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Sandra M. Barr

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Résumé de l'article

Comme le mot l'indique, les disciplines des géosciences ont une portée planétaire, et les géologues sont généralement de grands voyageurs qui sont conscient de la nécessité d'une collaboration internationale efficace. Les géoscientifiques canadiens en particulier sont reconnus pour leur tradition de participation active et leurs efforts au sein d'organismes géoscientifiques internationaux. Fondée au Canada en 1974, l'Association of Geoscientists for International Development (AGID), en est un exemple remarquable. Ce sont les Canadiens qui ont fondé l'AGID et qui y ont tenu des rôles de premier plan depuis. L'International Geological Congress, l'International Union of Geological Sciences, et l'International Geoscience Program (IGCP) en sont d'autres exemples. On trouvera des indices de la nature planétaire des géosciences dans la portée de ses projets recherches, la structure organisationnelle des industries minérales et pétrolières, ainsi que dans les programmes planétaires de prévision et d'atténuation des risques naturels. En dépit du fort niveau de conscientisation qui existe au sein de la communauté géoscientifique, l'importance des géosciences sur le bien-être des habitants de la planète n'est pas très connu. L'Année internationale de la planète, est un des exemples d'activités qui vise à rehausser cette conscientisation; mais on doit faire plus, en soutenant financièrement des initiatives en ce sens de géoscientifiques et d'organismes et sociétés comme l'Association géologique du Canada.

ISSUES IN CANADIAN GEOSCIENCE

Global Geoscience - Canada's Link with the World

Sandra M. Barr
Department of Geology, Acadia University, Wolfville, Nova Scotia, Canada, B4P 2R6.
sandra.barr@acadiau.ca

SUMMARY
Geoscience is a global discipline, and geoscientists are typically world travellers who recognize the need for effective international collaboration. Canadian geoscientists, in particular, have a long history of active participation in international geoscience organizations and efforts. A notable example is the Association of Geoscientists for International Development (AGID), which was founded in Canada in 1974. Canadians are credited in establishing AGID, and have been prominent throughout its history. Other examples include the International Geological Congress, the International Union of Geological Sciences, and the International Geoscience Program (IGCP). The global nature of geoscience is demonstrated in research, the mineral and petroleum industries, and natural hazards prediction and mitigation. In spite of this global awareness within the geosciences, the importance of geoscience to the well-being of Earth and its inhabitants is not widely appreciated. International efforts to address this issue include activities such as the International Year of Planet Earth, but more must be done by granting agencies, societies such as the Geological Association of Canada, and individual geoscientists.

SOMMAIRE
Comme le mot l'indique, les disciplines des géosciences ont une portée planétaire, et les géologues sont généralement de grands voyageurs qui sont conscient de la nécessité d'une collaboration internationale efficace. Les géoscientifiques canadiens en particulier sont reconnus pour leur tradition de participation active et leurs efforts au sein d'organismes géoscientifiques internationaux. Fondée au Canada en 1974, l'Association of Geoscientists for International Development (AGID), en est un exemple remarquable. Ce sont les Canadiens qui ont fondé l'AGID et qui y ont tenu des rôles de premier plan depuis. L'International Geological Congress, l'International Union of Geological Sciences, et l'International Geoscience Program (IGCP) en sont d'autres exemples. On trouvera des indices de la nature planétaire des géosciences dans la portée de ses projets recherches, la structure organisationnelle des industries minérales et pétrolières, ainsi que dans les programmes planétaires de prévision et d'atténuation des risques naturels. En dépit du fort niveau de conscientisation qui existe au sein de la communauté géoscientifique, l'importance des géosciences sur le bien-être des habitants de la planète n'est pas très connu. L'Année internationale de la planète, est un des exemples d'activités qui vise à rehausser cette conscientisation; mais on doit faire plus, en soutenant financièrement des initiatives en ce sens de géoscientifiques et d'organismes et sociétés comme l'Association géologique du Canada.

INTRODUCTION
Geoscience is a global discipline, and many geoscientists travel widely and have worked in more than one part of the world. The purpose of this paper is to present an overview of international geoscience and the role of Canadians in this realm. It is not intended to be all embracing or to cover every aspect of the topic, and the perspective is mainly personal. Many readers could write on a similar theme but from their own perspectives. My main purpose here is to stress, through examples, the importance of global geoscience from a variety of perspectives.

