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Mr. President, Honoured Guests and Members of the Mineralogical Association of Canada, this address from a retiring president will resemble another traditional type of address in that it will have "something old and something new, something borrowed and something blue". It will also have something for me, and I hope something for you. The twin honours of serving as President for the past two years and of continuing to serve our Association as your Representative on the Canadian Geoscience Council warrants in return, my best effort to show that your confidence has not been misplaced.

Like all my predecessors in the presidential office, and, I am sure, like many of you, I believe strongly in the preservation and advancement of mineralogy as a discrete science. As a career, it has given me personally the satisfaction of contact with professionals of the finest scientific quality in Canada and around the world. You see many of them around you in this room. The achievements of these mineralogists over the last thirty years in coping with the increasing demand for scientific facts on minerals, culminating in the magnificent effort on samples brought back from the moon, speak for themselves. Those of you who have followed reports from the moon projects realize that without the background supplied by the scientific discipline of mineralogy, the interpretation of the materials brought back would have been as lifeless as the moon itself. We are proud as mineralogists to belong to the fraternity which continues to work on these projects, whether or not we have been assigned direct parts.

One of the more mundane efforts of mineralogists, the accumulation of information useful in extraction of more and more materials from the earth's crust, at lower and lower grades, has been an indispensible pursuit, although less visible. Unfortunately, this contribution by mineralogists is often taken for granted, and is little recognized even by those who use our techniques and information. Perhaps this lack of recognition persists because mineralogists like other scientists are constrained by their discipline to avoid flamboyance and hyperbole in presentation of their facts and deductions. "Quaecumque Vera — whatsoever things are true" is the motto of the University of Alberta. It is also the central ethic in the training of every scientist. The scientists who observe this ethic, which also implies professional modesty, cannot beat their chests and yell their claims of supremacy like Tarzan of the Apes. Nor does the excellence of their work, as judged by their peers find the country-wide coverage given by the communications media to the achievements of quarter-backs and the measurements of beauty queens. Excellence is expected to be its own satisfaction in mineralogy as in many others of the quiet paths of science.

Before proceeding further, perhaps a definition of Canadian Mineralogy would be of interest. Rather than say what it is not, let us try to define it in positive terms. Canadian Mineralogy is the practice of the science of Mineralogy in any Canadian context, such as in Canada, by Canadians, on Canadian materials, or for the benefit of Canada or Canadians.

* Address of Retiring President given at Annual Meeting of the Mineralogical Association of Canada at Saskatoon, Saskatchewan, 25 May, 1973.

Regressing a step let us ask what place has the science of Mineralogy as a discrete discipline in the modern scientific world? Where are the dividing lines among mineralogy and the disciplines pursued under the presently fashionable names, "Materials Science," "Solid State Physics", and "Rock Geochemistry" for example? Can the boundaries be defined at all in any meaningful way? Has mineralogy faded into obscurity beneath or among all these names? I believe that the boundaries can be outlined by the objective of the discipline. If the investigative activity relates to development of knowledge on the nature and relationships of naturally occurring solid materials, it is mineralogy. Thus the term "coal mineralogy" is perfectly valid, as is "ice mineralogy" the investigation of the properties and relationships of natural ice. As defined, mineralogy therefore retains a high place as a separate discipline. All effort devoted to research on the properties and relationships of minerals and on the descriptions of occurrences of established and new species is mineralogical research. Mineralogy in a country such as ours, which depends so greatly on the extraction and sale of natural mineral resources for our high standard of living, is an indispensible, discrete science.

Let us look briefly at the recent record of the extent of mineralogical activity in Canada. The Science Council publication "Earth Science Serving the Nation" fails to list Mineralogy as a separate discipline. This omission descends from the original omission in the source material — mainly publication 69-56 of the Canadian Geological Survey. Your executive for the past three years has deplored this inexcusable omission to the Survey and its servants at every opportunity. The Science Council publication was obviously written in a hurry by geologists who must take their knowledge of mineralogy for granted, as it is obviously a central factor in their own professional performance. We must charitably reject the other explanation, of professional jealousy, which teaches that if you cannot master a science, ignore it.

