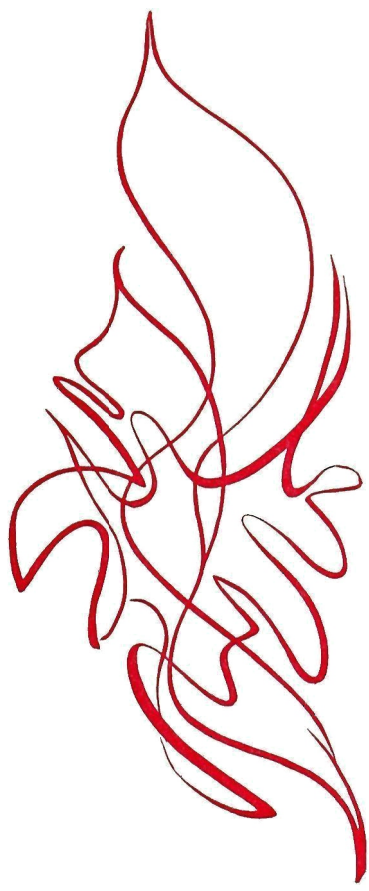




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RIDING THE MINERALS BOOM

R. L. WHITMORE

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RIDING THE MINERALS BOOM

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THIS UNIVERSITY IMPOSES FEW RESTRICTIONS on its professors, but there is one feature of the post on which it is most insistent and which in many ways is the most arduous of all the tasks asked of a professor—the giving of an inaugural lecture. The additional restriction is imposed that he must perform in accoutrements more appropriate to a medieval miners' court than to a blossoming industrial community, but in return he is presented with a distinguished captive audience. I shall respect this fact and hope to make your period of captivity as comfortable as the seats of this hall will permit.

I want to talk tonight, not about any detailed research topic or about what a mining engineer or a metallurgist does, despite the fact that there is considerable misunderstanding about these matters, and particularly about their changed role in the minerals industry of today. My main objective is to put to you the reasons for the present dramatic expansion of the industry, explain why this momentum must be maintained, consider some of the problems which are likely to follow from the growth, and finally suggest how they will need to be tackled.

We are in for a period of great changes and whatever decisions are made, or are left unmade, will incur certain risks. But living is a risky business, as the insurance broker knows to his advantage. The risks are not necessarily reduced by doing nothing or trying to maintain the status quo. On the other hand, positive decisions require not only great determination by the decision makers but—if they are to be the best decisions that are possible under the particular circumstances—a detailed analysis of the most extensive information available. Many of the most troublesome problems we are likely to be facing in the future will arise from the piecemeal decisions which are presently being made on the basis of various partial criteria, some of them rather emotional in character and all based on quite inadequate data.

I would, then, first like to look at the reasons for the present boom in the minerals industry. The basic facts are relatively simple.

Over the last fifty years there has been a steady depletion on a world-wide scale of high-grade, accessible, easily worked ore deposits. The discovery of substantial high-grade reserves of many minerals in Australia has inevitably led to the demand that they be exploited. The stable political climate has added to their attraction in the eyes of overseas investors and finance houses. There is no doubt that Australia can draw immense material benefits from the working of its ores but, at the same time, there are some reservations among the public as to the extent to which present developments are to be wholeheartedly welcomed.

A frequent criticism of the rapid expansion turns on the fact that particular deposits, once exploited, cannot be exploited again. There is a fear that by using our potential now we are sacrificing something that might be of greater value in the future. This is based on a misconception regarding the present position and I do not believe that it is a realistic fear. There are three reasons for taking this view. The first is that it is very unlikely that we have yet exhausted the scope for new finds. The discoveries of the last decade justify an optimistic view; indeed at the present time, discovery of new reserves of many ores in Australia is outpacing our capability to work them. For example, although the known reserves of iron ore (which are conservatively put at 15,000 million tons) will last for well over a hundred years at foreseeable rates of extraction, new reserves are being discovered at a faster rate than they are being exhausted. To the fruits of exploration must be added the development of new mining and processing techniques which enable us to extract progressively more from given deposits. Although in a few areas (such as uranium) new reserves are slow in being uncovered, experience with iron ore reserves suggests that vigorous exploration will only follow a proved, stable export demand. If this is frustrated, exploration will languish too.