Thirty-one years ago, in May 1974, two entirely unrelated events were to have a major impact on my life. First, a group of international geoscientists met in St. John's, Newfoundland, during the GAC-MAC annual meeting. One result was the establishment of an organization that eventually became known as AGID, the Association of Geoscientists for International Development, in which I later became a life member and served as Treasurer and Vice-President for Developed Countries. Second, in the same month, I began a posting with CUSO, teaching in the Department of Geological Sciences at Chiang Mai University in northern Thailand. I will begin by sharing with you some of the latter personal story of international experience, and then return to AGID and other related topics.

CUSO – FORMERLY CANADIAN UNIVERSITY SERVICE OVERSEAS
CUSO is a volunteer organization founded in 1961. It was originally university based, and recruited its volun-

teers from university campuses. That philosophy has evolved, and now the organization is known just by its acronym "CUSO", it has no university connection, and it places volunteers with a wide range of life experience (http://www.cuso.org/english_home.htm).

In contrast, at the time when I joined CUSO, many volunteers were new university graduates who were placed in schools or teacher-training colleges to teach English. However, I was posted to Chiang Mai University, where my job was to teach geology in the recently established Department of Geological Sciences. This experience turned out to be exceptionally rewarding, especially for a newly minted Ph.D. with a background mainly in marine geology and almost no teaching experience. I suddenly found myself teaching courses ranging from the second-year through to graduate-level; the department at that time was in the midst of establishing the first graduate program in geology in Thailand. In addition to teaching, I was able to conduct research that ultimately led to a number of publications (e.g., Barr and Macdonald, 1978, 1981; Barr et al., 1978, 1979) and a university job in Canada.

My positive experience is apparently typical of geoscience volunteers. Hastings (2004) cited several similar examples of volunteers for whom the experience became part of their life-long work. He concluded that volunteer geoscientists provided great benefits to the host and provider countries, to the scientists themselves, and to their profession.

AGID - ASSOCIATION OF GEOSCIENTISTS FOR INTERNATIONAL DEVELOPMENT

The founders of AGID believed that geoscience, and geoscientists, should play a more active role in international development. They established AGID in 1974 to provide a continuing forum for the exchange of ideas, experience, and information amongst all persons concerned with the role of the geosciences in international development. At its peak, AGID had over 2500 members from 120 countries.

To develop the history of AGID, we need to go back to August, 1972. During that month, a symposium on "Earth Science Aid to Developing Countries" was held in conjunction with the 24th International Geological Congress in Montreal. The symposium was chaired by Ward Neale (then of Memorial University of Newfoundland) and Mousseau Tremblay (Special Advisor to CIDA). The session discussed problems related to earth science aid and ways to improve its effectiveness. De Vletter and Berger (1980) summed up the discussion using a quotation from Leo Heindl of the US Geological Survey, "*The question raised at the symposium was really - how do geoscientists get the ear of those who make the decisions to give them the benefit of our professional expertise and experience?*" This question remains prominent in the minds of many geoscientists in 2005 (e.g., http://www.iugs.org/iugs/news/iugs_hazards_statement.htm).

During 1973, Ward Neale and Tony Berger (with support from GAC president W.W. Hutchison) convinced the Canadian Geoscience Council to sponsor another international workshop on Earth Science aid to developing countries during the 1974 GAC-MAC meeting in St. John's, Newfoundland. At this workshop, the formation of AGID was endorsed, and an organizing committee (including Canadians Roger Blais and Tony Berger) was established. The work of this group led to the First AGID General Assembly, held at the 25th International Geological Congress (IGC) in Sydney, Australia in 1976.

The first headquarters for AGID was in St. John's. It subsequently moved to Venezuela, Thailand, Brazil, and now Bangladesh. For most of the first twenty years of its existence, AGID received an annual grant of $100,000 from the Canadian International Development Administration (CIDA) but since 1996 the only sources of income have been membership fees, a small annual grant from the International Union of Geological Sciences, and occasional grants for specific projects. AGID has found it difficult to sustain many of its core activities and as a result membership declined and membership income fell. The voluntary efforts of AGID supporters, as well as "in kind" contributions, have allowed AGID to maintain some of its operations.