Nevertheless, hidden in the tables and text in "Earth Sciences Serving the Nation" are some figures, in their way as revealing as those in the centrefold of "Playboy". These show (p. 159, Table III-5) that in 1968-69 mineralogy was listed as the principal field of research activity of five percent of specialists engaged in earth science in all the earth science departments across the country and that in 1963-67 the number of publications by academic staff on mineralogical themes was ten percent of all scientific contributions in the earth sciences. That is no small effort. In comparison, economic geology occupied six percent of university earth science specialists, who published five percent of scientific contributions in the same period. Add to this mineralogical effort the large contribution of excellent mineralogical work from the Mines Branch, the Canadian Geological Survey, the National and other Research Councils and Foundations, and from private institutions across the country (some of which work is never publicly released) and the total can only be described by the French word "formidable".

Confusion among disciplines develops, of course, where artificial analogues of minerals are made and studied with the objectives of intrinsic use or convenient definition of properties at known compositions and histories. Another source of confusion is the persistence of some scientists in reporting descriptions of minerals and their relationships in deposits as "economic geology" instead of "economic mineralogy". The terms are not interchangeable, as a moment's thought should clarify. For both these reasons much excellent work pertinent to Canadian minerals is lost to mineralogists by publication in whole or in part, as "crystallography", "ceramics", "rock geochemistry", "materials science", "experimental petrology", or "economic geology" in numerous scattered publications, some of which are not easily available to the mineralogist and to others in the mineral industry. Without prejudice to authors' freedom of choice, I believe that more encouragement could be given to the publication of much of this work as contributions to mineralogy in more specific Canadian publications. Here it would be readily available, in appropriate context, in one place.

To go back to the matter of self-advertisement, the practitioners of modern mineralogy in Canada do have legitimate means for recording their achievements, by publishing with their peers in the Canadian Mineralogist, the Journal of our Association. Perhaps we all need to be reminded, just as the preacher warns his congregation against straying from the fold and worshipping in other churches, that scattering publications could have several detrimental effects on Canadian Mineralogy. The ephemeral prestige of having papers appear in omnibus publications however high in circulation, in company with totally irrelevant subjects, in my opinion is not worth being overlooked by those who perform their literature searches in purely mineralogical publications. The opposite practice, of fragmenting mineralogical data by publishing in esoteric little journals with low circulation devoted to a single tool or technique is equally poor. The choice of publication for one's work is, of course, a matter of personal preference. It can hardly be

called in itself detrimental to the intrinsic quality of Canadian Mineralogy if someone publishes in popular mineralogical or geological journals with wide circulation in the United States, or in European publications which only appear in this country in a few technical Libraries. Personally I believe in trying to get my publications into the hands of the people who will find them most useful. For a mineralogical publication in a Canadian context, this means publication in a Canadian mineralogical magazine, available in most scientific libraries across the country and in many such librairies around the world.

Our Canadian contribution is undoubtedly affected by the scattering of work among the dozens of outlets now available. No convenient method exists of assessing year-by-year the amount and quality of this scattered Canadian work. I wonder whether those responsible for approving Government contributions to research are pleased when some of the results of that research grace foreign publications. I would opt for retaining government-supported Canadian research in Canadian publications.

I believe that a publication filled with high quality Canadian work has a significant effect also on recruitment of students to the field of mineralogy. From my own experience as a student the existence of the Canadian Mineralogist, at that time "Contributions to Canadian Mineralogy", played a large part in my recognition of the place of mineralogy as a field for advanced scientific research in Canada, one in which I could try to contribute.