Secondly, we can be by no means sure that our mineral wealth will continue to possess its present value. In many cases the value may indeed rise as world deposits are progressively exhausted and more difficult or inaccessible ores have to be exploited. But there is always the possibility that the development of substitute materials and new kinds of end-use products will reduce the demand for particular minerals and hence the value of existing deposits. One example is coal which, over the next fifty years, is likely to be largely displaced by nuclear fuels for power generation, while improvements in metallurgical techniques could remove the necessity of using coke as a reducing agent in the processing of metals.

A second example is aluminium—the most abundant metal in the earth's crust but at present only extractable economically from high-grade bauxite deposits. Queensland possesses the world's largest bauxite deposit but technology could rapidly erode its position as a prime source of aluminium.

Thirdly, resources properly invested now in human and material capital in their various forms through education, training, the construction of roads and buildings, and the installation of plant and equipment, are capable of yielding a larger flow of material benefits in the future than we could get at that time simply by drawing on conserved resources. It is true that in deciding how to use our increased present command over resources we may pay too much heed to our desires for present satisfaction and too little to the future gains from human and capital investment, but that is a matter of what we do with the proceeds of our wealth when we decide to cash it and has little bearing on the rate at which we should exploit it.

At the other extreme, it is sometimes a cause of indignation that we cannot build overnight a series of industrial complexes in which the ores are carried to an advanced stage of processing or manufacture. Even though this is our ultimate goal it is not just a question of obtaining sufficient capital and labour to build and operate the plants, but also of providing on an adequate scale the ancillary services, frequently in remote localities, in competition with other demands of a growing economy. To have achieved within the space of a few years a very large capacity for mineral extraction and preliminary processing is no mean feat. As these stages become firmly established we must encourage further stages to follow, although they will follow more rapidly if we are prepared to devote governmental resources to fostering them in preference to providing some of the other services that we demand from our governments.

It must also be remembered that smelting and refining plants, unlike mines, do not have finite lives, and new plants are only needed to the extent of the net increment in annual production. Very often the question of local smelting and refining facilities is mistakenly measured by governments in terms of foreign exchange earnings to the producing nation. In fact it must be weighed against the problems of product marketing, plus the cost and availability of initial finance for the total mine and smelter development.

This leads me directly to a consideration of financial aspects of the mineral industry—a topic which arouses great and emotional debate. The large influx of foreign finance has caused a good deal of uneasiness to some sections of the public and is accompanied

by the fear that the control of our mining operations is passing, or indeed has passed, into overseas hands. A lack of satisfactory, up-to-date figures makes it impossible to assess the justification for these fears, but there is no doubt that the output of a fair proportion of the minerals industry comes from mines or plants in which overseas capital predominates. There are very good reasons for this which we must now examine.

Mining is an international industry. The distribution of economically-workable mineral deposits over the globe is uneven, but we are now in the situation where many sections of it are controlled by relatively few companies. This is a fact of life with which we must live, and means that there is either no free world market for most metals or there is a ready market for ores and concentrates rather than for metals. Overseas smelters are anxious to secure long-term contracts for raw materials and have actively assisted in mine financing in order to aid new development. Without this finance some projects would have foundered. It is a comparatively simple matter to arrange long-term contracts for concentrates, offering them as negotiable instruments with major institutions for financing. But few nations are prepared to purchase refined metal on the basis of long-term contracts. We can break into these sections of trade only through partnerships with large overseas companies or if our selling price is very competitive. Bauxite, alumina and aluminium are good examples. Bauxite is easy to sell overseas, alumina more difficult, while aluminium has a very limited sale. We must also remember that the domestic market for many minerals is so small that the establishment of a large-scale mining venture depends upon finding an export market, either because it is the only market available or because only on the basis of production for export can the scale of operations be large enough to achieve the low unit cost necessary for profitable enterprise.