No organization is perfect, but AGID did many things right. Membership dues were kept low, especially for those in developing countries. AGID was mainly concerned with communication, which was facilitated by publication of a widely distributed international newsletter known as AGID News; 76 issues were published before the title changed in 1994 to Geoscience and Development, after which 8 issues were published (most recently in 2003; the next issue will be electronic). AGID continues to publish the "South and West Asian Geoscience Newsletter" (Issue # 48 appeared in December, 2004). AGID also published 21 books on diverse topics such as geoscience education, geohazards, groundwater, industrial minerals, urban geoscience, mineral exploration techniques, small-scale mining, sustainable mineral development policy, and environmental geology, all with special reference to developing countries.

AGID was also concerned with training and education. It sponsored and organized or co-organized over 200 separate workshops, training courses, and conferences in almost 40 countries, 90% in developing countries. Particularly valuable were the 50 "geoscience writing and editing workshops", held between 1986 and 1996 and run by a former AGID president, the late P.G. (Jerri) Cooray. AGID also established the William Greenwood Scholarships, named in appreciation of a former member, in 1990. These small grants were used to assist individual geoscience students in developing countries to carry out fieldwork in connection with their postgraduate studies. Over 50 students have been helped, and many would not have been able to complete their training without AGID support. It was one of my pleasant tasks as AGID Treasurer (1993-96), to mail out the modest funds to the scholarship recipients, and their letters of acknowledgement and gratitude were memorable.

One of the first activities of AGID was the donation of books and journals to developing country libraries. Many people were involved, especially John Moore in Ottawa and John Carman in Toronto (A. Berger, written communication, 2005). This activity was formalized in 1985 as the AGID Canada Book and Journal Donation Program, through which donated geoscience books and journals have been sent to libraries in developing countries up to the present

time. In 1994, the operation became a registered charity and well over 8,000 books and 2,000 complete volumes of journals have been shipped to libraries in a wide variety of developing countries since then. The leader in these activities since the early 1990s was Owen White in Toronto. In 2004, AGID Canada decided to wind down the scheme for a variety of reasons, including the difficulty of recruiting volunteers to undertake the arduous task of packing and dispatching consignments and lack of funds for shipping the books overseas, as well as the loss of donated warehousing space. Generous donations from the mineral industry and PDAC helped in the final months of the program.

Over the years, AGID has been an effective voice for global geoscience at the grass-roots level and also on the international stage. At the 32nd International Geological Congress in Florence, Italy, in August 2004, AGID sponsored sessions on "Geoscience education for sustainable development" and "Groundwater development for poverty mitigation in low-income countries". Also, it held its regular general meeting, where a motion to disband AGID was overwhelming defeated by the members in attendance and also by postal ballot. In the light of the new global geoscience, enhanced by the ease of communication afforded by the Internet, perhaps AGID is an organization whose time has come again? Watch for the launch of the new website at www.agid-web.org.

IGC - INTERNATIONAL GEOLOGICAL CONGRESS

The IGC is a nonprofit scientific and educational organization which meets every 4 years in collaboration with, and under sponsorship of, the International Union of Geological Sciences (IUGS). The main purpose of the Congress is to encourage the advancement of fundamental and applied research in the Earth Sciences.

During the mid 19th century, the necessity of holding an international congress was strongly felt among the community of geologists in Europe and North America. In 1875, during a meeting of the American Association for the Advancement of Science in Buffalo, New York, a committee was formed to consider the organization of an international congress on geology. This committee was composed of leading geoscientists of the time, including two from Canada (T. Sterry Hunt and J. William Dawson). The Founding Committee asked the Geological Society of France to organize an international geological convention on the occasion of the Paris Exposition in 1878. The result was the First International Geological Congress, with 310 members from 23 countries in attendance. Since then, 31 additional congresses have been hosted by 21 countries throughout the world. The 32nd IGC was held in Florence, Italy, in August 2004, and was attended by over 7400 participants from 120 countries. The Congress included some 3000 oral presentations in 354 sessions, and another 3500 poster displays (S. Limaye, written communication, 2005). Through the Geohost Program, the IGC Secretariat provided financial assistance to 595 delegates from developing countries, including many AGID members. The 33rd Session will be held 5th–14th August, 2008, in Oslo, Norway, and the 34th Session is planned for Brisbane, Australia, in August, 2012.

The IGC has been held twice in Canada: 1913 (Toronto) and 1972 (Montreal). The important role of the Montreal IGC in the founding of AGID has already been mentioned, and will be again with respect to the International Geoscience Program.

