1987-92). He is a graduate of McGill (B.Sc. 1955; M.Sc. 1957) and Queen's (Ph.D. 1963). He was awarded an honoraryy doctorate degree (docteur honoris causa) from the University of Quebec in 1996. During the latter part of his career he was actively involved in a number of international geological projects, mainly under the auspices of UNESCO and IUGS (International Union of Geological Sciences). He was a founder of the International Deposit Model Program and the originator and first Chair of the International Consortium of Geological Surveys (ICOGS).

Notes on some Events and Activities at the Geological Survey of Canada, 1970 – 1995

by
D.C. Findlay

Contents

Introduction

In the spring of 1974 I returned to the Geological Survey in Ottawa after having spent four years in the consulting business; prior to that I had been the Survey's Resident Geologist in Whitehorse, Yukon Territory (1966 – 1969) and had worked in various parts of the country as a Technical Officer and later field petrologist with Dr. Charles Smith's "Ultramafic Rocks In Canada" project (1958 – 1966).

At the time of my return, the Survey was just becoming involved in new federal-provincial programs that were being mounted under a series of General Development Agreements (GDAs) negotiated with individual provinces by the Department of Regional Economic Expansion (DREE) on behalf of the federal government. Funding for these new programs was shared between the federal and provincial partners in ratios that ranged between 50/50 in Ontario and the western provinces, 80 (federal)/20 (provincial) in Nova Scotia and New Brunswick and 90/10 in Newfoundland. The programs were managed by joint committees, with federal (DREE) and provincial co-chairs and with other departmental representatives, as required. In the Department of Energy, Mines and Resources (EMR) the senior representative was usually from Mineral Policy Sector (MPS) but in what later (1984-94) became known as Mineral Development Agreements (MDAs) the GSC had major input as program technical consultants and, particularly in later years, as active participants in geoscience projects of the programs. Over the next two decades MDA programs with the provinces and territories would become a major component of the GSC's field programs as well as providing a significant contribution to its budget. Further, they served to foster the development of cooperative partnerships in planning and carrying out projects with provincial and territorial agencies.

These initiatives derived originally in part from a major economic conference held in Calgary in 1973 called the *"Western Economic Opportunities Conference "* (WEOC). For the Survey, the first involvement with a product of WEOC and a precursor of the MDAs, was the *Non-Renewable Resources Evaluation Program* (NREP) planned to be carried out jointly with the provinces.

These and similar programs being mounted on the energy side reflected the increasing preoccupation on the part of government with the availability of mineral and energy resources to drive the Canadian economy, and this preoccupation would be one of the chief hallmarks of government activities over the next decade or so. The idea that resources of minerals and energy would become scarce was widespread, and, in the federal government at least, reached to the top. The new Trudeau government (elected in June, 1968) placed great emphasis on the development of new policies in energy and minerals that would address this issue.[1] And in the Department (EMR) it would drive the development of two major policy thrusts in the seventies:- the *National Energy Program* (NEP) and the parallel *National Mineral Policy*. The former became one of the defining public images (bad) of the Trudeau government of the time, especially in the West; the latter was a largely internal process that eventually produced a "National Policy" (1987) but by then preoccupations had shifted to the performance of the Canadian economy *per se* and concerns over supplies of minerals and energy were diminishing.

When I returned to the GSC I worked on NREP (in the end, only operational in Manitoba) and on background studies in resource assessment for Dr. Yves Fortier, then Senior Advisor, Earth Sciences. I spent a couple of secondment periods in the office of the ADM Science and Technology (Dr. John Keyes) in the "Black Tower" (as EMR headquarters at 580 Booth St. was known), the first (Sept. 1975 —June 1977) working on science & technology documents as input to the National Mineral Policy (Mineral Policy Sector); the second (1980 —1981) working on a variety of tasks in the S&T sector, again, mainly to do with resource assessment. In between (July 1977 to January 1979) I spent a year or so as Acting Subdivision Head, Economic Geology Subdivision, sitting in for Dr. G.B. Leech who had been granted time from administrative duties to finish up a mapping project in the Rockies. In 1982 Dr. Leech retired and I took his place as Director of the Economic Geology group, now raised to Division status. In 1986, following the merger of the Earth Physics Branch and GSC, a reorganization resulted in a new Division called

[1] As pointed out by my colleague, Dr. John Scott, the policies and practices of the federal government, insofar as minerals and energy were concerned, underwent a major "sea change" in 1966 with the creation of the new Department of Energy, Mines and Resources as a successor to the Department of Mines and Technical Surveys. In a break with the past, the government now assigned a policy function with regard to natural resources to the Department. This policy role would, in turn, lead to major changes in programs and operations in the Department's agencies, including the Geological Survey. (personal communication, 2009)

Mineral Resources Division that incorporated parts of the former Resource Geophysics and Geochemistry Division (RGG). At about the same time GSC divisions were grouped under a new Branch structure and I became head of one of these Branches—Continental Geoscience and Mineral Resources—where I remained until I retired at the end of 1992. After that I spent another three years part time as a Senior Advisor, mainly, international geology, in Coordination and Planning Division. I ceased being a GSC employee in 1995 and for another three years worked as an Emeritus Scientist in Coordination and Planning Division, mainly trying to promote the *International Consortium of Geological Surveys* (ICOGS) and other international projects[1]

The notes that follow concerning some of the events and activities at the GSC over the 25-year period 1970 —1995 are coloured by my background and experience as sketched above. They are based on my personal recollections, miscellaneous notes and memoranda that cover parts of the period, and documents and papers that are for the most part available in GSC files of one sort or another. The latter consist mainly of internal correspondence and memoranda, much of it within or between the various Divisions and Branches of the organization, or with the offices of the Directors General or Assistant Deputy Ministers. I have also made use of the various NRCan websites, especially those dealing with the energy side of the Department. In particular an on-line document called "Energy Resources Chronology" by Ralph Toombs is a very useful chronicle of energy developments in the country and in the Department over the period 1970 —1975 (Toombs, 1995). As well, members of the "Friends of the GSC" history project committee have compiled useful summaries of the chronology of many of the events discussed in these notes (*see* "Acknowledgements" and "References").

An explanation is warranted concerning my approach in these notes. As I read through various documents and websites concerned with the events of the years here chronicled it became more and more apparent that to understand their affects on GSC programs and activities it is clearly necessary to set them in the context of the larger issues of the times, both domestic and global. That is why for example, considerable space is devoted to energy matters, both within the Department and externally. For it is

[1] My last "official" GSC function was a visit to China (Beijing) in June 1988 with Dr. Ron Smyth of the British Columbia Geological Survey to give "lectures" on geological survey organizations to a group of middle managers from the Ministry of Geology and Mineral Resources (MGMR).

clear that, over much of this period, energy concerns dictated the main priorities of the Department and its agencies, including the Geological Survey. Although there is no question that the mineral industry was the GSC's principal *external* client in a historical sense, many of the elements that drove it's day-to-day operations were generated internally by these energy priorities.

Because of my involvement mainly on the minerals side of GSC programs and projects, my recollections are obviously biased in that direction. There were many benchmark occasions and events during this period that can be captured more accurately by others who played more central roles than mine. The most that can be said of these notes is that they provide one "memory slice" through the Geological Survey over a period that has, in its earlier part at least, been labelled as the "Golden Age" of the organization.

Acknowledgements

I am indebted to Charles Smith, Bill Poole, George Plant, Christy Vodden, John Scott, Murray Duke and Barbara Cloutier of the "Friends of the GSC" history project for their interest in this account and for providing helpful and insightful comments on the draft manuscript. In addition, I thank Ray Price for reading the account, for providing helpful comment, and for gently drawing my attention to a number of places where my memory was faulty.

In spite of the best efforts of the above-noted, however, the residual mistakes remain mine.

The Decade of the Seventies

(*Earth Sciences Serving the Nation; Zaslow history of GSC; Changing environment for GSC; Concern for resource supplies; The Club of Rome; Dominance of energy concerns; OPEC and the 1973 October War; Energy supplies and "peak oil"; Mackenzie Valley Gas Pipeline Project and the Berger Inquiry; Uranium Reconnaissance Program (URP); National Geochemical Reconnaissance Program (NGR); Assessments of mineral and energy supplies;" Operation September"; Mineral Area Planning Study (MAPS); General Development Agreements (GDAs) and the beginnings of the Mineral Development Agreement era; National Energy Program (NEP); National Mineral Policy and GSC Role: International Strategic Minerals Inventory(ISMI); Mineral and Energy Resource Assessments (MERA); New project management experiments and the Integrated Mapping and Minerals Project (IMMP); Structural and culture shifts and administrative tinkering; The end of the Decade and shifts in government priorities*; *The buzzwords for the eighties)*

As the decade opened, a major study of the earth sciences in Canada by the Science Council of Canada was tabled in the form of a report from the Chair of the Council, Dr. O.M. Solandt, to Prime Minister Trudeau (Science Council of Canada, 1970). This report, and a subsequent series of background reports (e.g. Science Council of Canada 1971; Smith, 1970), set out the recommendations to the government of the Science Council Study Group on the Solid Earth Sciences in Canada. Many of the recommendations would have a major influence on federal government science policies in the 1970s.

As for the Geological Survey itself, the end of the Zaslow volume (Zaslow, 1975) documenting it's first 130 years, ends with an optimistic view of the organization's future: – *" The two decades since 1950 have probably been the most productive in the Survey's history"* (Zaslow, 1975, p.409) and further that *"The success and recognition that have come to it (the Survey) are also due in some degree to its continuing efforts to carry out its functions in the light of the country's needs, and to mobilize its strength in pursuit of these goals*…" (Ibid, p. 411)

Undoubtedly this momentum carried the Survey through into the 1970s on a high note, but already the environment in which it had been accustomed to operate for many years was beginning to change. At the Department level, a forerunner of this change had occurred four years earlier in 1966 when the federal government passed the "Energy, Mines and Resources Act" and created the new Department of Energy, Mines and Resources to succeed the earlier Department of Mines and Technical Surveys. This new legislation (and Department) presaged the federal government's increasing preoccupation with natural resources in general and with energy resources in particular. It also represented a shift away from the purely technical aspects of resource exploitation and toward the generation of policies and programs aimed at mineral-and energy-based economic development. As subsequent events would illustrate however, this shift toward "policies for development" would quickly run afoul of provincial jurisdictions[1].

[1] Ownership of natural resources was vested in the provinces by the British North America Act of 1867 and subsequent Acts and was not in question. However, the federal government of the day apparently felt it had a role in "guiding" resource development in the provinces through the influence of "national" policies, as

For the GSC (and other technical agencies of the government) such policy-driven change would mean a realignment of its programs and projects towards a closer fit with the planning and policy functions of the Department. This would require (sometimes painful) readjustments of GSC's traditional, largely self-directed technical orientation to accommodate the idea of programs and projects carried out in direct support of resource policy development within the Department.

But the root of this change was probably not that simple. With the advantage of hindsight, two of the principal drivers of this change were: the much more aggressive roles played by the provinces in the conduct of national joint programs; and the overwhelming preoccupation with energy matters in the national scheme as well as on the world stage. Both of these factors had major influences on the priorities and programs within the Department (Energy, Mines & Resources) and thus, ultimately on the priorities and programs within the GSC. In effect, the relatively long leash GSC had traditionally enjoyed in terms of designing its own future within the Department was about to be shortened.[1] Throughout the federal government as a whole, there would be a realignment of efforts so that the priorities and operations of departments would more closely reflect the political priorities and preoccupations of the day. This realignment would, in turn, be carried down within departments to the level of operating agencies like the GSC.