Let us look, from a financial point of view, at the various stages in the development of a new deposit. The beginning of such a venture usually calls for finance of the order of \$25,000 to say \$150,000. This is for the initial prospecting, pegging of claims, or optioning of claims related to a single project. It is always highly speculative but by the same token it holds out the greatest rewards and carries the strongest public appeal. The extent of this initial examinational work may be gauged by the published figure of \$40 million per annum applying to current prospecting expenditure in Australia—excluding oil exploration. Much of this money has come from powerful mining companies looking for desirable properties, but much also has come from the public through the

efforts of promoters who, with the stockbroker, attempt to bring venture capital and mining prospects together in happy or unhappy marriages.

The second stage commences after a sound prospect has been revealed. An extensive exploration and development programme has to be undertaken to outline ore reserves. This stage is still quite speculative but sums of the order of \$500,000 to \$2,000,000 (or over ten times the size of the sums required for the first stage) are needed, and this sort of money usually comes from large mining groups.

The third stage, the final phase, begins when a property has been fully explored and requires money for plant construction. It is the least speculative of all, approaching the respectability of investment, and involves, essentially, mine preparation followed by the installation of plant and equipment in order to place the property in production. Finance normally comes from investment houses or large mining companies. From a minimum of \$1,000,000 up to \$50,000,000 or even \$100,000,000 are required for an individual property, depending on the scale of operations. It is here that long-term borrowing is usually the essential ingredient.

Sir Maurice Mawby, Chairman of Conzinc Riotinto of Australia Limited, in a speech to the Australian Industries Development Association last year, stated that some fifty mineral projects in Australia, either under construction or about to begin, will collectively involve expenditures of more than \$2500 million. The main problem today is clearly the procurement of this money, including the channelling of Australian savings and public funds into these mineral developments. Unfortunately, Australians until very recently have not been prepared to take the financial risk involved in these operations, rewarding though they have proved to be, and the capital has come from overseas.

I must also mention the flow of overseas capital into existing Australian-controlled mining and petroleum companies which has been occurring in the recent past. This, of course, is not a problem peculiar to the minerals industry. The high rate of investment of foreign capital in many branches of industry is viewed with alarm by some sections of the community although this disquiet has been allayed to a considerable extent by the rapid rise in the value of Australian holdings which the influx of foreign capital has generated. It is important to remember that only 10 or 15 per cent of development capital consumed in Australia is imported—but it is imported into key areas having the greatest earning power and growth potential. Minerals, therefore, rank very high on the list. I do not wish to expand on this aspect at the moment

except to urge the rapid collection and distribution of much more information through official channels. Japan has set an example in this respect; figures are released regularly showing the amount and distribution of foreign capital in their share market, and it is high time that Australia instituted a similar practice.

The strong flow of foreign capital into our minerals industry must be balanced by an increased flow of domestic savings into existing and new developments. Canada in the main failed to find domestic risk capital for the development of her mineral resources and now faces a situation where the controlling interest is held fast by the United States. Public opinion in Australia must not be swayed by comparisons with the flow of British money into the United States in the last century. If comparisons must be made (and all must be treated with reserve because conditions are never the same at different times and places) the Canadian experience is surely more relevant. The domestic flow can only come on a significant scale from large Australian institutions with ample resources, and it is very satisfactory to see that in 1967 the Australian Trading Banks, in consultation with the Treasury and backed by the Reserve Bank, set up the Australian Resources Development Bank to encourage this type of investment, but additional methods of financing our own developments must be found as a matter of urgency. Between now and 1972 funds at a rate of at least \$400 million a year will be required, and this is one quarter of the total spending by all Australian industry in the last financial year. It is double the annual rate of expenditure on exploration, production, and processing in the last five years. Obviously a good deal of this must come from overseas if it is to come at all.