IUGS - INTERNATIONAL UNION OF GEOLOGICAL SCIENCES

The IUGS was founded in 1961, with Canadian J. M. Harrison as its president. Today, with 118 national members, it is one of the largest and most active non-governmental scientific organizations in the world, and is estimated to represent about 250,000 to 500,000 earth scientists worldwide (http://www.iugs.org). The IUGS promotes the study of geological problems (especially those of worldwide significance), and supports and facilitates international and interdisciplinary cooperation in the Earth Sciences. It was founded in response to a growing need to coordinate geoscientific international research programs on a continuing basis. Geoscientists felt that a mechanism was required to take action on global geological problems between the International Geological Congresses, which are traditionally held every four years.

IUGS Commissions, Committees, Initiatives, and Task Groups are concerned with a wide range of geologic research of direct interest to governments, industry, and academic groups within the Earth Sciences. IUGC fosters dialogue and communication among the various specialists in Earth Sciences around the world and it achieves these goals by organizing international projects and meetings, sponsoring symposia and scientific field trips, and producing publications. Topics addressed span the gamut from fundamental research to its economic and industrial applications, from scientific, environmental, and social issues to educational and developmental problems. IUGS also serves as a vital link in solving problems requiring interdisciplinary input from other international scientific unions operating under the aegis of the International Council for Science (ICSU).

The IUGS Secretariat is located in Trondheim at the Geological Survey of Norway, and is financed by the Norwegian Ministry of Trade and Industry. Three Canadians are past-presidents of IUGS: J. M. Harrison, W.W. Hutchison, and W.S. Fyffe. The current Secretary-General is Canadian, Dr. Peter T. Bobrowsky. After the Asian tsunami, it was the IUGS secretariat that was the first organization to issue a strongly worded resolution on behalf of earth scientists worldwide (http://www.iugs.org/iugs/news/iugs-hazardsstatement.htm).

IGCP - Internation Geoscience Program

To geoscientists, the most well known IUGS activity is probably IGCP, whose logo is a widely recognized symbol of global geoscience. Formerly called the International Geological Correlation Program (hence the acronym), the name was changed recently to International Geoscience Program to reflect the evolving goals of the program. IGCP is co-sponsored by IUGS and UNESCO, for the latter originally through its Division of Earth Sciences and now through its Division of Ecology and Earth Sciences, and was launched in Canada in 1972 at the Montreal IGC. IGCP is among the most successful

international scientific programs ever undertaken. The Canadian National Committee of IGCP (IGCP-CNC) was founded in 1974, and established as a standing committee within the Canadian Geoscience Council in 1976.

Many Canadians have been involved in IGCP as both project participants and leaders. In 2004, for example, of about 38 projects, 11 (almost 30%) had Canadian international leaders and 75% had Canadian coordinators. Over the history of IGCP, about 50% of projects have had Canadian participation (C. Gower, written communication, 2005).

Given the success of IGCP, and its importance to Canadian and global geoscience, it was ironic that, as President of the Geological Association of Canada, I received a request at the end of January, 2005, to write letters in support of an effort by the global geoscience community to reverse recent decisions by the Director-General's office of UNESCO to abolish the Division of Earth Sciences and halve the budget for the International Geoscience Program (IGCP), beginning in 2006. The longer term impacts of this decision remain uncertain, but a new structure for IGCP is being jointly developed by IUGS and UNESCO (P. Bobrowsky, personal communication, 2005), which appears promising.

The Year - International Year of Planet Earth

On an even more promising note, a new joint IUGS and UNESCO project is nearing implementation. The International Year of Planet Earth is intended to be a vigorous international endeavour, the principal goal of which is to demonstrate the enormous potential of the Earth Sciences to lay the foundations of a safer, healthier, and wealthier society. This goal leads naturally to the YEAR subtitle: Earth Sciences for Society, which will have two major lines of action - Science and Outreach.

The Science program will endeavor to provide answers to specific scientific questions vital to addressing societal needs. It is currently divided into eight broad themes:

- Groundwater: toward sustainable use
- Hazards: minimizing risk, maximizing awareness
- Earth and Health: building a safer environment
- Climate: the 'stone tape'
- Resources: sustainable power for sustainable development
- Megacities: going deeper, building safer
- Deep Earth: from crust to core
- Ocean: the abyss of time.

The Outreach program will serve the general public and promote activities including:

- Communicating progress in, and provisional results of, the science topics (above)
- Involving the general public in the research
- Sponsoring excursions and tours to geoscientifically interesting places
- Commissioning educational tools on Earth Science's significance for society
- Supporting production of Earth Science TV documentary programs
- Supporting exhibitions and events on geoscientific/societal topics
- Promoting the Earth Sciences to a wider public.

