

EXPLORATION – ADAPTING TO A CHANGING WORLD

Abstract

Historical trends in exploration expenditures over three decades provide a background to an analysis of trends in the 1990s and form a basis for looking into the future. Historically the industry has been characterised by the dominance of the senior companies, traditional exploration territory and a herd mentality approach to commodities in vogue. With the removal of political and economic barriers to activity in many countries that has characterised the nineteen nineties the industry has undergone a dramatic change. The choice of geologic terrain and countries multiplied, the junior sector became a major element in the industry and the senior companies started to rethink their role and approach to the exploration business.

The greater junior sector role has been enabled by a refocusing of the equity markets and investors and advances in technological systems. The traditional cyclicity of stock markets clearly influences the scope and timing for the junior sector to finance itself. The Canadian stock exchanges, investment dealers and regulatory authorities have been leading this junior financing industry. Their roles have also evolved with dramatic change in regulatory approaches and electronic financings.

The junior sector is not only in the process of weathering a brutal downturn in the industry but also facing a period of transition to:

- new tough standards of operation with more rules and regulations
- evolving standards for activity internationally with the need to acquire a social license to operate
- a financing regime where the speculative internet stocks may provide a competitor for the risk capital it has traditionally relied upon.

In looking to the future the paper will discuss the potential for the junior sector to remain a dominant force in the world-wide exploration industry, where it will direct its exploration activities and how it will finance its activities. The new role adopted by several of the senior companies, of merchant banker to the juniors, is examined and its implications demonstrated. Finally some concerns are highlighted related to social and environmental issues as they relate to exploration activities where orebodies are still a promoters dream.

Authors Résumés

Presenter

Gerald Harper, Ph. D., P. Eng.

President, Prospectors and Developers Association of Canada

Gerald Harper grew up in Southern Rhodesia (now Zimbabwe). After graduating in geology his first job was in Cape Town as a marine geologist investigating offshore mineral concentrations. Returning to Rhodesia he joined Anglo American Corporation exploring for sedimentary copper deposits. He subsequently completed his doctorate on structural studies of sedimentary copper environments.

Moving to Vancouver, Canada in 1970, he joined the Falconbridge, western cordillera, exploration team where his activities included exploration and mine geology from Alaska to Peru. Falconbridge transferred him to their Sudbury nickel copper mines in 1975. He moved to Montreal in 1977 to manage exploration in Newfoundland/Labrador for Brinco.

In 1980 he joined Northgate Exploration in Toronto. With the investment in Geddes Resources by Northgate in 1988 he was appointed President of that company and oversaw the evolution of Windy Craggy from prospect to largest copper deposit in Canada.

He left Geddes Resources in 1992 and established Gamah International which provides metals and minerals research services, project management and consulting services. From living in six provinces and countries around the world and worked in more than forty he has a wealth of international minerals information which forms the nucleus of Gamah's computerised database of minerals information.

He is the President and a Director of the Prospectors and Developers Association of Canada, their representative on the joint PDAC/Mining Association of Canada environment committee, Co-Chair of the Year 2000, MM2000 joint PDAC and CIM Convention organising committees and completed a three year marathon as an Issues Group member of the Whitehorse Mining Initiative. He is a member of the Advisory Board to the Association of Professional Geoscientists of Ontario.

Co-authors

Tony Andrews Executive Director, Prospectors and Developers Association of Canada
Tony Andrews is Executive Director of the Prospectors and Developers Association of Canada, a position he has held since 1987. He is a geologist by training and graduated with a Ph.D. from the University of Western Ontario in 1978, followed by a Postdoctoral Fellowship at the Scripps Institute of Oceanography from 1978 – 1980. Prior to joining PDAC he devoted much of his work to mapping, research and management of studies on mineral deposits, in particular, base metal sulphides in modern oceanic crust and Archean gold and silver deposits.

Brian Fenoulhet Senior Associate, Gamah International Limited
Brian Fenoulhet is a Senior Associate of Gamah International Limited. He graduated from the Royal School of Mines, London, England in 1953 in Extraction Metallurgy. After working for five years in an Anglo American Group company in Northern Rhodesia (now Zambia) he joined the Canadian Copper Refiners company within the Noranda Inc. group. Subsequently he worked for the Ontario Ministry of Northern Development and Mines as the Provincial Mineral Development Co-ordinator.