But if the rapid development of our minerals industry is essential to the economy and, as Sir George Fisher so admirably summarized in a recent speech to the Electrical Industry Marketing Convention in Melbourne, there are overwhelming reasons for believing that it is, the least that the public should demand is that Australian capital in one form or another has a significant initial stake in new enterprises. I also cannot see why it should not be possible to provide an option to buy into foreign partnerships at a later stage when more local capital has been generated and the overseas interests have received a satisfactory return on the initial risk capital or specialist knowledge. One of the depressing aspects of the present boom is the tight grip which overseas groups have on the exploitation of some of our mineral resources for a very long period. The present desire of foreign capital to invest in our minerals industry strongly suggests that we could, and should, raise our

terms for co-operative development, although the scope for raising our terms might not be as great as some people seem to imagine.

The need to employ foreign investment in order to expand the minerals industry inevitably brings with it a number of potential dangers, some more obvious than others. Foreign mining companies are not investing in the Australian minerals industry just to do us a good turn. They are concerned primarily in establishing profitable enterprises and secondly, in some cases, in obtaining ores or concentrates for further processing in their own countries. This exposes us to various potential dangers which we must recognize, but which are minor compared with the dangers of rejecting foreign investment, if we were ever foolish enough to try this.

Firstly, the attainment of comprehensive processing and fabrication in Australia may be hampered by the desire of the company or its home government to obtain minerals cheaply as raw material.

Secondly, in times of financial stringency in its home country and in times of oversupply, the foreign company may act in its own interest or that of its country of domicile.

Thirdly, a proportion of the rapidly growing wealth generated in Australia by overseas groups will be ploughed back in increased exploration in Australia to the detriment of and in competition with Australian-owned companies.

Fourthly, foreign government policies may, through the operating countries, exert an undesirable influence on Australia's policies, particularly in relation to overseas trade. The prohibition on trading by Canadian subsidiaries of U.S. companies with Communist China could well affect Canada's balance of trade and not be in her best interest. There have recently been reports of similar difficulties experienced by Belgian associates of U.S. firms who wished to export to Cuba. Friction is unlikely to occur so long as there is close alignment between the overseas policies of the country providing the investment and the recipient but difficulties are almost certain to appear when the policies diverge.

Finally, the foreign company will look too readily to its country of domicile for goods and services. In the initial stages of a new enterprise, the inflow of foreign technical knowledge and the personnel who come with it are inevitable and should be welcomed, but domination by foreign mining companies is not necessary to ensure continued access to modern technology and there are grave dangers in not generating indigenous expertise. It has already been pointed out that mining operations are only carried out in Australia because they are profitable. The discovery of deposits elsewhere which were capable of cheaper development would lead to a transference of activity to them and a corresponding deterioration

of our economy. It is in Australia's interests not to live on overseas technology but to develop her own, based on the special characteristics of her raw materials. She must aim at a position like that of Sweden, which exports ore, techniques, and sophisticated mining machinery. In no area is this more important than in the processing and extraction of the types of ores and metals which are being mined here. It is in these operations that Australia particularly needs to strengthen its teaching and deepen its research services. This should be helped to some extent by the recently enacted Industrial Research and Development Grants Act of 1967, which provides for the payment of grants by the Commonwealth government for certain specified kinds of research, but much more will need to be done. I will refer to this matter again later.