As noted earlier, the seventies – particularly the early and mid-seventies —were characterized by concerns about the continuing availability of resources, mainly energy, but also minerals, water and food. These concerns probably can be traced to a number of events, but they were given wide public profile by the Club of Rome studies and the publication of the book *"Limits to Growth"* (Meadows et al, 1972), the gloomy predictions of some U.S. oil experts about future oil supplies (e.g. Hubbert,1949, 1956) and the public discussions that such arguments generated[2]. Early in the decade the

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well as, of course, discharging it's primary stewardship responsibilities over resources in the northern territories.

[1] The GSC had traditionally pursued its mission of documenting and interpreting the geology and (minerals and energy) resources of Canada with a single-minded, largely self-managed vigour. Now, the new policy responsibilities and obligations assigned at Departmental level meant that GSC (and other technical agencies of the Department such as Surveys and Mapping Branch, Earth Physics Branch and CANMET) would have to divert some of that vigorous effort in order to respond to the urgent priorities of the day. (s*ee* also Zaslow 1975, p 412) for further discussion on this matter.

[2] M.King Hubbert, a geologist first with Shell Oil, later with the US Geological Survey, first outlined his thesis of finite oil resources in a paper in *Science* (Hubbert, 1949) and then refined his projections in a later

international oil situation descended into chaos as a result of the OPEC (Organization of Petroleum Exporting Countries) oil embargo and the Israeli-Arab "October War"[1] The international price of crude went from US $5.00/barrel at the end of 1973 to US $11.25[2] at the end of 1974 (Toombs, 1995). These developments had major impacts on western economies, triggering serious inflation and driving some into recession. In the midst of this oil-driven turmoil there seemed to set in a sort of global panic over the perceived looming scarcity of *all* earth resources.

In Canada, as in many developed countries, these resource concerns affected government priorities and rapidly became reflected in the policies and programs of line departments like EMR. In particular, the Department became dominated by energy policy concerns and this would remain the case throughout the decade. In addition to the global questions raised by international oil matters, Canada grappled with a whole set of domestic oil issues, ranging from finding appropriate oil and natural gas export balances with the U.S.,[3] through complicated concerns regarding proposed pipelines to carry northern oil and gas supplies to southern markets,[4] to the establishment of a National oil company (Petro Canada) and a host of new measures to be implemented to foster and promote energy conservation. Looking back on the records, the crisis menu of these times certainly held no shortage of items. Mineral supplies, although of concern also, were relegated to a lesser priority. In any case, both these headquarters priorities (energy and minerals) impacted firmly on GSC operations.

On the energy side the Survey's Institute of Sedimentary and Petroleum Geology (ISPG) in Calgary was most affected by new and expanded projects in oil and natural gas

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paper (Hubbert, 1956) when he predicted that world oil production would peak around 1965-1970. These papers ignited the long-standing (and still active) controversy over "Peak Oil".

[1] On October 7, 1973 Syria and Egypt invaded Israel to commence the October or "Yom Kippur" War. In support, OPEC placed embargoes on oil delivered to countries sympathetic to Israel, including the United States, Netherlands and Japan.

[2] These, and subsequent oil prices are taken from a number of historical oil data websites: e.g. "Annual Oil Market Chronology" – Official Oil Statistics from the US Government; or from Toombs (1995)

[3] Throughout the 1960s Canada tried to export as much western oil and gas as possible; after OPEC and 1973, Canada introduced various export controls and taxes to restrict exports to the U.S. These measures disappeared with the introduction of the "Western Accord" by the Mulroney government in 1985; taxes were reduced, ownership and control restrictions were abandoned and exports were encouraged again. In 1980 oil exports to the U.S. were 455,000 barrels daily; in 2004 the figure was 2,118,000 barrels/day (Cohen, 2007).

[4] There was particular concern about the U.S. plan to move oil from the giant Prudhoe Bay Alaska field via tanker down the west coast to Seattle; Canada pushed strongly for an alternative land pipeline route through the Yukon Territory, in the end, to no avail.

assessment, coal research and geological mapping in Arctic terrains. But other GSC units were affected also, particularly Resource Geophysics and Geochemistry Division, Terrain Sciences Division and the Economic Geology Subdivision of Regional and Economic Geology Division. For the Survey, the work lay mainly in four main areas: accelerated assessments of reserves and resources of oil, natural gas and coal (mainly Calgary); northern terrain mapping and environmental studies in connection with the proposed Mackenzie Valley gas pipeline project (to be the subject of the inquiry headed by Mr. Justice Thomas Berger in 1974)[1]; assessments of uranium supply and demand carried out jointly with other departmental units, including CANMET (former Mines Branch) and Mineral Policy Branch (this collaboration would be called the *"Uranium Resource Appraisal Group"* or URAG and over the course of its long career it would conduct more than 20 annual appraisals of Canada's uranium demand and supply requirements) and, the commencement in 1975 of the joint federal-provincial Uranium Reconnaissance Program (URP), a two-pronged program (geochemical surveys and airborne radiometric surveys) designed to identify promising areas for uranium exploration by industry. Later, the geochemistry component of URP would evolve into the very successful National Geochemical Reconnaissance program (NGR) aimed initially at non-fuel mineral targets and then – in the 1990s – at public health and environmental questions as well. [2]

On the minerals side, assessments of Canada's resources became a high priority, driven not so much by internal pressures in the GSC as by Departmental initiatives, particularly within the then Mineral Policy Branch. In the beginning, certainly, there was considerable scepticism in GSC about the validity and usefulness of such assessments as well as uncertainty about the methodologies used to conduct them. The mineral deposits group in the Economic Geology Subdivision (a part of Regional and Economic Geology Division) under the supervision of Dr. G.B. Leech had just completed (1972) the original *"Operation Septembe**r**"* project, a crash "quantitative" national assessment of resources

[1] The Berger Commission Report, released in June, 1977, recommended: a) that no pipeline be routed through the Yukon Territory; b) that no pipeline be built in the Mackenzie Valley for at least ten years.
[2] A study of NGR conducted for EMR by the Queen's Centre for Resource Studies concluded that the (then) 23-year cumulative (1973—1995) NGR expenditures of about $41.8 million (constant 1986 $) would probably be recaptured about two times over by benefits accruing from just two mineral deposits (Brewery Creek, Yukon and Kudz Ze Kayah, Yukon) should they go into production and whose discovery was partly attributable to the program. Even more important were "legacy" benefits in terms of baseline geochemical data available for downstream public health studies (Doggett et al. 1996)

of copper, lead, zinc, nickel, molybdenum, uranium and iron. This study, done as the technical component of a larger study by Mineral Policy Branch called "MAPS" (Mineral Area Planning Study) was probably the first and only non-fuel *quantitative* assessment carried out by GSC. The details of *"Operation September"* have never been published but generalized versions of some of the results were released in 1977 as Mineral Policy papers.[1] Uranium assessments, have, however, been published on a fairly regular basis since 1974. Following this study ("Operation September") the mineral deposits group went on to conduct a series of qualitative assessments in various northern terrains, for various purposes. (*see* p. 12 and pp. 19-20).

Following the signing of the General Development Agreements with the provinces (initially Newfoundland, Nova Scotia, New Brunswick, Manitoba, Saskatchewan and British Columbia) in 1974, DREE began entering into a series of sector-specific development agreements that would involve GSC heavily for much of the next 20 years (the first mineral agreements were in northeastern BC and Saskatchewan in 1974).[2] Initially, the mineral agreements contained significant programs of airborne surveys (aeromagnetic and radiometric) and regional geochemical surveys that were managed or conducted (radiometric surveys) by Resource Geophysics and Geochemistry Division under the direction of Dr. Arthur Darnley. As additional mineral agreements were put in place, other activities were incorporated, including geological mapping and mineral deposit studies (Regional and Economic Geology) and surficial mapping and till geochemistry surveys (Terrain Sciences Division). At its peak (probably mid-late 1980s) the MDA (Mineral Development Agreement) process accounted for a significant part of the field operations of a number of GSC divisions. In the case of the Mineral Resources Division (formerly Economic Geology Division), for example, the MDAs would ultimately account for about 20 per cent of the Division's field budget but overall across

[1] Canada Mineral Resources Branch. 1977. A summary view of Canadian reserves and additional resources of copper, nickel, zinc, lead and molybdenum. EMR Minerals, MR 169, 23p.
Canada Mineral Resources Branch. 1977 A Summary view of Canadian reserves and additional resources of iron. EMR Minerals, MR 170, 14 p.

[2] The initial DREE agreement series (1974—1984) involved GSC staff mainly as technical advisors and in some cases, contract managers; the next generation of agreements (1984—1994) called Economic Regional Development Agreements or ERDAs involved many GSC officers as active participants in a variety of geoscience projects (Dr. W. Poole, personal communication, 2009)

the GSC the figure was about 10%.[1] Eventually the coordination of MDA activities within the Survey - at first left pretty much to individual divisions - became important and complex enough to require a separate office. This was set up within the Chief Geologist's Office (then Dr John Fyles) in 1984,with Dr. Bill Poole coordinating the new office.

The MDA period had another important effect on the Survey, in that it fostered (not without difficulties at first) a culture of cooperation with other federal and provincial agencies in delivering MDA programs. Initially, the principal partners that GSC dealt with were DREE, EMR/Mineral Policy and EMR/CANMET (formerly Mines Branch) on the federal side and, of course, the various geological surveys and departments of mines on the side of the provinces . Later, as MDA-type operations were extended into the northern territories, the cast expanded to include DIAND (Department of Indian and Northern Affairs), Parks Canada, COGLA (Canadian Oil and Gas Lands Administration) and others. These practices would stand the Survey in good stead in later years when major staff and budget cutbacks conspired to make joint-venture operations with other agencies and organizations the bottom line for survival.

The general preoccupation in the early 1970s with mineral and fuel supplies to feed the Canadian domestic economy and export trade translated to work on new energy and mineral policies within EMR, and this policy work would engage much of the Department's efforts over the next decade. On the energy side it resulted in a series of interim energy strategy and policy papers, the establishment of new agencies such as the Office of Energy Research and Development (OERD) and the Renewable Energy Resources Branch, the establishment of the Uranium Resource Appraisal Group within EMR and the issuance of its first report on Canada's resources and supplies of uranium fuel, and a number of initiatives dealing with the problem of long-term storage of radioactive waste. The GSC's role in these policy initiatives was significant: it was the central contributor in the uranium resource appraisal process (Uranium Section, Economic Geology Subdivision), and its estimates of Canada's coal resources (1979) and oil and gas resources (1980) produced by ISPG in Calgary were important inputs into

[1] The 20% figure is my estimate; the 10% figure is from the Annual Report of the Earth Sciences Sector for 1994-1995. According to Dr. Bill Poole, new MDA funding accruing to GSC over the period 1984—1994 was between $45 and $55 million or $4 to $5 million/year. (personal communication, 2009).

energy policy. For the Department, the culmination of this period was the launching, late in 1980 of the National Energy Program (NEP).