The authors have presented several papers in the last few years addressing the issue of exploration spending, the junior and senior companies spending patterns and the evolution of each sector into the wider world in the decade of the 1990s. As we look forward to the next decade or longer it is appropriate to consider whether the decade of the nineties was an aberration or a consistent part of the trend of the big picture of the evolution of our industry.

It is appropriate to start the consideration of this topic with the assumption that ten or fifteen years ago the majority of private sector exploration was focussed on a small group of western countries. The big four exploration target countries at that time were Australia, Canada, South Africa and the USA. It was relatively easy to acquire a sense of the state of the industry to confirm the market mood induced by commodities prices. Both the Australian and Canadian Governments collected annual statistics. Those of Canada were generally considered the most comprehensive and consistent over time. Occasional and partial surveys, such as those conducted by SEG in the mid to late nineteen eighties, had demonstrated that the numbers and patterns for Canada could be reasonably extrapolated to the other activity areas of the industry. Anyone wanting further information would have to go the Annual Reports of the major mining companies.

The first step in the process of testing this assumption was to accumulate as much information on exploration as possible dating back for a period of thirty years to ensure coverage of several complete global business cycles.

For this last decade it was easy as we had access to a wealth of information such that numbers can be cross checked. We wanted the data to reflect geographic distribution of those expenditures but found that prior to the nineties decade that was not feasible.

Eventually we used a variety of information sources including:

- those of a few national governments for their own jurisdictions
- those collected in one of a kind partial surveys such as that of SEG
- academic studies such as those of Tilton et al which relied heavily on extrapolation
- those of the United Nations relating to government to government aid package exploration programmes during the 1980s.

As the statistics invoke sources in various world currencies we have not corrected or adjusted for inflation or generated a hypothetical “constant” dollar figure. We want the numbers to reflect the cost of doing business at that time. Therefore the only adjustment we have made is to convert them to Canadian dollars, using the annual average exchange rate prevailing for that year.

From 1970 to 1998 the compiled amounts of exploration expenditures for the whole industry have risen from US\$660 million to US\$3,500 million but with cyclical swings as low as US\$500 million and as high as US\$5,100 million (see Table 1, Column A). The cyclical pattern follows the general world economic condition through several business cycles yielding a best fit straight line annual increase of approximately 10% per annum for the 29 years. As worldwide average long term inflation has been of the order of 7% over that time frame, the net 3% long term increase in exploration spending represents a reasonable growth rate when compared with growth in consumption of many mineral products which runs at plus or minus 2 percent.

For comparison a long term trend can be derived from statistics collected by the Canadian Government for exploration in Canada (Table 1, Column B). This indicates a long term straight line annual increase of 5% as the Canadian experience. This is not adjusted for inflation so allows comparison with the first trend figure. Does this lower level of increase reflect the trend for a mature, developed economy or is it the trend to be expected when more complete numbers are available?

We know that the world statistics as shown in Table 1, Column A, contain significant amounts of exploration expenditures contributed by the public sector and many of us remember the substantial programs of the United Nations (UNDP program), the Japanese Government (JECO program), France through BRGM and the UK through the BGS. These programs essentially ended at the mid-nineteen eighties. They can be seen in the world data that made up the total for Table 1 and it is apparent that, once the programs ended, exploration virtually ceased.

We also know that the decade of the seventies saw many countries in several continents adopt policies which encouraged State ownership of mines, government exploration activity and crown corporations. We saw it here in Canada with Provincial Minerals Companies having an automatic joint venture right or back in. Some of these policies were adopted in conjunction with the nationalisation of mines such as occurred in Zambia, Chile, Peru and Canada. The private sector was therefore constrained as to its ability to and desire to spend on exploration in many areas of the world.

So the geopolitics of the period fits with a picture of an exploration industry operating at a relatively low level for at least the first of the three decades under consideration and then accelerating its activity.