It should be stressed that the dangers of overseas capital already mentioned are predominantly potential rather than actual, and none of them justifies a drastic reduction in its level of investment. Mining companies which have operated in Australia for many years have always acted in the national interest. For example, to name only two, Mount Isa Mines Limited and Conzinc Riotinto of Australia Limited have consistently adhered to a policy of development and diversification, and have carried out that policy faster and on a larger scale than any government would have demanded of them. Most of the new-comers will probably act similarly but some may not. Every major Western government accepts the practice (if not the theory) that government is more than the provision of a detached framework of law and order within which any interested person may pursue private economic gain without hindrance or responsibility, and public influence must be brought to bear to demand that its interests in Australia's mineral wealth are adequately protected. I do not believe that the role of government should simply be restricted to blanket inducements in the form of subsidies, tax allowances and concessional rates on items such as freights and electric power, valuable though these may be. This is like putting your foot on the accelerator of a car and closing your eyes at the same time. We require an overall policy for the proper development of our mineral resources, grounded on a determination to preserve a controlling Australian interest in the long run, but there is still only a glimmer of appreciation of the vital need for formulating one. There are not even any coherent Commonwealth guidelines, and urgent concerted action to decide where we are going and what our objectives are is absolutely essential. When there are no rules to a game one can hardly blame the most active participants for making their own. Any policy must ensure that the continuation in the growth of the minerals industry

is based on strong indigenous technological foundations. We must avoid being subjected to permanent branch-office technology; we must always know more about the mining, properties, handling and treatment of our ores than anyone from overseas. In this context it is a remarkable fact that so far mining research has not received even the limited, uneven Commonwealth government financial support which has been expended on the extraction of minerals.

Ores, being natural materials, vary in their form, texture and composition even inside a single ore body, and the properties of two ore bodies are never the same. The optimum mining and processing procedure can only be determined after long and detailed study of the disposition and properties of each ore body. We can already see in Australia examples of plants which have been designed overseas to treat a particular ore, and which failed to reach their potential because the properties of the feed material were never clearly understood. In particular we must seek low capital cost methods of extracting the minerals and metals from our ores. Tradition dies hard in the minerals and metallurgy field and much of the equipment and many of the processes have evolved over long periods of time; they are ripe for consignment to the scrap heap. In Australia, uncluttered by the outmoded methods of the industrial revolution, we have a unique opportunity to develop new methods, based on the properties of our own ores. It is a challenging, exciting field in which scientists and engineers of all kinds can, and must, be encouraged to make their contribution. It is an untrue truism to say that research in mining and metallurgy is best done by mining engineers and metallurgists although they must, of course, play an important role in guiding their mathematical, scientific, economics or technological colleagues along avenues where innovation is most desirable.

We are a small country from the population point of view and can only hope to make a technological impact in limited fields. It is essential to concentrate our research and development efforts in specific areas and this calls for a reappraisal of the roles of government and industry through organisations such as the universities, CSIRO, AMIRA and AMDEL. More of our most gifted researchers could with advantage be encouraged to direct their efforts towards objectives of importance to the minerals industry. I do not believe that they would find the problems any less challenging or intellectually less satisfying than a good deal of the broad-based work on which they are presently engaged, and it would help immeasurably in stimulating rapid technological innovation. There still seems to be some resistance

to dedicated research in areas where success would reap rich economic rewards, and the curious tradition must be broken that the less obvious the material benefits of a programme the more academically satisfying it will be. We must not be afraid to look at research from a cost/benefit point of view. In a world of rapidly expanding scientific discovery a small country may often find it best to buy fundamental know-how from overseas and concentrate its research effort on applying it to particular needs. A recent visit to Japan has led me to suspect that the remarkable speed of expansion in that country is a direct result of this type of approach. We might do worse at this time than have a very close look at the way in which Japan differentiates between basic and applied research in terms of the objectives which it seeks to achieve.