Over on the mineral side, Mineral Policy Branch (later Sector) embarked on a study to produce a companion piece to NEP called the National Mineral Policy. As the NEP would experience, the development of such "national" policies to fit the Canadian scene proved a difficult and complex process. The mineral policy process involved a complex set of projects and subprojects that were, in the end, supposed to come together—with the approval of the provinces – to set out guidelines for mineral-based economic development in Canada.[1] Since this project also was, in part, a child of the "resource scarcity" syndrome, there was an element of security of supply built into the process Amongst other things this element led to Mineral Policy's and the Geological Survey's participation as founding members in the six-country *International Strategic Minerals Inventory (ISMI)* project when it was co-proposed in the early 1980s by Dr. Dallas Peck, Director of the US Geological Survey and Dr. William Hutchison then GSC Director General. ISMI, involving the U.S. Canada, United Kingdom, then West Germany, Australia and the Republic of South Africa, began in about 1984 or 1985 and continued for many years thereafter. It resulted in the creation of a number of shared databases for mineral supplies considered "strategic" in the 1980s.

The GSC's role in this mineral policy enterprise was through *Project A – 7,* designed to describe the role of science and technology in the national mineral policy process. The project was initially given a high priority and Dr. Yves Fortier, former GSC Director and at the time (1975) Senior Advisor to the ADM's office (Science & Technology Sector) was assigned as the S & T Sector's project leader. However, shortly afterwards Dr. Fortier became ADM and the job of capturing and collating Sector input fell to the author. I was transferred from the Economic Geology Subdivision to the ADM's office for 18 months to complete the S&T report. Dr. Murray Stewart and Dr. Lawrence Whiting were seconded from Mines Branch to provide assistance. We

[1] As originally envisaged the NMP process had three stages. The first was to produce a framework that the provinces (at Ministerial level) and EMR could agree on; the second was to produce a set of overall policy objectives and goals, and the third stage was to produce a series of commodity-specific and activity-specific reviews. As benchmarks in this process, a number of interim policy documents were produced; e.g. "Mineral Policy Objectives for Canada" (EMR, 1973); "Towards a Mineral Policy For Canada; Opportunities For Choice" (EMR, 1974), etc. The process eventually culminated with the publication in 1987 of a report called "A National Mineral Policy for Canada"

eventually got the project completed and the report was published in 1976 (EMR 1976). Meanwhile, the overall National Mineral Policy project continued on but, in part because of objections from some of the provinces, and in part because of shifts in priorities within EMR, it became a lower priority within the Department. As already noted, it resulted along the way in a number of interim documents and in a final policy "Blue Book" (EMR 1987), which I think, more or less marked the end of the project. [1]

Within GSC in the latter part of the decade, there was considerable effort in resource assessment for uranium, oil and gas and coal, as well as for iron and other non-fuel minerals. On the minerals side the emphasis had shifted, however, from assessing reserves and resources of economic minerals, as in *Operation September*, to assessing the potential for tracts of land to contain undiscovered deposits of certain minerals. A series of resource assessments for northern Canada including some of the Arctic Islands, was completed between 1976 and 1980 (GSC 1978, 1980). These studies would later (1981 and after) evolve to the more sophisticated field-based *MERA* (Mineral and Energy Resource Assessment) process involving GSC, Mineral Policy Sector of EMR, DIAND and Parks Canada (e.g. Findlay et al., 1986). In energy, as already mentioned, the Petroleum Resource Appraisal Secretariat at ISPG Calgary was working flat out to produce assessments for the National Energy Program process. These assessments, known as the "Blue Books" would continue intermittently into the 1990s.

During the decade, important operational and structural changes were also taking place within GSC. The practice of cross-divisional and multi-divisional joint projects had been established in the 1960s through the large, helicopter and fixed wing aircraft-supported geological mapping projects in the mainland north and in the Arctic Islands. Such projects *(e.g., "Operation Franklin", Operation Keewatin", "Operation Porcupine")* had clearly demonstrated the effectiveness of combining the expertise of

[1] The National Mineral Policy process resurfaced in 1995 when the federal government made a commitment to update the 1987 policy following the signing of the Whitehorse Mining Initiative (WMI) in 1994. The resulting new mineral policy – with heavy emphasis on "sustainability" – was introduced in 1996. The 1996 Speech from the Throne had committed the federal government to withdraw from certain natural resource functions—including mining—that were deemed provincial responsibilities. The new (1996) mineral policy reflected this change.

various specialists to result in the very rapid reconnaissance mapping of enormous, little-known frontier regions.[1]

Following the completion of these large, multidisciplinary projects however, the GSC appeared to revert to the traditional "Lone Ranger" approach to many projects in the early 1970s. That is, GSC officers by-and-large had their own individual projects and budgets and generally speaking guarded both zealously. Although there was no shortage of cooperation and consultation amongst GSC officers at project level, a considerable degree of autonomy existed at division level and crossing division boundaries to construct and operate multidisciplinary projects was not always easy. By the middle of the decade, efforts were being made to change this traditional approach to project management. The Integrated Mapping and Minerals Project (IMMP), under the direction of Dr. J.E. Reesor of Regional and Economic Geology Division was one of the prototype attempts in this area. The project had mixed success but it marked one of the first serious efforts by GSC senior management to re-introduce the concept of multi-divisional project operations.[2]

At about the same time, some divisions, including Resource Geophysics and Geochemistry and Economic Geology were experimenting with the establishment of group projects that drew expertise from a number of different areas within the division, in contrast with the traditional "Lone Ranger" project approach. These tentative moves would expand significantly in the 1980s, leading eventually to the replacement of the classic vertical management structure by partial and full matrix structures in the 1990s. In parallel with these cultural shifts, administrative "tinkering" was taking placed that, over time, would transform the structure of the GSC even further. Subdivisions were notched up to Divisions (Economic, Cordilleran, Precambrian), Division Chiefs became Directors, the "Director" of the Survey became a Director General, the former Deputy Director General position reverted to the Chief Geologist position (later Chief Scientist), from whence it had come, and the like.

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[1] Details of these large multidisciplinary mapping projects (and others) are given in Zaslow, 1975, pp 431-437.

[2] I have little information about this project but my memory tells me that it would have taken place about the same time as the MERA projects started, which would have been about 1980.

The decade ended with the beginnings of another major shift in GSC's operating environment on the horizon. Increasingly in the late 1970s the federal government's preoccupations turned to the question of the actual performance of the Canadian economy and not so much to the drivers of the economy. For example at a major conference called "*The Canadian Economy*" held in Quebec City late in 1976, the respected Canadian economist Judith Maxwell presented the argument that the classic Canadian "mixed" economy (private sector plus government agencies and Crown corporations) was becoming seriously unravelled because of the government's monetary policy, the rise of inflation, and the growth of the government sector. Other experts echoed Maxwell, and the government seemed to take the message to heart. This theme cascaded down to lower levels within government and by the end of the decade for example, training courses for middle managers were saturated with references to *restraint, zero - based budgeting, matrix organizations, management by objectives, market forces* and the new lexicology of the three "ees" – *economy, efficiency and effectiveness*. The buzzwords for the eighties had arrived.

The Decade of the Eighties

(Economic depression and recession; Gyrating oil prices; Residual concerns about resource supplies; "The Mineral Resource Potential of the Earth" – conference; Geological spies!?; National Energy Program; Updated oil and gas resource estimates; " Ocean Ranger" disaster; Hibernia squabbling and the Atlantic Accord; 1986 oil price collapse; A new government and deregulation, market forces and dismantling of NEP; Chernobyl accident and long-term storage of nuclear waste; AECL's Waste Concept Plan; "Green & Sustainable" terminology; Conservation & renewable sources; CO2 emissions & climate change; Soviet Union & Berlin Wall; GSC Futures Conference; Report of the Canadian Geoscience Council on output of GSC; Report of the Canadian Geoscience Council Advisory Committee on Mineral Deposits Research at the GSC; Assessment of Northern Parks and MERA: First GSC Geoscience Forum; Expenditure restraint; Minister's Independent Industrial Advisory Committee; "Thrust" documents and the Frontier Geoscience Program; Minister's Task Force on Program Review; Ocean Drilling Project; Lithoprobe; Merging of GSC and Earth Physics Branch; The "New Geological Survey"; MESP (Minerals & Earth Science Program); Multidisciplinary & Group projects; Organization structures and cultural change – lessons to be learned?; International involvement – MOU's and Protocols: China Gold Project; International Deposit Modeling Program; Leesburg Workshop; New GSC Long Term Plan; GSC Sector Planning Conference and the "sandbox" speech; GSC role and the Public Good mission; GSC Communications Office; New GSC Quebec Office; Infamous Gaspe Office; IMMA(Increased Ministerial Accountability Accord; Origins of

NATMAP;GSC western divisions; The Survey's future and the Lindseth Report; Exxon Valdez and the environmental movement).

The economic jitters (many of them oil-related) that had economists worrying in the latter part of the 1970s decade proved valid[1] and the new decade opened with a mild economic downturn in 1980 and a full-blown recession in 1981-82. As noted earlier, these developments were beginning to shift government priorities towards the performance of the Canadian economy but there were large time-lags in the system. The concerns of the 1970s carried well on into the new decade, and there was still considerable emphasis on resources and security of supply, particularly in the U.S.A. and in Europe. At the close of the decade (1979) for example, a major conference entitled *"The Mineral Resource Potential of the Earth"* had been hosted in Hanover, FRG by BGR (Bundesandtalt fur Geowissenschaften und Rohstoff). Prof Frits Bender, then Director of BGR shocked his colleagues and superiors in the Ministry of Economics by suggesting that BGR should be given major extra resources so that it could engage directly in exploration to ensure security of supply for the country. This was of interest because the Canada – FRG Agreement on Science and Technology was causing some uneasiness in GSC (Dr. John Maxwell was Canadian coordinator) related to suspicions that BGR people working on Agreement projects in Canada might be passing on insider information to German exploration companies like Metallgesellschaft and Preussag which were active in Canada at the time. These suspicions were never substantiated and remained only speculation.

In the USA the US Geological Survey (USGS) and the US Bureau of Mines (USBM) were busy promoting scenarios on the need to utilize lower-grade ores because of (perceived) increasing scarcity of conventional grade deposits. On the petroleum side, experts were bemoaning the lack of a stable price for crude and in Canada pundits argued that east coast offshore sources like Hibernia (discovered in 1979) would never be economic unless the price of crude exceeded $25.00/barrel.[2]

At home the Department (EMR) continued to be heavily preoccupied with energy

[1] In spite of the old joke that went -"if all of the economists in the world were laid end to end they still would not reach a conclusion."

[2] Oil prices were on a roller coaster: by the end of 1980 oil would be at U.S. $32.00/bbl, but would fall to $18.75/bbl by the end of 1981; only to rise again to $28-29.00/bbl in 1982 (Toombs, 1995).

matters. The NEP was launched late in 1980, despite strong opposition from the western provinces, especially Alberta (Alberta said it would take the federal government to court over the NEP). New estimates for Canada's resources of oil and natural gas were published (ISPG Calgary) as well as updated reserves and resources of uranium (Uranium Resource Appraisal Group, Ottawa). The 1983 ISPG updated oil and gas potential estimates for the Arctic Islands had considerable influence on the direction of NEP because the estimates suggested that about half of Canada's natural gas resources lay in the frontier regions (Arctic and offshore). In the eastern offshore region, exploration received a tragic setback when, on February 15, 1982 the offshore drilling platform "Ocean Ranger" capsized and sank in a storm 165 miles east of Newfoundland, with the loss of 84 lives. A Royal Commission Report on the accident was tabled in August of 1984.[1] Meanwhile, fierce opposition to NEP continued in the western provinces and in the east, the federal government and Newfoundland were bogged down in arguments over the sharing of offshore petroleum revenues, amidst the on-again, off-again development scenarios for the new Hibernia "giant" oil field. In 1985 the two governments signed the "Atlantic Accord" laying out the principles of offshore revenue sharing but in the meantime Hibernia had become, in the jargon of the trade a "marginal megaproject" with an uncertain future (Toombs, 1995). The 1986 oil price collapse (by June 1986 the cost of a barrel of oil had dropped to US $15.00) did nothing to clarify this future. But oil prices quickly rebounded and in 1987 the decision was made to proceed with Hibernia, with the federal government providing 25 per cent of pre-production costs to a maximum of $1.04 billion. Production was slated to start in 1996 (Toombs, 1995) but was delayed until1997.[2]

As the decade wore on new energy matters occupied centre stage. The federal election of 1984 brought a new Conservative government to power and it quickly began

[1] The Royal Commission report concluded that the Ocean Ranger had design and construction flaws and that the crew lacked adequate survival training. The cause of the disaster was determined to be a combination of extreme sea conditions (100 mph. winds and a 65-foot rogue wave) and a broken portlight that, through a chain-reaction series of events, led to flooding of the ballast control room. (source: Wikipedia).