Table 1 1970 – 1998 Trends in Exploration Expenditures in millions of Canadian dollars

Year	Column A World Spending from various sources of Governments & Industry	Column B Natural Resources Canada data for Canada only	Column C World Spending by select group of international long life major mining companies.
1970	649.3	187.1	115.907
1971	582.9	152.0	128.823
1972	517.1	115.7	136.644
1973	645.0	144.1	161.379
1974	744.0	180.3	217.596
1975	802.0	207.3	191.686
1976	928.9	206.8	208.172
1977	1197.6	283.5	242.917
1978	1247.4	294.8	258.912
1979	1573.0	358.9	373.703
1980	2238.5	590.7	328.322
1981	2595.5	734.2	474.312
1982	2020.1	576.3	438.171
1983	1704.1	471.8	307.916
1984	1633.4	617.3	302.840
1985	1411.6	588.9	292.997
1986	1641.9	697.9	274.555
1987	2222.6	1300.0	302.935
1988	2277.3	1350.0	468.062
1989	1567.3	827.9	668.425
1990	1515.1	774.7	658.578
1991	2151.9	531.7	690.374
1992	2080.2	385.3	618.915
1993	2118.0	477.2	610.405
1994	3005.2	628.1	844.408
1995	4124.2	710.0	1063.484
1996	5211.4	894.8	1079.481
1997	6030.7	820.2	1011.779
1998	4323.7	601.1	796.718
Approximate long term annual % change	10	5	20

For comparison we determined to review the same time period from the corporate viewpoint. So we selected a series of private sector major mining companies that have existed throughout the three decades or had predecessors who had done so. We compiled annual reported exploration expenditure from their corporate reports. Table 1, Column C, shows the totals annually for the three decades. The best fit, straight-line trend of this series of amounts indicates an annual increase of 20%. Comparing the numbers in Table 1, Column C, with the totals of Metals Economics Group for the decade of the nineties we know that our sample represents 15 to 27% of their total and therefore can be assumed to be a statistically meaningful population for the three decade period.

This select group of companies is an interesting set as it includes several companies in each of several groupings. One grouping is by commodity:

- nickel companies
- base metals and multi metals companies
- gold companies

This split shows some interesting trends. The nickel companies have spent an almost constant amount, averaging a 2%p.a. increase over the 28 year time period. This does not keep pace with inflation. The gold companies have averaged about 13%p.a. in this time. They started at a very low number and had a big increase in the last decade. The base and multi-metal group averaged a very steady 8.5%p.a. increase over the whole period (probably better than the inflation rate) and have easily been the major contributors to exploration for the thirty years.

A second split is based on the corporate spending characteristics over time and relative to business cycles.

- The steady spenders
- The exaggerated business cycle group
- The flavour of the cycle group

The nickel companies have to be the champion steady spenders on exploration and are absolutely in step with one another. Only Noranda, in the base & multi-metal group, has exaggerated swings in exploration spending. This group also has some steady spenders in RTZ/CRA, Phelps Dodge and Teck/Cominco. While the Placer group of companies has shown a steady increase at high level, the Barrick organisation has accelerated its spending only in the last fifteen years.

Gold is not the only commodity to have seen its own exaggerated cycle of exploration spending. There was a boom in exploration for uranium in the mid to late 1970s, stimulated by the \$40 per pound price of the commodity and the discovery of the “world class” exceptionally rich deposits in Saskatchewan which rapidly came to dominate the development of the industry.

A re-examination of the expenditure pattern for exploration in Canada, as reported by Natural Resources Canada annually, shows that the mid 1980s cycle reached far greater heights in Canada than the world trend displays.

This cyclical peak coincided with two features. The flow through share mechanism for tax assisted financing stimulated much greater investment levels than previously and it marked the beginning of the growth of the junior sector. Following the discovery of the Hemlo gold camp by the junior sector team and the surge in use of the flow through share concept by junior companies, the junior sector portion of the Canadian annual exploration effort rose to more than 40% of each year’s total of about 1.6 billion Canadian dollars in 1987 and 1988.

This development set the stage for several significant changes to occur in the decade of the nineties and which may herald further changes in the next decade.