The premise that the lore and techniques of mineralogy are essential to the Canadian mineral industry is so self-evident and so thoroughly demonstrable by repetitious example that it need not be proved once more here to the initiated. We are all aware of the importance of mineral recognition in exploration of properties, of grain-sizes and compositions of minerals in relationship to extractive techniques, and of mineral properties in the direct utilization of industrial mineral products. Nevertheless, constant vigilance on the part of the mineralogist is still essential to avoid misguided or misinformed attempts to ignore the mode of combination of elements in mineral phases when evaluating deposits. Hans Frohberg's Presidential address, is worth reading again on this subject.

Mineral deposits with lucrative concentrations of elements can be rendered completely uneconomic under present conditions by unfavourable distributions of elements among mineral phases. Experienced mineralogists, using properly designed sampling techniques with relatively low expenditure in time and effort can assess these and other types of deposit by reconnaissance, and save large amounts of money prematurely spent on more elaborate feasibility studies. Yet we still find the specific information on element distribution among phases derived from mineralogical reconnaissance on such deposits ignored, and numerous Edisonian experiments carried out at great cost trying to concentrate these elements by mechanical means.

What have mineralogists to offer to the conservationists? The controversy between the misers and the spendthrifts over the exploitation of Canadian natural resources seems far removed from the concern of those studying minerals. Nevertheless, a short reflection shows that measurement and evaluation of the reserves of ores in Canadian deposits depends on the nature and scope of the bank of information developed during mineralogical investigations of these deposits. Tremendous efforts will be demanded of all those skilled in mineral evaluation to ensure that these information banks remain pertinent and valid for decision as to time and rate of exploitation. Changing world economics and more efficient processes vary the rules without warning. The basic information must be there, stored ready for immediate use.

Most people realize that today's waste could be tomorrow's ore. Fewer recognize that the converse can be true, and today's ore could be tomorrow's waste. Today bentonite mining on the prairies might be lucrative because of local oil-drilling requirements. Tomorrow bentonite may be back to being cursed as gumbo mud, as the oil-drillers depart. The properties of the bentonite descend from its major mineral constituent, montmorillonite. Mineralogists using techniques recorded in hundreds of pages of text can recognize and describe the peculiar properties of this mineral, upon which the quality and price of the bentonite depends.

Innumerable examples exist of mines abandoned because new sources of their ore came on-stream at lower prices. Yet these mines when active provided livelihood — and taxes — for appreciable numbers of people, and often formed nuclei for settlement permanent beyond the lives of the mines. Thus it is hard for me to agree with those who wish to keep our mineral resources "in the bank" for some future generation to exploit. How do we know that future generations will be interested in these deposits as anything more than curiosities? Fifty years from now will anyone be digging lignite when the same energy and chemicals which it yields may be won more cheaply and conveniently from new applications of sunlight and photosynthesis? Sylvite from resources yet unknown may make gov-

ernment export quotas ridiculous without notice.

Of course, the above arguments can also be carried to absurdity. The truth I am sure occurs somewhere in the middle as usual. We should not give away or waste resources — notably by converting them into nonsensical armaments — but we should use them judiciously, provided they can be won at a profit to all. It is the old problem of just distribution and sharing of the profits from mineral resources among the owners, and among those who show enterprise and effort in placing the resources economically on the market. This problem cannot be solved by dog-in-the-manger attitudes, nor by waving wands of rhetoric. It takes hard work shared by skilled teams of mineralogists, geologists, metallurgists, mining engineers and economists to examine the mineral inventory, find out what is there and plan suitable times and rates of exploitation at a fair reward to all. These parameters should be governed by present markets, and best estimates of present value of future production.

To return to Canadian Mineralogy, I believe that one of the major tasks of mineralogists is to expand and develop the efficiency of our means of study and evaluation of minerals in place in their Canadian deposits, more precisely to define their nature and relationships. Detailed inventory of deposits must be made and used to make valid decisions on timing and rate of exploitation. The same information is being developed in the rest of the world, for foreign deposits, especially in Russia, Japan, Finland, Sweden, South Africa and Australia. If we are to continue as leaders in the world mineral industry, and at the same time retain our standard of living, extraordinary efforts in economic geology and mineralogy will have to be made over the next twenty years. Only in this way can profitable return on our resources be efficiently maintained and improved, and the Canadian economy preserved.