[2] The original Memorandum of Agreement between Newfoundland and Canada on offshore oil and gas resources management and revenue sharing ("Atlantic Accord") provided for 100% of revenues (royalties, taxes) to accrue to Newfoundland, "just as if the resources were on land." Atlantic Accord #2, signed in 2005 was to authorize "additional payments to Newfoundland to provide 100% offsets against reduction in equalization payments resulting from offshore resource revenues."

to dismantle some of the more controversial elements of NEP. The oil price collapse of 1986 led to oversupply and security of supply became less of an issue. The new mantra was deregulation and the benefits of "market forces"

On the nuclear energy side, the accident at Chernobyl, Ukraine in April of 1986 caused many countries to reconsider their nuclear power programs.[1] In Italy, for example the government began phasing out nuclear plants in 1988. In Canada there were 18 CANDU reactors in operation, with two more under construction. Nuclear supplied 13% of Canada's total energy requirements but for Ontario, the country's largest producer, the figure was 40%. On the mining side Canada accounted for about one - third of total Western world uranium supply (mainly from mines at Elliot Lake and Agnew Lake in Ontario, and the new deposits in Saskatchewan) but there were increasing concerns about the long term storage of high level radioactive waste (spent fuels). Under the *Nuclear Fuel Waste Management Program (NFWMP)*, Atomic Energy of Canada Limited (AECL) and EMR had been conducting research into the long-term storage of spent nuclear fuel from Canadian reactors in underground repositories since 1973 (for GSC the program particularly involved Terrain Sciences Division, Resource Geophysics and Geochemistry Division and Precambrian Division) By the mid-1980s most of this activity was focussed on AECL's underground research facility near Lac du Bonnet, Manitoba because the prime candidate as a host for storage was the type of Precambrian granite that underlies the site. The program culminated with the development by AECL of an Environmental Impact Statement on the subsurface repository concept and its submission in 1994 to the federal Environmental Assessment Review Panel process. [2]

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[1]The four reactor, 4-gigawatt Chernobyl generating station, constructed between 1976 and 1983, is located near the town of Pripyat near the Ukraine-Belarus border and about 100 km north of Kiev. At the time of the accident it produced about 10% of Ukraine's electricity. During a test of pumps at reactor No. 4, a sudden power surge caused an explosion that generated temperatures over 2000 degrees Celsius and released a cloud of radioactive gasses into the atmosphere. Some 336,000 people were evacuated from the region. Although long-term health effects have been monitored closely, experts disagree over the "ultimate" casualty figures (some estimates are as high as 100,000) but to 2005, 60 deaths had been attributed to the accident. (source: Wikipedia)

[2] The Review Panel reported (1994) that the concept was "technically sound but socially unacceptable". Later, the federal government created a Nuclear Waste Management Office which submitted a report to Parliament in 2005 recommending procedures to deal with the nuclear waste issue (Dr John Scott, personal communication, 2009). For a detailed description of GSC activities under NFWMP *see* Scott, J.S., 2007, pp62-72.

By the end of the decade, "green" and "sustainable" concepts were increasingly creeping into government policies and plans, conservation and renewable sources were dominating energy resource discussions and, harbinger of things to come, CO2 emissions and Global Warming were starting to appear on the edges of the spotlight. On the global stage, the old Soviet Union was disintegrating, the Berlin Wall had come down (November 1989) and the world was lurching toward yet another oil-driven crisis, the First Gulf War (Aug, 1990—Feb, 1991) and the infamous "Mother of all battles."[1]

For GSC one of the first significant events of the decade was the *"Futures Conference"* held December 1-4, 1981 near Gananoque in the Thousand Islands. Organized by the author, Dr. Arthur Darnley and Dr. John Scott as a result of a suggestion to Dr. Digby McLaren, then GSC Director-General, the conference drew together about 80 representatives from all parts of GSC to attempt to map out the major factors that would affect the organization over the next few years. In the report of the conference [2] four major priority areas were identified: maintenance of scientific excellence; service-oriented investigations in support of national economic and social priorities; improvements in internal and external communications and better information transfer to clients and the public; and changes in internal structure and methods of operation to cope with expected decreasing budgets. In hindsight, the priority areas were prescient, especially the second and last. The second priority reinforced a theme that would increasingly weave through GSC operations: the idea that science and technology efforts would be expected to contribute to the general *social and economic objectives* of the *government* as well as to, for example, the more specific economic aims of GSC's traditional industrial clients.[3] This gradual shift in emphasis, not really fully incorporated until the 1990s is probably– again, in hindsight –one of the major turning points in recent GSC history. As for the last priority, this foreshadowed the later introduction of

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[1] The price of oil was down, Iraq was essentially bankrupt and Saddam Hussein sought to revive his (oil) fortunes by annexing Kuwait. Kuwait was invaded on Aug 2,1990, the UN Security Council imposed economic sanctions against Iraq and a US-led, 34 nation UN Coalition invaded the country Feb. 23,1991 after a month-long aerial bombardment. (Wikipedia)

[2] This was an internal GSC report by the author entitled "Report of the GSC Futures Conference, December 1981"

[3] Examples of the type of program directed at these larger objectives would be the Sudbury Timmins Algoma Minerals Program (STAMP) (Duke, 2007) and the evolution of NGR (National Geochemical Reconnaissance Program towards environmental and public health issues. Also, beginning with the 1992 Long Term Strategic Plan environmental geoscience became one of the six GSC formal programs.

program-based structure leading eventually to large multidisciplinary operations like NATMAP (National Geoscience Mapping Program), EXTECH (Exploration Science & Technology Development Program) and the like of the 1990s. The Conference also served to introduce Dr. Raymond Price as the new incoming Director General of the Survey.

Not long after the Futures Conference, GSC received the first of many reviews of various parts of its operations that would be conducted by committees set up under the auspices of the Canadian Geoscience Council (CGC). This one, chaired by the late Dr. Alan Coope, reviewed the "Output" of GSC (Coope et al., 1983). The report lauded the generally high quality of GSC output, but expressed concerns about a number of areas, including timeliness of reports and publications, communications (internal and external) and management structure and practices (not enough capability to discipline or dismiss unproductive staff).

In 1979 the federal government through the Department of Indian Affairs and Northern Development (DIAND) had announced new policies for northern development, including new measures for the designation of lands to become National Parks. The Department (DIAND) was instructed to ensure that mineral and energy resource potential " inventories" were conducted on lands proposed to be set aside for parks, just as evaluations of potential park heritage and ascetic values were required. Parks Canada was instructed to cooperate with other federal agencies in carrying out these inventories (National Parks Policy, 1979).[1] In 1980, following discussions between DIAND and EMR (Dr. J.O. Wheeler, Dr. G.B. Leech and the author were involved for GSC) a tripartite system was set up whereby EMR (GSC and Mineral Policy Sector), DIAND (Mineral Resources group) and Parks Canada would each share one-third of the costs of conducting the studies. GSC was to be the operator. Over the next year or so, a Working Group co-chaired by the author and Mr Al Burgoine of DIAND set out a protocol for doing the assessments and for reporting up the chain of command. The latter was done through a Senior Committee composed of Assistant Deputy Ministers from DIAND

[1] The Terms of Reference for the "modern" MERA (Oct. 1985) can be found on NRCan website under Minerals and Metals Sector. They are derived from the 1979 National Parks policy document which states "It is the policy of the Department of Indian Affairs and Northern Development to ensure that an inventory of the non-renewable resource potential of areas of the Yukon and N.W.T. be compiled prior to their formal establishment as new National Parks."

(Chair), EMR (Mineral Policy and GSC), Parks Canada and, from time to time, other representatives as required. We coined the term **"***MERA"* (Mineral & Energy Resource Assessment) for these studies; the Working Group became the MERA Working Group and the Senior Committee became known as the Senior MERA Committee. Over the next 25 years, GSC would go on to conduct many field-based northern MERAs, for many of these years under the direction of Dr. Charles Jefferson of Mineral Resources Division and more recently under the supervision of Dr. Danny Wright of the same division.

In 1982, the GSC's Atlantic Geoscience Centre (AGC) celebrated its 10th anniversary[1], Mineral Development Agreements with many of the provinces were in full swing, and GSC held its first *Geoscience Forum* at the Skyline Hotel in Ottawa (January). The Forums would carry on to the mid-1990s and served the useful purpose of quickly releasing the initial results of work during the past field season to industry and to members of the public. In later years the Forums alternated with the *Minerals Colloquiums*, the latter being directed more specifically towards mineral deposit related topics. With the incorporation of digital technologies and subsequent quicker publication of preliminary maps and reports, the incentives for these annual meetings declined and for this as well as cost-cutting reasons they were phased out in the mid 1990s.[2]

The theme of expenditure restraint began moving seriously into government operations in part as a result of the severe economic downturn of 1981-82. The federal government moved toward an "envelope" expenditure control system and by the middle of the decade long-term planning and priority-setting had become increasingly critical exercises for agencies hoping to pry new resources out of downtown Ottawa.[3] In EMR, Dr. W.W. (Bill) Hutchison, Director General of GSC became ADM of the new Earth

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[1] AGC (Atlantic Geoscience Centre) was formed in 1971/72 as a Division of GSC, co-located with the Department of Fisheries & Oceans Bedford Institute of Oceanography (BIO) at Dartmouth, Nova Scotia. It was established "to provide integrated scientific concepts, data bases and state-of-the-art interpretive maps of Canada's coasts, sea floors and underlying sedimentary basins." Its name was changed to GSC Atlantic in 1995.

[2] The last Minerals Colloquium was held in 1996. Similar forums for oil and gas were held in Calgary, at least until 1995, perhaps later.

[3] This goes back to the Royal Commission on Government Reorganization ("Glasco Commission") of 1962 which recommended that the government abandon line-item budgeting and adopt PPBS (Planning, Programming and Budgeting System), which, in turn, evolved into PEMS (Policy & Expenditure Management system) in the late 1970s and eventually into EMS (Expenditure Management System) in the mid-1990s.. The envelope budget system divides programs into "envelopes" that are managed by Cabinet committees within a five-year budget cycle. (McCaffery, 1984).