The Metals Economics Group data for the international population of seniors shows detailed trends for international exploration activities of the senior mining companies annually since 1991.

During this period the combination of economic recovery, strong growth in demand for minerals, the end of the cold war and encouragement of privatisation and free enterprise in many of the less developed nations all created an environment where the explorer with money had the choice of a bonanza of unlocked geologic opportunities. The seniors leapt at the opportunities and some parlayed the right projects into major growth opportunities for their shareholders and the countries. Others got embroiled in difficult title and ownership rankles which are still being unwound.

The juniors also got into this act. The trend is quite evident in the exploration spending data of the Canadian juniors collected for PDAC. Their proportion of exploration spending made in Canada over the period from 1991 to 1999 has dropped from 59% to 30%.

Given the mood of the nineties one would have been surprised if the industry had not taken full advantage of the new opportunities.

PDAC got involved in collecting spending data for the juniors because no one else was and:

- The junior companies were a growing portion of its membership base

- Metals Economics Group was only collecting senior sector exploration spending numbers
- The authors observed a variety of factors giving evidence that Seniors and Juniors were changing roles in the exploration spending game
- The authors had also noted a variety of factors indicating that internationalisation was changing the face of the industry and the Canadian national figures were becoming less and less of a valid snapshot of the pulse of the industry
- The authors suspected there were links between junior company financing patterns and their spending trends, which might allow forecasting of their activity levels.

From the PDAC and MEG statistics of the past decade it is evident that the juniors proportion of world wide exploration expenditures has increased from a range of <10 – 20% to something in the order of 15 – 30% of world exploration expenditures. If governments, aid agencies and others contribute at most 5% to the world total then the senior companies have been responsible for 65 – 85% of the world expenditures under the historic model.

Metals Economic Group studies have shown a clear trend towards globalization of the senior sector that has followed the political re-alignment of the world during the decade and the coincident economic cycle. The data shows clearly the surge of spending into areas of the world like Africa, S E Asia and most prominently Latin America. The focus on Latin America precedes that into S E Asia and Africa respectively. In contrast the traditional mining countries, Australia, Canada, and USA, over the total period, display net declines or no growth.

The PDAC surveys of the junior sector showed that that industry were moving offshore very rapidly. Indeed when MEG “senior” and PDAC “junior” percentage spending growth rates for selected areas of the world are compared it is apparent that the juniors have led the way into new areas in terms of growth of exploration effort and expenditures.

In Latin America the juniors got in sooner and grew their expenditure rate faster than the seniors. This quick off the mark activity resulted in their acquiring several key properties that had been on the shelf for many years and in making important discoveries which evolved into giant orebodies. Following a pattern of dealing them to senior companies for the balance of the advanced exploration and start of development the expenditure trend then reflects the build up of the seniors sourced dollars.

Looking at Africa we see a similar trend as in Latin America. But the curve of the trend is at an earlier stage. Africa has only recently become a focus area. The acceleration of spending into Africa by the juniors leads the seniors. Already several discoveries or rediscoveries in East and West Africa are attributable to their activities and have now been acquired by the seniors. As a consequence we can expect to see the seniors spending in Africa continue to rise for a while yet.

Now turning our attention to S E Asia one might have expected the previously enunciated trend to be most evident in this part of the world. Given the high profile of Indonesia before the Bre-X bubble burst and the impression that this exploration rush was entirely junior sector driven then one would have expected to see the proportion of junior spending soar in this region. But it did not. Seniors spent more from an earlier start.

That the juniors were able to accelerate their year over year spending rate growth in each “new” area of the world faster than the majors is evidence of the old adage that the junior sector is much more nimble than the seniors and capable of reacting quickly. This premise is also borne out by the evidence that junior spending peaked out quickly after major discoveries or rediscoveries and redirected itself to other parts of the world.

Given an ideal world with no money constraints for the juniors where will they move next and what will be the next hot area of the world? Neither MEG nor PDAC are collecting data with a fine enough geographic filter to be able to distinguish a potential discovery hot trend in a sub-continental scale region such as the Middle East or south eastern Europe so we cannot see incipient surges in spending for such areas. At the larger, sub-continent size scale, that the data is collected at, any relative rising trend has been masked by the overall rate of decline in spending in the last two years.