It is planned that the YEAR, actually envisioned as a three-year event, will be proclaimed through the United Nations and will involve the active collaboration of the geoscience community worldwide. On April 28th, 2005, UNESCO's Executive Board adopted a Draft Resolution, tabled by the Permanent Delegation of the United Republic of Tanzania, which invites UNESCO's Director General to support all efforts leading to the United Nations General Assembly to declare 2008, the International Year of Planet Earth. Fourteen nations, one of which was Canada, voiced their full support for this initiative. The next step will follow soon by tabling the International Year of Planet Earth on the Agenda of UNESCO's General Conference for October 2005 and by tabling a Draft Resolution for the UN General Assembly.

GLOBALIZATION

The examples cited above demonstrate that the international geoscience community is in the forefront of the current trend of increasing globalization. The geoscience role in globalization is perhaps even greater than we realize - in research, in the global economy (e.g., mineral and petroleum industries), and in terms of social issues (hazard prediction and mitigation).

Looking first at global geoscience research, a few examples will illustrate my point.

A search in "GeoRef" for the word "China" in the titles of publications for the years 1975-1980 yielded 708 hits, whereas the period 1999-2004 gave 8191 hits. Interestingly, Canada had 1572 and 2528 hits for the same time periods. As another example, I noted that the May, 2005, issue of the Elsevier journal "Tectonophysics" contains papers on the following diverse geographic areas: Aegean Sea, Japan, Greece, Morocco, Canada, Chile, Australia, Switzerland, California, France, and Central America (the 12th paper is not region specific). The authors' addresses represent an even wider range of geographic locations. As a third example, a comparison of authors of papers in 1974 and 2004 in the journal "Geology", published by the Geological Society of America, showed that in 1974 most (88%) of the authors had addresses in the USA or Canada, whereas in 2004, less than 50% had addresses in those countries (Fig. 1). Although a large increase in that 30-year period was in authors with European addresses, the increase in the number of authors from Asia is also dramatic. Looking at the scientific topics, the number of papers dealing with topics that are not region-specific has stayed approximately constant at about 25%, but the proportion on North American topics has declined from about 46% to 26%, whereas the proportions from other parts of the world have all increased (Fig. 2).

The mineral and petroleum industries have long been global. As an example, Figure 3 shows that the exploration budgets of the world's larger companies for precious-metal, base-metal, and diamond exploration in 2003 were spent all over the world. It is interesting that a high proportion of these companies (over 40%) are based in Canada. The annual meeting of the Prospectors and Developers Association of Canada (PDAC) in Toronto in March, 2005, reached an all-time high of 12,000 registrants. In all, 85 countries were represented (http://www.pdac.ca/pdac/conv/2005/summary.html).

Turning to social issues, the IGC in Florence in August, 2004, included general and special symposia on topics such as geoscience education for sustainable development, ground-water development for poverty mitigation in low-income countries, disaster management, tsunamis, engineering geology, landslides, foundations, tunnel drilling, geoscience curricula in schools, watershed development, geo-tourism, geo-parks, eco-geology, geo-ethics, and taking geosciences to society. These diverse topics indicate a significant application of geoscience in service of global society. But we must do more. A recent thought-provoking article (Mutter, 2005) vividly pointed out that poverty and disaster vulnerability are co-dependent, and vulnerability to natural variations in Earth behaviour preferentially affects the lives of the poorest. Mutter (2005) argued for the need for research on the question "How does the condition of the Earth govern and limit human well-being"? He pointed out that earth scientists uniquely have the skills to do that research, and recommended that:

1. Granting agencies must develop programs targeted toward issues of the poor world.
2. Scholarly societies must support such work.
3. Individual earth scientists must develop research programs that will help.

LOOKING FORWARD

Global geoscience comprises numerous players, a few of which have been touched on in this article. They include international organizations, industries, international aid agencies, and professional societies. All such organizations now have websites for dissemination of information, and in recent years, the Internet has become increasingly a facilitator for Global Geoscience. The ability to educate, communicate, and network, goals toward which AGID worked so hard and at so much expense, is now at our fingertips, in Canada and Worldwide. With the new global economy, are geoscientists finally poised, in the 1972 words of Leo Heindl, "to get the ear of those who make the decisions to give them the benefit of our professional expertise and experience"?