Sciences Sector (ESS) and initiated a review of ESS programs as well as introducing a strategic planning process to assign priorities to various competing projects and programs. As a part of this process, Dr. Hutchison introduced the idea of a senior external advisory committee whose job would be to advise the Minister of EMR as to the effectiveness and relevance of Sector programs. Such a committee was duly established as the *Minister's National Industrial Advisory Committee on Earth Sciences (MNIAC)* [1] and played a major role as a sounding board for Earth Science Sector initiatives and as a channel of communications between the private industrial sector and the Department at senior levels. The Committee went on to play a critical role in convincing successive governments of the value to Canada of many new earth science initiatives, including Lithoprobe, Canadian membership in the Ocean Drilling Program (ODP), the extension of the Polar Continental Shelf Project in support of Arctic logistics, and the Frontier Geoscience Program (FGP).[2]

As a part of the strategic planning process set in motion by Dr. Hutchison, the Sector embarked on a review of its part in "Federal Initiatives in the Earth Sciences". The Sector[3] input to this review, locally referred to as the "Thrust" document, was then used as a base to design a major new initiative, the *Frontier Geoscience Program (FGP*). Set out in a Cabinet submission largely authored by Dr. John Harrison and Dr. Vera Lafferty, both working in Dr. Hutchison's office, FGP became one of the few EMR initiatives, apart from energy conservation measures, that would receive new funding under the newly-elected Mulroney government. Announced in August of 1984, FGP set out an ambitious $20 million plan to upgrade the geoscience base in the Arctic and offshore regions in support of oil and gas exploration and to provide much-needed geological and undersea geographic information in the troublesome boundary disputes with France in the St. Pierre et Michelon area south of Newfoundland and with the USA and the Soviet Union in the Arctic. For the most part the GSC share of operating funding went to projects at ISPG (Calgary), AGC (Dartmouth), Polar Continental Shelf Project (Ottawa)

[1] Sometimes irreverently referred to by the rank and file as the "MANIAC" Committee.
[2] Dr. Raymond Price, personal communication. Dr. Price has set out some of these matters in some detail in his biography of Dr. Hutchison as part of the process of sponsorship of the Hutchison Medal of the Geological Association of Canada (Price, 2004).
[3] In 1982 a regrouping of EMR's various components resulted in the formation of a new Sector called Earth Sciences (ESS), comprised of GSC, Earth Physics Branch, Surveys and Mapping Branch and Polar Continental Shelf Project.

and Terrain Sciences Division (Ottawa). FGP ran until the early 1990s and eventually the funding (probably less than half of the $20 million originally allocated) was rolled into the GSC regular budget and apportioned according to the various division responsibilities.[1]

Also in 1984 there came another major landmark in "big science" opportunities for GSC with the announcement by the government that Canada would join the consortium of countries forming the *Ocean Drilling Program (ODP)* network as a full participating member. Canada would contribute $15 million to the project for the first four years and, for this, would earn the right to have its scientists participate in various of the ODP "legs" as well as, eventually, the opportunity to have seabed holes drilled in Canadian areas of geoscientific interest. This development had come about as a result of a long and arduous process in which a number of GSC staff, led by Dr. W.W. Hutchison ADM Earth Sciences, and including Dr. Ray Price and Dr Robin Riddihough, had played key roles.[2]

In mid-1985, the Survey received another of its Canadian Geoscience Council external review reports, this one on the topic of mineral deposits research[3]. The Committee, chaired by Prof. Anthony J. Naldrett, University of Toronto, found some things it liked and some things it didn't in the course of its review. In the latter category were included: the perception that GSC senior management had given a relatively low priority to mineral deposits research in the past; the lack of strong planning and coherent overall objectives for such work; and the lack of serious integration of research efforts within the Economic Geology Division and with other divisions, particularly RGG (Resource Geophysics and Geochemistry). The Naldrett report arrived at a critical time for GSC because of the major reorganization that was about to take place (*see* following)

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[1] This was probably in part due to the severe cost restraint measures introduced in many departments (including EMR) as a result of the Ministerial Task Force on Program Review (Neilsen Task Force) of 1985/86.

[2] As noted by Ms Christy Vodden in her excellent "No Stone Unturned" (Vodden, 1992) this was also the beginning year of LITHOPROBE the largest geoscience research project (government, universities, private sector) ever undertaken in Canada. It has involved some 700 scientists over the years and has provided a wealth of new data and new interpretations on Canada's continental crust to depths of 50 km.

[3] Naldrett et al. 1985. "Report of the Canadian Geoscience Council Advisory Committee on Mineral Deposits Research at the Geological Survey of Canada"; GSC Paper 85-6, Part 2, 23p.

and in fact, many of the Committee's recommendations were about to be addressed in this process.

The seminal event for GSC in the mid-eighties was the merging of the Earth Physics Branch of EMR and the Geological Survey to form the "New" Geological Survey of Canada, as a result of recommendations of the Neilsen Task Force (Ministerial Task Force on Program Review). The new GSC officially came into being April 1, 1986. In a special edition of "Geogram" (the GSC house newsletter) dated May, 1986 an extended note by Dr. Raymond Price, Director General set out the history, mandate, organization and responsibilities of the new GSC. The reorganization left GSC with eight operating divisions, 5 in Ottawa, 3 in the regions. They were: Geophysics (most of the former Earth Physics Branch); Mineral Resources; Terrain Sciences; Geoscience Information; and Lithosphere and Canadian Shield, all in Ottawa; and Atlantic Geoscience Centre (Dartmouth NS); Institute of Sedimentary and Petroleum Geology (Calgary), and Cordilleran and Pacific Margin (Vancouver and Pat Bay, Vancouver Island). Barely a year later in April 1987, the EMR Deputy Minister (Mr Arthur Kroeger) announced a reorganization of EMR's *Minerals and Earth Sciences Program (MESP)* that would elevate the GSC to Sector status consisting of four branches:- Sedimentary and Marine Geoscience Branch (AGC, ISPG, CPM); Continental Geoscience and Mineral Resources Branch (LCS, MRD); Geophysical Surveys, Hazards and Terrain Sciences Branch (Geophysics, Terrain Sciences); and Program Planning & Services Branch (GIS, Program Planning & Coordination Division and Administrative Services Division).[1] Polar Continental Shelf Project, the federal government's Arctic logistics and support service also became part of the new GSC Sector.

Within most GSC Divisions in this general time period (mid-eighties) there was considerable experimentation with new project approaches, based more closely on the program structure and on making better use of skills both within and across divisions. For example, in Mineral Resources Division (formerly Economic Geology Division) the traditional approach to minerals deposit research had been commodity-oriented; that is to

[1] This material is from an internal "Friends of GSC" document by Dr. A.G Plant dated Jan 25, 2005 and revised April 27,2008 as Document HGSC-9. (personal communication, 2008). As noted by Dr. Plant, after the April, 1987 reorganization, there was some tinkering with the names of the various Branches and Divisions; for example, Geophysical Surveys, Hazards and Terrain Sciences became simply Geophysics and Terrain Sciences Branch.

say that individual scientists studied deposits of a particular commodity type (e.g iron, copper) or commodity groups (lead-zinc; gold-silver).[1] Beginning in the mid-1980s however, the research was shifting towards a focus on deposit-types as distinct from commodity types; further, the mineral deposits group was moving away from the traditional "one man - one commodity" approach toward group projects where a variety of expertise was trained on one problem or target. Early examples of this (in MRD) were the "Ultramafic-hosted mineral deposits" project and the Gold Working Group Project, each having a number of scientists working under the project umbrella. In the early days of these and similar projects, individual scientists brought their own research budgets to the project (and in many cases guarded them zealously) but as the projects matured, "pooled" budgets became common and eventually project budgets (as opposed to individual scientist's budgets) became the order of the day.

Similar changes were taking place in other divisions within the Survey and multidisciplinary or "group" projects became increasingly the norm. As noted earlier, this shift in operating culture probably received considerable impetus from the MDA process, where many projects were multidisciplinary and partnership-oriented. These *project* changes, in retrospect, were the harbingers of new *organizational* changes that would move through the Survey in subsequent years.

There is probably an important lesson to be learned about organizational structures in looking back at this group project evolution within GSC: that in many cases the incentive for change initially came about as a result of requirements at the *project* level and not necessarily at management level. That is, the changes at project level were initiated in response to research needs (e.g. deposit types vs. commodities) or *perceived* research needs; they were not parachuted down through the organization as a result of some desire for organizational neatness on the part of those at the top.

The notes above about the evolution of multidisciplinary or group projects point to what – again in hindsight – is probably one of the major cultural shifts to take place in the Survey in the post-Zaslow years. This, coupled with the earlier-noted changes in the attitude regarding the impact of science and technology on general social and economic

[1] Coincidentally, the Naldrett Report had commented that, in the Committee's view, the commodity approach had not been particularly successful in terms of understanding the origins of mineral deposits and the development of exploration models.

(later environmental as well) issues as well as on specific issues related to traditional industrial clients, seems to capture much of the essence of *cultural* change that has taken place within the Survey in the period under discussion. A third component of this change has its roots in the re-emergence at Departmental level of the concept of the Public Good mission, after a period of neglect under the various "market forces" banners. (*see below*)

There was another factor that seemed to be emerging in GSC operations in the early-and mid-1980s. This was a turning outward to become increasingly involved in joint projects with other countries and with United Nations-related activities. This new trend was officially recognized with the establishment of an International Relations group in the Chief Geologist's office in 1984.[1]

GSC had long been involved (though participation by individual staff) in international projects such as the *International Geological Correlation Project (IGCP)* and similar activities sponsored by IUGS (International Union of Geological Sciences) and UNESCO (United Nations Educational, Scientific and Cultural Organization) but now it began entering into bilateral arrangements (or in cases such as the above-noted ISMI and ODP, multilateral arrangements) with other countries, often through the vehicles of MOUs (Memorandum of Understanding). An early example was the Protocol between Canada and the USSR, originally negotiated in 1981 but not actually signed until 1984. Theme I of the Protocol was directed primarily at geoscience work to be carried out in the Arctic regions (both Canadian and Soviet) and involved mainly ISPG, AGC and Polar Continental Shelf on the Survey side, but a mineral deposits component was included as well. It had long been the goal of Canadian and US mineral deposits geologists to be able to visit some of the classic Soviet deposits, such as, for example the world-class nickel and platinum group deposits of the Norils'k region of the Siberian Platform. By the same token, Soviet geologists had wanted an opportunity to visit the Canadian deposits at Sudbury. Because of the difficult Cold War security regimes at the time, such exchanges had not been possible. Theme I thus presented (or appeared to at the time) an unprecedented opportunity to begin a process of exchange visits, although it has to be said, with some scepticism on both sides. In October 1981 the process was started with a month-long visit of four GSC geologists to the Soviet Union to look at base

[1] The first members of this group were A.R. Berger and Bernard Manistre (Plant, 2005/2008)

metal deposits in various parts of the country (Caucasus Mountains, Ural Mountains, southwestern Siberia). Still at that time, the Soviets would not permit western visitors to Norils'k, which was a part of one of the gulags.[1]

Various other bilateral or multilateral projects were being mounted during this period. In 1986 Dr. Howard Poulsen and the author, both of Mineral Resources Division, visited China as the first part of an exchange under the newly-signed MOU with the Chinese Ministry of Geology and Mineral Resources. From this visit and subsequent visits to Ottawa by Chinese Ministry officials, came the *Canada-China Gold Project*, a three-year joint field study of gold terranes in China (Western Liaoning District, North China Platform) and Canada (Rice Lake District, Manitoba)[2]

Closer to home, a number of joint projects were being conducted with the US Geological Survey (USGS). In September 1986, GSC and USGS convened a four-day workshop on mineral resource assessment techniques in Leesburg, Virginia (co-convenors Dr. Larry Drew for USGS and the author for GSC). The workshop explored the evolution of assessment techniques from *qualitative* to *quantitative* and set out some guidelines for future developments in the field.[3] The Leesburg Workshop was intended to serve as a model for future USGS-GSC joint meetings, but in the end none was held and the Leesburg Workshop remained the only event in this proposed series.