The junior sector depends almost entirely on raising equity financing to spend on exploration. Since 1997 there has been a dramatic decline in the available speculative investment money for junior exploration companies all over the

world. The Canadian juniors have seen a collapse of the market ability to raise finance, back to the levels they experienced in 1991 and 1992. If *the senior producers want to rely on the junior companies* to provide them with the necessary steady stream of new development projects then the juniors must do the exploration and must receive the funds to undertake that exploration. If not, then the industry will move into a period of false optimism as it expands production from the new mines built in the nineteen nineties and enjoys improved earnings for the senior companies but develops a time lag in the necessary search for replacement deposits to sustain itself

For the junior sector to contribute the increasing share of exploration activity needed for continuation of the pace of world discoveries as characterized recent years it needs a financing ability that grows accordingly. Can it get this and where from? We suggest that it will have a very difficult time finding it and consequently the pace of exploration activity growth will be at lower rates than experienced in the world over the last 30 years.

Less exploration means less discoveries and by the latter half of this New Millennium first decade we could see a drying up of the readily available development opportunities. Firstly the deposits in the pipeline that achieve the economic hurdles will all have been developed and secondly the flow of new exploration opportunities may have diminished drastically.

REFERENCES

_____ ; May 14, 1999; *Exploration Information Bulletin*, Natural Resources Canada, 4p.

Andrews, A.J., Harper, G. and Fenoulhet, B.; March 1999; *Worldwide financing and exploration trends*, paper presented in the Keynote Session of the Prospectors and Developers Association Annual Convention

Canadian Intergovernmental Working Group on the Mineral Industry; 1998; *Overview of Trends in Canadian Mineral Exploration*, Natural Resources Canada, 114 p.

Canadian Intergovernmental Working Group on the Mineral Industry; September 1996; *Overview of Trends in Canadian Mineral Exploration*, Natural Resources Canada, 84 p.

Gamah International Limited; May 1999; *Mining and Exploration Company Financings, Monthly Records and Historic Trends*; Vol II, Part V of a Monthly Series.

Gamah International Limited; February 1999; *Second Supplementary Report to Canadian Junior Mining Sector Exploration Trends 1997 – 1998 dated December 1998*, Results of a Survey for the Prospectors and Developers Association of Canada.

Gamah International Limited; January 1999; *Supplementary Report to Canadian Junior Mining Sector Exploration Trends 1997 – 1998 dated December 1998*, Results of a Survey for the Prospectors and Developers Association of Canada.

Gamah International Limited; December 1998; *Canadian Junior Mining Sector Exploration Trends 1997 – 1998*, Results of a Survey for the Prospectors and Developers Association of Canada.

Gamah International Limited; January 2000; *Canadian Junior Mining Sector Exploration Trends 1998 – 1999*, Results of a Survey for the Prospectors and Developers Association of Canada.

Intergovernmental Working Group on the Mineral Industry; September 1992; *Mineral Exploration Trends: Canada and the World*, Background Study No. 7 on the Canadian Mineral Investment Climate, Natural Resources Canada.

Mining Engineering; December 1998; p12, Society for Mining, Metallurgy and Exploration.

Mining Engineering; December 1997; p13, Society for Mining, Metallurgy and Exploration.

Mining Journal; October 25, 1996; p322, Mining Journal Limited.

Mining Journal; October 27, 1995; p312, Mining Journal limited.

Mining Journal; December 3, 1993; p379, Mining Journal Limited.

Mining Journal; November 20, 1992, p353, Mining Journal Limited.

Mining Journal; January 24, 1992; p53, Mining Journal Limited.

Corporate annual reports of: Cameco Ltd/Eldorado Corporation, Campbell Red Lakes Mines Ltd., Cominco Limited, CRA, Dickinson Mines/Goldcorp Ltd., Dome Mines Ltd., Falconbridge Ltd., INCO Ltd., Noranda Inc., Phelps Dodge Corporation, Placer Dome, RTZ, Teck Corporation.