The (nearly) thirty years of memories of Canadian mineralogy and mineralogists, I regard as my most valuable personal possession. A few of these memories perhaps will interest you also. After the second world war, I resolved to update my 1940 degree in Mining Engineering (Geology Option) by returning to Queen's. Post-graduate work under Len Berry at Queen's firmly fixed in my mind the elegant technique of x-ray powder diffraction as one of the chief tools of the modern economic mineralogist. Used both qualitatively and quantitatively, this method of phase identification and determination of proportions in mineral mixtures remains highly important. As well, I believe that the high goal of excellence in scientific achievement set for his students and for authors by this dedicated mineralogist has inspired the high quality of Canadian contributions throughout the recent years. Other strong influences on me and my contemporaries were the teachings of the late Louis Bruce and Ed. Hawley, of Queen's University, and of the late Wilson Moorhouse and the still highly active Gordon Smith of the University of Toronto. These scientists taught economic geology, mineralogy, petrology, integrity, and excellence in large portions. Economic mineralogy and the value of a trained memory were thoroughly instilled by the example of the late Ed. Hawley of Queen's University, who would lecture without notes, and with total recall of precise statistics on mineral production, properties, occurrences, and examples of the importance of ore microscopy and petrography in evaluating economic mineral deposits.

At the University of Toronto, I was fortunate in being one of the last students graduated under Martin A. Peacock, whose meticulous attention to detail and devotion to excellence in all aspects of scientific activity we have never forgotten. An anecdote with which some of you may be familiar, helps illustrate Dr. Peacock's personality. When talking one day of Goldschmidt's famous Atlas, he said: "All such geniuses have their idiosyncrasies, now take me for instance". He did have his idiosyncrasies, and he did qualify as a genius. He was a Doctor of Music, an eminent glaciologist and geomorphologist, and a first-class mineralogist. From Les Nuffield, a fine researcher and teacher of Mineralogy, we received much help and support. F. Gordon Smith at the University of Toronto gave to his students unstintingly of his deep knowledge of geochemistry, of his ideas, and of his self-designed equipment for the synthesis of minerals. He continues to amaze with his grasp of the earth sciences, and with his endless curiosity and versatility in adaptation of techniques and tools in research in geochemistry. Sparks of inspiration from his inventive mind continually ignited explosions of effort by his students.

Another of our heroes was the late Wilson Moorhouse. Those of you who knew him recognize that his contribution to Canadian Mineralogy cannot be measured by numbers of words on paper, even though his book "The Study of Rocks in Thin-Section" is still used widely. His quiet sense of humour, his humanity, and his tremendous fund of knowledge of petrology and petrography were at our disposal unselfishly and at any time.

On leaving University a three years' stint with the Mines Branch at Ottawa formed ties of friendship with mineralogists there, notably Maurice Haycock and Sol Kaiman, which remain

strong. The next three years, spent with Dominion Gulf Company exposed me briefly to clay mineralogy, and renewed friendships with Jim Earley, Ivan Milne and Jack Curry, expatriate Canadians working at Gulf Research at Oakmont near Pittsburgh. Then I joined Falconbridge, and for the last seventeen years I have been trying to practice what I preach, to apply mineralogical techniques in the mineral industry, among friends and colleagues, too numerous to mention by name. Their efforts on behalf of our science and of the mineral industry continue to keep Canadian mineralogy respected throughout the world.