Multilateral programs and projects were also coming into play. In 1984, UNESCO's Earth Sciences Division convened a "meeting of experts" in Paris to consider a proposal for an international project in mineral deposit modeling. From this meeting came the IUGS-UNESCO-sponsored *Deposit Modeling Program***,** involving some 10 to a dozen countries over the next decade. The objectives of the program were two-fold: knowledge transfer to developing countries through the conduct of in-country hands-on workshops; and conferences and symposia from time to time to exchange "best practices"

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[1] The GSC visitors were Dr.Don Sangster, Dr. Rod Kirkham and the author, from Economic Geology Division and Dr. Bill Poole from Precambrian Division. The visit was successful, particularly because it established contact with Soviet scientists at a working level and led in subsequent years to further exchanges including, eventually, access to Norils'k and Sudbury.

[2] The results of this study are contained in a 1990 internal GSC report entitled "Report on the Sino-Canadian Gold Project, 1987- 1990" by K.H. Poulsen (GSC) and Lin Baoqin (MGMR-PRC) 124p.

[3] The results of the Leesburg Workshop were published in 1986 as USGS Circular 980 – "Prospects for Mineral Resource Assessment on Public Lands: Proceedings of the Leeesburg Workshop;"eds Simon M. Cargill and Stephen B. Green; 330 p.

amongst experts in deposit model studies. The GSC was a founding participant of this program, served as Chair of the Steering Committee for several years (the author), and Secretary for many years (Stephen Green, Mineral Resources Division).

Early in 1987, GSC embarked on a major internal effort to produce a new *Long Term Plan*, designed to guide the "new" Geological Survey through to 1992. Led by Dr. Robin Riddihough, (then Branch Scientific Executive Officer and later Chief Scientist), this was a major document, signed off by Dr. Raymond Price, Acting ADM (Geological Survey Sector). It set out the organization of the new Survey into four Branches plus the Polar Continental Shelf Project (PCSP).[1] The relationships between government priorities and line department activity structures had become increasingly complex and the GSC Long Term Plan had to dovetail with the government priorities of the time. These were listed as: deficit reduction; economic growth; regional development; federal-provincial relations; and sovereignty and defence. In addition, the government was developing a new overall *Science and Technology Framework*, under which the GSC "Activity Structure" had to fit. In GSC's case its activities were slotted into the "government mission" category of the S & T Framework (the other two categories in the Framework were: economic and regional development; and advancement of knowledge). In hindsight, this passion for pigeonholing the various "activities" of an agency into some preordained framework may have shed more heat than light on the subject, but at the time it was the order of the day.

The Long Term Plan was an important milestone in the evolution of the "new" Geological Survey because for the first time it gathered together the various operations of the Survey into a formal Program Structure that crosscut division boundaries. In effect, the Plan served to formalize the various processes of multidisciplinary groupings that had been evolving informally within divisions for a number of years.[1]

The new long-term plan then became the major source document for a GSC *Sector Planning Conference* held November 24-26, 1987 at Mont. Ste. Marie

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[1] As noted earlier the Branches were: Sedimentary & Marine Geoscience; Continental Geoscience & Mineral Resources; Geophysical Surveys, Hazards and Terrain Sciences; and, Programs, Planning and Administrative Services.

[1] The Programs were: Geoscience Surveys; Minerals; Energy; Environmental Geoscience; and Geoscience Information.

Quebec. It was here that the (then) EMR Associate Deputy Minister responsible for MESP (Minerals and Earth Sciences Program), Dr. Pierre Perron famously antagonized GSC management and staff with the *"Sandbox Speech"* in which he likened GSC scientists to children playing in their part of the sandbox, oblivious to (and uninterested in) what was taking place in other parts of the sandbox. Of interest in the "sandbox" context was that one of the questions posed in the Minerals Workshop at the Conference was: "Can we find diamonds in Canada? A few years later in 1991 Canadian industry did discover diamonds, perhaps helped initially in part by GSC (ISPG Calgary) sponsorship of an Unsolicited Proposal from industry to analyze archived till samples that eventually led to the recognition of diamond indicator minerals in samples from the Contwoyto Lake area, NWT. Although GSC cannot claim any direct link to the discovery of diamonds in Canada, the incident illustrates that "sand" from one part of the sandbox may turn out to be valuable in another part with the passage of time.

Late in the decade EMR seemed to become concerned about its "role" and mission, or at least the perception of that within the bureaucracy. A document entitled *"Science and Technology in EMR – New Directions "*(Nov. 23, 1988) pointed out that EMR played a major role in delivering federal science and technology ($300 million annually and 3,000 person years) but lamented the generally low political visibility afforded EMR's S & T activities "until highlighted by a major event or accident." [2] This lack of clout and visibility is an old theme in line department and agency histories, and it seems to cascade down through the hierarchies: at the Department level there is frustration that its yeoman efforts are not sufficiently appreciated downtown (central federal agencies as for example, Treasury Board), while internally, at the sector or agency level (especially technical agencies) there is unhappiness because there is a perception that the agencies have little influence in the formulation of policies by headquarters (Department level), especially those that will come back to bite them. At the GSC this was a thread of discord that frequently wove through the organization over many administrations. To some degree, similar feelings were shared by staff in the regional divisions when they regarded what they deemed to be inexplicable or incoherent decisions coming from far-away Ottawa.

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[2] This document was apparently intended as a briefing book for a new EMR Minister.

But in spite of this perceived uncertainty, EMR did in fact seem to have a good understanding of its mission. A note dated August 16, 1988 entitled *"EMR's Public Good Mission (Version 3)"* sets out in succinct terms the rationale for the division of activities within EMR in support of its two "missions" – the Economic Mission and the Public Good Mission. The note also suggests that the public good mission of EMR and other line departments was not well understood by the central agencies.[1]

During this period, and related to questions of "missions" and public perceptions of government roles and activities, many agencies established internal communications offices, in order to facilitate information transfer within the organizations as well as to improve communication with external clients. Also, increasingly line agencies were being called upon to supply technical information as input to Department-level responses to questions arising in Parliament, either through Question Period or as a result of Parliamentary Committee activities. Such responses usually demanded very short turnaround times,[2] and there was a need for internal groups that could quickly gather the required information from within the agency and deliver it in appropriate formats (e.g. "Memo to Minister") to the Department. In GSC, mainly to serve the need for better communication with external clients and sister agencies, such a Communications Office was set up and rapidly became a busy place. The office was under the direction of Christy Vodden and reported to the Chief Scientist, Dr. Robin Riddihough.[3]

As the decade drew to a close, a number of issues were occupying GSC. For a year or so discussions had been proceeding with two Quebec universities (Laval and University of Quebec – Institut national de la recherche scientifique - INRS) concerning the establishment of a GSC office in Quebec. Initially, a proposal was made by Laval for GSC to relocate its mineral deposit research activities from Ottawa to Quebec but after various negotiations an agreement was signed in 1988 between GSC (Dr. R.A. Price) and INRS for a joint-venture office at INRS's Ste. Foy location. The Agreement was complex and, in the beginning, there were many uncertainties concerning staff,

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[1] I think the authors were being polite. I do not know the origins of this note (I suspect Corporate Policy Sector of EMR) but I recognize input from Dr Raymond Price and myself in it.

[2] The conventional belief was, of course, that these requests for quick answers invariably arrived at 4 o'clock on a Friday afternoon.

[3] According to Christy Vodden, the GSC office was especially intended to focus on promoting the value of GSC work to clients in the general public, youth organizations and decision-makers in all sectors (personal communication, 2009).

responsibilities and budgets, but over the next year or so the various hurdles were overcome and the office – officially called *Centre Geoscientifique de Quebec (CGQ)* – was formally opened in November 1989. It was designated, on the GSC side, as a Division within the Mineral Resources and Continental Geoscience Branch, so that in my capacity as Branch DG I spent considerable time and effort along with Dr. Pierre Lapointe (DG Programs, Planning and Administrative Services Branch), Dr. Denis St-Onge (Director, Terrain Sciences Division) and Dr. Robin Riddihough (Chief Scientist) setting up the office.[1]

At about the same time as discussions about the Quebec office were going on in the east there was considerable agitation in GSC over the organization and structure of the western divisions, specifically Cordilleran Division in Vancouver and Pacific Geoscience Centre (PGC), at the Institute of Ocean Sciences (Department of Fisheries and Oceans) facility at Pat Bay, Vancouver Island. In the reorganization of GSC following the merger with the former Earth Physics Branch in 1986, these units had been combined (1987) to form the Cordilleran and Pacific Geoscience Division but there were serious logistic and staff morale problems with this arrangement and for the next two years or so various attempts were made to resolve the problems[1]. Early in 1989, with the approval of the then Deputy Minister Mr Bruce Howe, the group was split again into two divisions – Cordilleran Geoscience and Pacific Geoscience. The new arrangement satisfied some proponents both inside and outside GSC (e.g. BC-Yukon Chamber of Mines), but clearly dissatisfied others.

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[1] A couple of years later, at the time of the Charlottetown Accord discussions in Parliament (1992), we were instructed to set up another office in Quebec, this time in Sainte Anne des Monts on the Gaspe coast. This was a purely politically-driven initiative. We rented a fisherman's house in Ste. Anne, put a sign in the window, and hired (through CGQ) a couple of graduate students to do mapping and mineral work in the Chic Choc Group volcanics. We also set up a field geochemistry laboratory near Paspediac on the south coast for analysis of till samples collected in the course of the Chic Choc work. The project lasted about a year and then died of neglect. When we went across the street to the Deputy Minister's office (Mr.Bruce Howe) in the "Black Tower" to get our instructions on this office, I ventured meekly that I thought it was a pretty dumb idea. The Deputy rounded on me furiously and said: "My boss (meaning EMR Minister Jake Epp) thinks it's a good idea; his boss (meaning Prime Minister Brian Mulroney) thinks it's a good idea, so you bloody well better think it's a good idea too". Yessir! From time to time there were other proposals to set up regional offices, specifically in St John's Newfoundland and in Thunder Bay, Ontario.

[1] According to Dr. Price, the combined division was intended to focus the "integrated multidisciplinary expertise and technology" from Pat Bay and Vancouver on GSC's Pacific margin responsibilities as well as providing a "national focal point for earthquake studies in Canada." (personal communication, 2009).

In other matters in the GSC operating environment, the Conservative government had been re-elected (1987), the Free Trade Agreement (FTA) was in place with the U.S. and in the bureaucracy, new buzzwords included, amongst others, *"IMAA"* (Increased Ministerial Authority and Accountability). It was not clear in the lower echelons how this differed from business as usual.