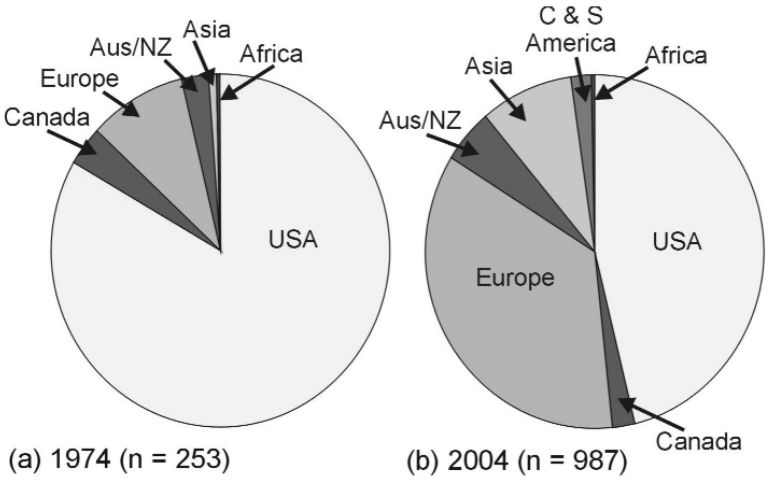

Figure 1. A comparison of the addresses of authors by region or country of papers published in (a) 1974 and (b) 2004 in the journal "Geology". "Geology" is published by the Geological Society of America, Boulder, Colorado. Abbreviations: n, total number of authors; Aus, Australia; NZ, New Zealand; USA, United States of America; C & S America; Central and South America.

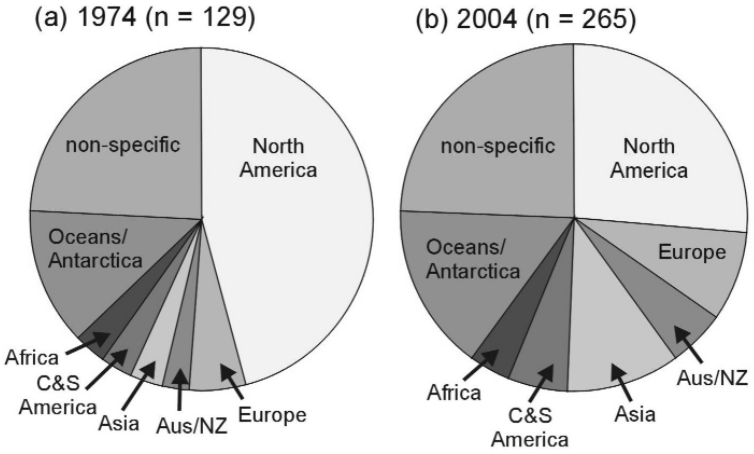

Figure 2. A comparison of the topics by region or country of papers published in (a) 1974 and (b) 2004 in the journal "Geology". "Geology" is published by the Geological Society of America, Boulder, Colorado. The non-specific category includes papers on topics not specific to any one region. Abbreviations: n, total number of authors; Aus, Australia; NZ, New Zealand; USA, United States of America; C & S America; Central and South America.

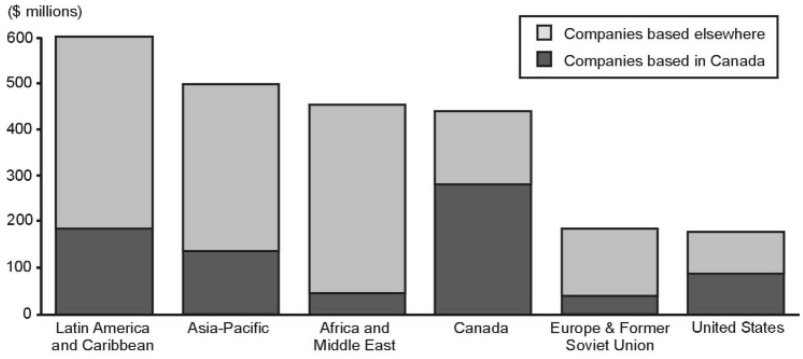

Figure 3. Exploration budget's of the World's larger companies for selected regions of the World in 2003. Companies included are those with worldwide exploration budgets of at least $4.3 million for precious-metal, base-metal, and/or diamond exploration. The diagram is modified from Canadian Intergovernmental Working Group on the Mineral Industry (2005), Fig. 39, p. 140.

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