Throughout this latter period the well-being of the Mineralogical Association of Canada has been a major outside interest. I accompanied Les Nuffield to a meeting of the National Advisory Committee on Research in the Geological Sciences in 1955 to help extract the first grant of $2,400.00 to assist the newly-formed Mineralogical Association of Canada to publish the Canadian Mineralogist. Ever since, I have been deeply involved in trying to serve our Association.

Perhaps at this time the history of the Mineralogical Association of Canada can be sketched to provide background for this meeting. From 1949 to 1955 the American Mineralogist kindly published the "Contributions to Canadian Mineralogy" once a year, as one of their six numbers. The University of Toronto had been forced to discontinue it in 1948, through lack of funds, after thirty-seven years as one of the "University of Toronto Studies" series. The Council of the Mineralogical Society of America found that devotion of one of their numbers solely to Canadian Mineralogy was unfair, as a backlog of United States papers had developed. Repatriation of the publication was therefore essential. Meetings of concerned mineralogists were held in Ottawa in August, 1954, and at the University of Laval during the CIMM Meeting at Quebec in the spring of 1955. The Mineralogical Association of Canada was born there, with the main object of publishing "The Canadian Mineralogist". Len Berry, who had taken over the editorship of the "Contributions" at the death of Dr. Peacock, accepted the responsibility of continuing editorship of the renamed journal, which responsibility he has discharged to the Association's great advantage ever since.

At first one number, then two numbers a year appeared through the unselfish efforts of the unpaid staff and editor. Paid circulation has built to more than 1,200 world-wide, nearly half to libraries and corporate members, through demand alone.

Unbroken publication of Canadian mineralogy in a high quality Canadian journal has thus persisted since 1921. In recent years, additional special numbers have been published dealing with particular areas. These have been only partly supported through other sources such as public grants. The latest, on the Cobalt area, received welcome support from the Canadian Geological Foundation, as well as generous sums from the Mines Branch, and from the Survey. The Association and its publication in recent years otherwise have been self-supporting. This year, quarterly publication has been instituted, justified by the number of papers received over the past three years. Direct subsidy for the additional numbers is being sought from the National Research Council. Len Berry is now being assisted by John Jambor as co-editor. We believe that our publication will retain and increase under their direction the eminent position it has held world-wide over the past sixty-two years.

It may be opportune to discuss the relationship of the Mineralogical Association of Canada to other earth science societies. Our ordinary membership is just over six hundred, of which well over two hundred are located in the United States. Recognizing this interest, we publish papers submitted from the United States, and we have presently on our Executive Miss Mary Mrose of the U.S. Geological Survey as a regional representative. We have always enjoyed good relationships with other professional mineralogical groups and are recognized as one of the larger associations in the International Mineralogical Association, in which we play an active part. In Canada we have joined with nine other professional and learned societies in the Canadian Geoscience Council. I was reappointed this year as MAC Representative by our Executive, and have had the honour of being elected by the Council to serve as Secretary-Treasurer. In this Council I believe that your Association can participate in activities concerning all the learned earth science societies in Canada. Certainly the good relationships we have enjoyed with the Geological Association of Canada over the years should be perpetuated in this larger organization, and the interests of all geoscientists in Canada can be served without prejudice to the objectives of our Association.

I thank those who worked with me to preserve and improve our Association over the past two years, both on the Executive Committee, and on other committees and commissions. The advance of Canadian Mineralogy depends on those who get involved and stay involved. May Dr. Mandarino continue to enjoy your support, as I have.

May I refer again to the rhyme of the bride's

dress, "something old — something new — something borrowed — something blue". The "something blue" part of this address is the regret that many of our friends now have become in our minds and memories, unseen watchers of our progress.

The "something old" has been the few reminiscences on the history of our Association and on some of the many friends whose help and fellowship I have enjoyed over the years. The "something new" is the bright future of this Association and its publication, and of Mineralogy in Canada. The "something borrowed" has been your time to listen to this dissertation. What was in it for me was the pleasure of addressing you. What was in it for you, you are asked to judge for yourselves. Thank you for your kind attention.