Within GSC, an important program element was developing in the form of *NATMAP* – the proposal for a cooperative National (Geoscience) Mapping Program with the provinces. The proposal had been circulating internally for a year or so and, after a series of meetings and discussions, had moved toward a public discussion which was commenced at a Workshop in Toronto in March of 1990. At the Workshop – attended by representatives of GSC, provincial geological surveys, academia and industry – a recommendation was made to proceed with a prototype project under the direction of a Steering Committee. The prototype - known as the Shield Margins Project - commenced jointly with Manitoba and Saskatchewan in 1991 and was completed in 1996. Altogether, during the 10-year life of the program about a dozen major mapping projects were completed or started in various regions of the country.[2]

The end of the decade brought the tabling of the Canadian Geoscience Council (CGC) report on the future of the Geological Survey called "*Earth Science In The Service of the Nation"* (known as the "Lindseth Report" after the chair of the review committee, Mr. Roy Lindseth). This report presented 16 recommendations, including several urging action in areas later followed by GSC. These latter included: expansion of the International Geology Office; more attention to geoscience and public health; recapturing hydrogeological expertise and programs; and maintenance of cooperative activities developed with the provinces as a result of MDA programs. The newly-proposed

[2] The idea for NATMAP came from the attendance of Dr. Jim Franklin and the author at the Vince McKelvey Minerals Forum hosted by the US Geological Survey (USGS) in Denver Colorado in March(?) 1988. At that meeting the USGS displayed a document titled "National Geologic Mapping Program – Goals, Objectives and Long Range Plans" (USGS Circular 1020). On our return to Ottawa, I wrote a note to Dr. R. A. Price (ADM GSC) suggesting that we should look into such a program for GSC. After discussion at GSC Executive meetings and internal discussions with Ottawa divisions (A Working Committee was struck under the Chair of Dr. Marc St- Onge, Precambrian Division to guide the process) the decision was made to go ahead with the design of a national cooperative mapping program, later to become NATMAP. Early in this process (fall of 1988), Dr. Ken Babcock replaced Dr. Price as ADM and he (Dr. Babcock) also pursued the NATMAP idea enthusiastically.

NATMAP (and the companion Exploration Science and Technology Program or *EXTECH*) would, in the event, fit neatly into the last category of recommendations.

Also as the decade drew to a close an event took place far from Ottawa whose consequences, although not affecting GSC directly, would ultimately trickle down to have a profound influence on the operating environments of many organizations—both public and private—in North America. A few minutes after midnight on Good Friday, March 24, 1989 the supertanker "Exxon Valdez" ran aground on Bligh Reef in Prince William Sound, Alaska and 240,000 barrels of crude oil were spilled into the sound. Although the cost of the clean-up was major (ultimately reaching $2 billion US) the long term effects on the environmental movement were even more profound. For years to come, the Exxon Valdez would serve as a reminder that the best intentions and the best technologies were not always enough.[1]

The Decade of the Nineties – First Half (1990 – 1995)

(First GSC Minerals Colloquium; Coope Report on Geochemistry; GSC Long Term Strategic Plan; Towards Matrixes; GSC 150th Anniversary; International Consortium of Geological Surveys (ICOGS); IPP (Industrial Partners Program); Digital Mapping; Geologic Hazards and Public Safety; Climate Change; Sea-floor Mineral Deposits; SHRIMP (Sensitive High Resolution Ion Microprobe); Program Review; Winding Down MDAs; Intergovernmental Geoscience Accord; First Conference of Parties to the UN Framework Convention on Climate Change)

The new decade opened with the convening of a *Minerals Colloquium* in Ottawa in January, 1990. This was the first in a series that would run in alternate years with the Current Activities forums until 1996. The next Colloquium, scheduled for 1998, was cancelled when it fell victim of budget cuts. [1]

At about the same time as the *NATMAP* discussions were going on between GSC and the provinces during the spring of 1990, the Canadian Geoscience Council (CGC) tabled another review of GSC activities, this time in the field of geochemistry. This study, under the chair of the late Dr. Alan J. Coope had been commissioned in July 1988

[1] This is not my interpretation. In his Pulitzer prize-winning book about oil, politics and power- "The Prize" Daniel Yergin asserts that the nuclear accident at Chernobyl in 1986 (*see* this report, p. 17) and the Exxon Valdez incident were the two seminal events that triggered what he calls the "third environmental wave" that, ultimately, would have the world marching to Copenhagen in the waning days of 2009 (Yergin,1992).
[1] According to Dr. Murray Duke, the idea for the Colloquium came from the attendance of he and Dr. Jon Scoates of the Mineral Deposits group at a US Geological Survey Minerals Forum held in Reno, Nevada (personal communication, 2009).

and the Committee's report was delivered to GSC in April of 1990.[2] The report caused consternation within Terrain Sciences Division (TSD) because, amongst other things, it recommended that Quaternary geochemistry and drift-prospecting geochemistry be transferred from TSD to the Exploration Geochemistry Subdivision of Mineral Resources Division. No doubt reflecting the heavily industry-oriented composition of the committee. the report also took a strongly negative stance on the subject of environmental geochemistry, which at the time was considered by both management and geochemistry research staff at GSC as being one of the most rapidly-developing subdisciplines in geochemistry. Subsequent events proved this to be the case, and within a year or so of the report geochemistry had become a significant component of the Survey's Environmental Geoscience Program, one of the five main Programs under the new GSC Long Term Strategic Plan (1991/1992). The others were: Geoscience Surveys; Minerals; Energy; and, Geoscience Information[3].

Flowing from the above grouping of programs the GSC embarked on extensive internal discussions to flesh out Part B of the Strategic Plan, the process of incorporating a program-based backbone into GSC's traditional, vertical, Division-oriented structure.[4] This was a rigorous and exhaustive process that involved widespread consultation, discussion and argument, initially internally but later with external clients as well. These discussions began in the fall of 1990 and continued through the winter and, eventually, into 1992. This marked an important milestone in the evolution of the "new" GSC because it formalized the process of de-coupling financial control and responsibility solely from divisions and re-aligning those factors horizontally following the program structure. Although divisions retained ultimate control of parts of their budgets by virtue of being the "champion" of particular programs, they would no longer have across-the-board financial responsibility for all of their operations. This process of de-coupling and

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[2] Since Dr. Coope actually chaired *two* CGC review committees ("Output" and "Geochemistry") there was sometimes confusion when the term "Coope Report" was used, although by convention, it usually referred to the Output report.

[3] Some of the rationale for GSC's Environmental Program was laid out in a paper by the author and R.T. Haworth ("Geological Surveys and the Environmental Agenda") given at the ITC Jubilee Workshop on "Earth Sciences and the Environment" in Enchede Holland, October 1992.

[4] This change was driven by a number of factors, including the emergence of more multidisciplinary "group" projects and the need to stretch operational dollars through partnerships and joint ventures. It also reflected the need for GSC to break down the "fiefdom" culture that existed in some divisions.

realignment would continue for the next few years.[1] At the time of these discussions there was considerable rigorous intervention from some quarters within GSC that argued that this move towards program structure would turn out to be a slippery slope and that, in the end, it would prove impossible to retain a mixture of program (horizontal) and administrative (vertical) structure because power in an organization inevitably "follows the money."[2]

The year 1992 marked the 150th Anniversary of GSC, established in1842 and exceeded in longevity amongst national geological survey organizations only by the British Geological Survey (established in1835). A 150th Anniversary Committee, Chaired by Dr. Charles Smith organized and orchestrated a series of events both inside and outside GSC to celebrate the occasion and to promote the record of the organization in the public eye. The procedures culminated with a combination conference and Birthday Party Gala (April 14) at the GSC's home from 1912 to 1959, the venerable Victoria Memorial Museum Building on McLeod Street, Ottawa. The conference, called the International Conference of Geological Surveys**,** resulted in the eventual formation of an organization called the *International Consortium of Geological Surveys (ICOGS)* with a 9-member Steering Committee and a mandate to provide a forum for communications and information transfer amongst the geological survey organizations of the world (Findlay, 1992).[1]

The 150th celebrations marked another important milestone for the Survey. Not only did the publicity surrounding the event put GSC much more in the public eye (if only briefly) but the process had a positive effect on staff morale. There was, it seemed, a

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[1] By the mid-1990s this process would be essentially complete. For example, in the Draft Strategic Plan for Geoscience 1996-2001 (Draft, May 23,1996), GSC budget allocations are given entirely in terms of the six Program areas (Regional Geoscience, Marine Geoscience, Hydrocarbons & Coal, Minerals, Hazards & Environmental Geoscience, Geoscience Information) plus the Polar Continental Shelf Project and Administration.

[2] I remember listening years earlier (1979) to a man called Henry Boettinger, a former manager at AT&T, talking about this at a management seminar at Oxford, U.K. According to my notes ("Notes on Economic Change" – Chapter 3.5 –" Politics, Management & Collapsibles") Boettinger thought that the problem of matrixes (sic) was essentially insoluble and that what he called "Skill Heads" (program structure) and "Project Heads" (administrative structure) would always be at "logger heads".

[1] The proceedings of the conference were published under the title of "National Geological Surveys in the 21st Century" as Geological Survey of Canada Miscellaneous Report 55, 1994. ICOGS went on to convene a number of meetings (Paris, 1993; Budapest 1994; International Geological Congress, Beijing 1996) but financial restrictions and changes in the heads, and in some cases philosophies of some member organizations eventually led to its decline. However, the Consortium has apparently revived in resent years and I understand a meeting was held in Norway in 2007.

feeling of rejuvenation in the headquarters halls of 601 Booth Street. Whether real or imagined, this feeling was no doubt re-enforced by the strong positive response afforded the celebrations by the international geological community. At home, the Deputy Minister (Mr Bruce Howe) took to referring to GSC –often with exasperation – as "that Jesuit bunch across the street," no doubt in appreciation of GSC's religious pursuit of its mission.

Following the 150th celebrations, GSC pursued a number of new initiatives under the new ADM, Dr. Ken Babcock.[2] *NATMAP* was now proceeding on several fronts with projects underway in Slave Province in NWT, Shield Margins in Manitoba and Saskatchewan, and the Southern Prairies in Saskatchewan and Manitoba. Other projects were in the planning stages for Cordilleran sites in the west and the Magdalen basin in the Maritimes. *EXTECH* (Exploration Science &Technology Program), a cooperative project with the provinces to foster the development of new exploration technologies, had begun in 1989 with a pilot project in the Snow Lake-Leaf Rapids area of Manitoba and had followed up (1994) with a second project in the classic Bathurst mining camp in New Brunswick.[3] Following the discovery of diamonds in the Lac de Gras area, NWT in 1991, GSC embarked on a number of till geochemistry projects (diamond indicator minerals detection and tracing) and bedrock mapping projects in areas in Saskatchewan, Alberta, Ontario and NWT targeted for diamond exploration by industry. A new joint-venture program with industry called *"Industrial Partners Program" (IPP)* began in 1992/93 with the objective of encouraging GSC Divisions to enter into shared-cost research projects with industrial partners. By 1995 some 95 projects had been initiated and about 20 had been completed[1]

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[2] Dr. Babcock introduced a "tax" on division budgets in order to underwrite some of the new projects such as NATMAP, EXTECH and IPP (Industrial Partners Program). Naturally, the tax was unpopular with divisions but in the end it served a useful and necessary purpose in launching these and other initiatives.

[3] According to Dr. Murray Duke, the Snow Lake-Leaf Rapids project deserves credit for paving the way for provincial cooperation (Manitoba) in the prototype NATMAP Shield Margins Project. I am indebted to Dr Duke for providing the chronology of these events (personal communication, 2009).

[1] From an evaluation of IPP carried out by R.B. Boulton & Associates in September 1995. The evaluation concluded that 26 IPP projects either completed or nearing completion for a total investment of $3.96 million ($1.99 M GSC and 1.97 M industrial partners) have yielded aggregate economic returns of $3.0 M to date and will yield an aggregate of $144 M "over the next five years". This seemed clearly overly optimistic to this observer.