I need hardly point out that extra effort put into mineral research will not be available for research in other fields, but a way must be found of giving high priority to suitably-designed projects in the minerals field at the expense, if necessary, of projects in other fields. The present situation might well call for the diversion of a small proportion of the mining royalties and taxes to the search for mineral deposits, and research into more efficient methods of mining, metallurgical processing, and metal fabrication, but bearing in mind the remarkably low expenditure by Australia on research and development, which is about one-seventh of one per cent of the gross national product compared with over two per cent in the U.S. and one per cent in Sweden, there is obviously plenty of room for expansion. Innovation of course requires brains, but it also requires money, and if this has been wisely invested in research, development, and teaching, there are plenty of examples to show that the brains will follow. The minerals industry is the glamour child of Australia at the present time, and a properly planned, adequately financed research and development programme could act as a magnet and a challenge to our youth. In any programme this University, situated in one of the richest mineral states in the Commonwealth, possessing its own experimental mine and shortly—due to the foresight and courage of the University authorities and the government—to take possession of new buildings costing over a million dollars, must obviously hold an important place.

But at the same time better facilities in the way of the advanced equipment required for modern minerals research will be needed if the acquisition of the new buildings is to be fully exploited. To withhold the equipment which the buildings have been designed to house would be “cent wise and dollar foolish”—if I may decimalize the old saying about pennies and pounds. I think that the

provision of the major pieces of equipment—particularly those which can be used for improving the general efficiency of the industry (such as modern analytical tools)—should be the responsibility of the government. It is truly remarkable that the nearest electron-probe microanalyser to this University (a vital tool in mineral assessment) is situated in Sydney, and the absence of such equipment is hampering the co-operation which we are seeking to establish with the industry. The ability to offer sophisticated techniques would help break down the seeming reluctance of some companies to use university expertise except as a last resort. If we can help with the more tractable problems we shall gain the experience and background necessary for tackling the really difficult ones.

Secondly, we must train many more geologists, mining engineers and extractive metallurgists than at present. My colleague, Professor Morgan in the University of New South Wales, estimated in a recent report to the mining industry that we will have to double the total number of mining engineers in the next five years just to keep pace with the present expansion rate. With the installation of more complex processing plants, the need for minerals engineers and extractive metallurgists will rise even faster than this. Strong, active, well-equipped university schools, having the confidence of the industry and backed by a dynamic research programme, will stand the best chance of steering our youth into careers in an area which is of vital importance to Australia. In the 1950's the favourable shift in terms of trade bolstered the U.K. external payments position just as ours has recently been bolstered by foreign investment. Instead of using this breathing space to improve the underlying efficiency of the economy, the temporary gains were siphoned off in the form of higher levels of consumption. The uncomfortable changes being forced on the U.K. economy today by its creditors could happen in Australia tomorrow if we do not ensure both that production methods are so advanced and efficient that there is no wish to withdraw foreign money and reinvest it in technologically more advanced countries, and that we foresee the changing mineral requirements of our overseas customers brought about by technological innovation.

A large, powerful minerals industry will almost certainly be the backbone of Australia's industrial expansion over the next fifty years. New methods of financing, sustaining, and controlling it must be sought. But above all its technological roots must be tended; in the last analysis it will be the industry's ability to force back the frontiers of technical achievement that will ultimately control

its contribution to Australia's economy and prosperity. Old-timers have long enjoyed the saying that ore is where you find it. This is indeed true; but increasingly it can be found in the metallurgical research laboratory and pilot plant, so that one day it may be possible almost to say that ore is where you make it. We must not sit back complacently on our vast mineral heritage only to wake one day and find that technical progress has transformed it into acres of worthless rock. We must strive for a leading place by world standards in education, teaching, and research in mining and metallurgy, and be prepared to finance it from our abundant resources.

And now, ladies and gentlemen, to return to the title of my lecture, in the Australian stable we may liken our mineral resources to a magnificent, powerful steed. To ride it we have engineers the equal of any in the world, but our jockey must be given the reins of wise long-term policies to control his mount's actions, and the joint spurs of science and engineering to maintain its performance. Who'll join me for a day at the races?



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