Other major sea changes had been taking place within GSC. In part driven by NATMAP requirements, the incorporation of *digital mapping techniques* (field entry of data and computer-aided cartography) had advanced quickly and by the middle of the decade such techniques were routine in most mapping projects. Hydrogeology was back in the GSC's armoury after an absence of many years while in the Department of the Environment. Geological hazards and public safety (earthquakes, landslides, volcanic eruptions, tsunamis, toxic chemicals uptake in soils, geochemistry and public health) were taking on new profiles in GSC's Environmental Program. Ice core and borehole rock cores, originally drilled for other purposes, were being re-interpreted by GSC scientists in attempts to understand the nature of climate change, particularly in northern terrains. The lessons learned from many years of investigations of seafloor minerals deposits in the Explorer Plate and Juan de Fuca Ridge areas off the west coast by Dr. Jim Franklin and his colleagues in Mineral Resources Division were being applied to understand analogous massive sulphide deposits now exposed on land. On the laboratory side, GSC installed – after a long, arduous struggle to get financing – its new *SHRIMP* **(**Sensitive High Resolution Ion Microprobe**)** machine in the geochronology laboratory, consolidating its position as one of the world's leading rock and mineral age dating facilities.

Into this plethora of program initiatives came *Program Review*, the federal government's 1994 review of its activities, held up against the template of six criteria: public interest; role of government; federalism; partnership; efficiency; and affordability. The results were tabled in the government's budget of February 1995. For the Department (as of 1994 called Natural Resources Canada or NRCan), it meant that its budget would drop more than half, from about a billion dollars in 1995 to $435 million in 1997/98. For GSC the news would translate to a budget reduction of 32% over three years plus similar reductions in staff.[1]

Although not a direct casualty of Program Review, the MDA programs were winding down. By the mid-1990s most of the MDAs with the provinces (many of them on their second or third cycle) would be concluded (the last ones would be in Yukon and

[1] This is from the GSC Sector report "Geoscience Making a Difference" for 1994/95. The 32% reduction presumably includes the reduction of about 10% of GSC's overall budget that came from MDA contributions.

NWT, finishing in 1996). The demise of the MDAs was due in part to fiscal restraint but probably more importantly, to the federal government's commitment to the provinces to withdraw from direct involvement in program delivery in mining and forestry sectors, areas deemed provincial responsibilities. Some of the objectives of the MDAs would ultimately be continued under the umbrella of the new *Intergovernmental Geoscience Accord,* [2] signed with the provinces in 1996, but the golden era of the MDAs was passing into history.

In addition to the dramatic changes that would be forced on many government agencies (including the GSC) by Program Review, other larger issues that would profoundly affect their futures were on the horizon The world was gradually coming to realize the serious nature of climate change.[3] The mantra of infinite growth and infinite supplies of resources was being seriously challenged (*cf* the arguments over "Peak Oil"[4]). For the first time perhaps the realization was creeping in that it might be indeed possible for humankind to poison itself out of existence or drown itself through rising sea levels or fry itself through spiking surface temperatures or do all three simultaneously. The new mantra was "sustainability" but some things were obviously more " sustainable" than others, and definitions of the concept as applied to fuels and minerals were sometimes murky at best and incomprehensible at worst. But as they have done before, haltingly, ponderously and creakingly the world's apparatuses began to shift to do battle with these new nemeses. The United Nations Treaty On Climate Change was signed at the Rio Summit in 1992. The *First Conference of Parties to the UN Framework Convention on Climate Change* was convened in Berlin in April, 1995, one of many (including Kyoto in 1997) that would follow and eventually leading to Copenhagen in 2009. But first, there

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[2] The Intergovernmental Geoscience Accord sets out operating principles and areas of responsibility (roles) for geoscience work carried out in areas of federal, provincial or territorial jurisdictions.

[3] According to some, the roots of the concern about global warming/climate change can be traced, in part at least, to the "Limits to Growth" (Meadows et al., 1972). In his tome about oil, Daniel Yergin states that "the study (*Limits to Growth)* warned not only of resource depletion but also of the environmental consequences of hydrocarbon burning, the build up of carbon dioxide in the atmosphere, and a new concern about global warming" (Yergin, 1992, pp. 568-569).

[4] See footnote this account p.5. Peak Oil is the time at which the maximum rate of oil *production* is reached. For the world, it has been variously estimated as between 1974 and the early 2000s (Hubbert, 1949, 1956) but there remains much controversy over the question and not all agree that peak oil has been reached or, indeed, may ever be reached.

were a couple of wars to be gotten out of the way (Second Gulf Iraq and Afghanistan). Oil again.[1]

And so it goes.

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Epilogue

(Plus ça change….)

These notes began with oil (OPEC and the Yom Kippur war) and 36years later (2009) the world is still awash with concerns about oil. The first oil crisis (1973) occurred when the price of crude climbed from US $5.50 per barrel to around US $18.50. In May of 2008 the price of crude hovered at US $126 per barrel, precipitating oil - based crises of a different sort and exacerbating the deepening global financial crisis. If the concept of "peak oil" is valid and if, as some experts believe, the world's peak oil production was passed sometime in the early 2000s this means that it will no longer be possible for world oil production to keep pace with historical growth in demand. Something will have to give. That something seems likely to be on the demand side, through the cumulative effects of conservation, substitution, new technologies and lifestyle changes. But substitution has already got us into trouble through the biofuel dilemma, specifically corn-based ethanol. If we are to believe the experts the world's escalating food crisis is in part at least caused by the diversion of agricultural products to biofuel production. Interestingly enough, the Club of Rome back in 1972 warned of a global food crisis, although in their view the culprit was rapidly-increasing global population not diversion of food for energy production.

All this makes us realize that Mr Yogi Berra, star catcher for the New York Yankees, was a prophet far ahead of his time when he opined – "Its déjà vu all over again"

Maybe it is.

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[1] It is both remarkable and depressing to contemplate the influence that oil has had on the foreign policy of nations over the years. Wars have been fought, empires have teetered, crises have been triggered (e.g Suez Canal, 1956), the destiny of nations has hinged on its availability (e.g. Germany and Japan in WWII) and its pursuit seems to have brought forth the worst in men and nations. Arguably there is no other commodity (even gold) that has played a larger role in the annals of history, greed and avarice.

References

Canada Mineral Resources Branch. 1977. "A summary view of Canadian reserves and additional resources of copper, nickel, zinc, lead and molybdenum." EMR Minerals MR 169, 23 p.

Canada Mineral Resources Branch. 1977. "A summary view of Canadian reserves and additional resources of iron." EMR Minerals MR 170, 14p.

Cargil, Simon and Stephen B. Green (eds.). 1986. "Prospects for Mineral Resource Assessment on Public Lands – Proceedings of the Leesburg Workshop." US Geological Survey Circular 980, 330p.

Cohen, M.G. 2007. "Canadian Energy: Political Economy in the Shadow of the American Experience." Paper presented in Mexico City Oct 7/2007 (Wikipedia).

Coope, J.A., B. D'Angeljan, P.L. Gordy, D.W. Strangway, A Sutherland Brown and M.G. Tanguay. 1983. "The Geosciences in Canada: An Examination of the Output of the Geological Survey of Canada." Geol. Surv. Can. Paper 82-6, Part 1, 59p.

Dogget, Michael, Henry Van Ergteren, Christopher Findlay and Jon Scoates. 1996. "Evaluating the Economic Rationale for Government Investment in Geoscience Information." Final report prepared for Natural Resources Canada. 93p.

Duke, Murray. 2007. "STAMP (Sudbury, Timmins, Algoma Minerals Program), GSC History Series A004, March, 6p. (pdf file)

EMR 1976. "Minerals, Science and Technology." Mineral Bulletin MR 161 (Mineral Policy Series), 68p.

Findlay, D.C. 1992. "A World Organization of Geological Surveys?" *Episodes,* June v. 15 No. 2, pp 109-112.

Findlay, D.C., C.F. Gleeson, R.T. Bell, W.D. Goodfellow and R.D. Lancaster. 1986. "Mineral Potential of the Mount. Sedgewick Area, Yukon Territory (Northern Yukon National Park Assessment – Phase II). Geol. Surv. Can. Paper 85-24. 23p.

GSC 1978. "Evaluation of the Regional Mineral Potential (Non-hydrocarbon) of the Western Arctic Region." Geol. Surv. Can. Open File 492. 31p.

GSC 1980. “Non-Hydrocarbon Mineral Resource Potential of Parts of Northern Canada, Parts I and II.” Geol. Surv. Can. Open File 716. 375p.

Hubbert, M. King. 1949. “Energy from Fossil Fuels.” *Science,* vol. 109, no 2823, pp 102-109.

Hubbert, M. King. 1956. “”Nuclear Energy and Fossil Fuels.” Paper presented at the American Petroleum Inst. (Southern District), Division of Production, San Antonio, Texas, March, 1956. Shell Development Co. Paper No. 95.

McCaffery, Jerry. 1984. “Canada’s Envelope Budget: A Strategic Management System.” American Society of Public Administration, July/August. (internet).

Meadows, D.H. et.al. 1972. “The Limits To Growth: A Report for the Club of Rome’s Project on the Predicament of Mankind. *Universe Books*, New York.

Naldrett, A.J., R.J. Cathro, E.L. Hoffman, R.Y. Lamarche and R.G. Wallis. 1985. “Report of the Canadian Geoscience Council Advisory Committee on Mineral Deposits Research at the Geological Survey of Canada.” Geol. Surv. Can. Paper 85-6, Part 2, 44p.

Plant, A.G. 2005/2008. “Friends of the GSC” document No. HGSC-9. “Geological Survey of Canada – Post 1972 (A listing of organizational changes, management appointments and other issues, events and decisions).” Jan. 25, 2005, revised April 27, 2008. To be available on *NRcan website* (www. nrcan.gc.ca) in 2010.

Poulsen, K.H. and Lin Baoquin. 1990. “Report on the Sino-Canadian Gold Project, 1987-1990”. Geol. Surv. Can. Internal report. 124 p.

Price, Raymond A. 2004. “The W.W. Hutchison Medal of the Geological Association of Canada.” *Geolog* vol 33., no.1, Spring 2004, pp 14-17.

Science Council of Canada. 1970. “Earth Sciences Serving the Nation.” Report No. 7, *Queen’s Printer*, Ottawa, 36 p.

Science Council of Canada.1971. “Earth Sciences Serving the Nation.” Special Study No. 13, *Queen’s Printer*, Ottawa, 363 p.

Scott, J.S. 2007. “Terrain Sciences Division, Geological Survey of Canada: Its Origin and History from 1972—1987, 95 p. Geol. Surv. Can. Open File Rept. 5592. (also “Friends of GSC” document A003, pdf file).

Smith, C.H. (ed.).1970. “Background Papers on the Earth Sciences in Canada.” Geol. Surv. Can. Paper 69-56.

Toombs, Ralph. B. 1995. "Canadian Energy Chronology." *NRCanada website* –"Energy In Canada" (www.nrcan.gc.ca)

Vodden, Christy. 1992. "No Stone Unturned – The First 150 Years of the Geological Survey of Canada." *Minister of Supply and Services*, Cat No. M40-53/1992E. 52p.

Yergin, Daniel. 1992. "The Prize –The Epic Quest for Oil, Money and Power." *Simon & Schuster*, New York.

Zaslow, Morris. 1975. " "Reading the Rocks: The Story of the Geological Survey of Canada; 1842-1972." *The MacMillan Co. of Canada*, Toronto, 599p.