MINERAL RESOURCES OF THE BRITISH COMMONWEALTH AND EMPIRE

THE Fourth Empire Mining and Metallurgical Congress, meeting at Oxford under the presidency of Sir Henry Tizard, devoted July 13 to a discussion of the mineral resources of the Commonwealth and Empire countries, with particular reference to changes in the last two decades. Members had before them advance copies of nine papers, dealing with Australia (P. B. Nye, I. C. H. Croll and D. R. Dickinson), the Union of South Africa (A. R. Mitchell), Canada (G. C. Monture), Malaya and the Far East (L. L. Fermor), British West Africa (N. R. Junner), the East African colonies (E. O. Teale), India (D. N. Wadia), Southern Rhodesia (J. C. Ferguson) and Northern Rhodesia, Trinidad, British Guiana and Cyprus (E. H. Beard). These contain a wealth of factual information from which it is possible to select only a few items for comment.

Statistical estimates of the future potentialities of Empire mineral production for most minerals were either incomplete or not attempted in these papers, no doubt because in the present state of development or of collection of information in the countries concerned, such estimates are not possible. A notable exception, however, concerned the gold-mining industry of the Union of South Africa. Mr. D. G. Malherbe, introducing Mr. Mitchell's paper, pointed out that while it is expected that there will be a gradual decline in the tonnage of ore milled from the main Witwatersrand area, the recent new discoveries in the Orange Free State and Western Transvaal are estimated to be capable of providing sufficient ore to maintain the present rate of milling in the Union as a whole (approximately 56 million tons per year) until 1974. As, moreover, the ores of the newly found areas appear on the average to be richer than those of the Rand, it is probable that the annual yield of gold would be greater. A passing reference was made in this paper to the presence of uranium in small quantities in the gold-bearing reefs of the Witwatersrand conglomerate. It was emphasized that the development of other mineral raw materials, such as asbestos, manganese, chromite and antimony, within the Union has been nurtured by the profitable gold- and diamond-mining industries.

Dr. W. B. Timm maintained that in Canada the primary object of every prospector is to find gold, and that the discovery of many other useful metalliferous deposits has been an incidental result of the search, including the great base-metal deposits of the central and western provinces. Gold had likewise been the first object of the Southern Rhodesian mineral industry, though here a decline in production has now set in. A serious view is therefore taken of the effects of the war-time curtailment of development of precious metals, for example, in Canada and East Africa, which was necessitated in order to release man-power for the mining of minerals more needed at that time.

During the twenty years under review, a number of notable developments have taken place. The copper belt of Northern Rhodesia, of world-significance, was brought into production by the combined efforts of geologists and mining engineers. In Canada, where only twelve years ago there was no domestic production of iron ore, two major fields of occurrence of Pre-Cambrian hæmatite iron formations have been found. One, at Steep Rock, Ontario, is already yielding a million tons of ore annually; another, on the Labrador–Quebec border, is estimated after only three summers drilling to contain 300 million tons. Another recent discovery is the spectacular diamond-pipe found by Dr. Williamson in Tanganyika, which is stated to have yielded diamonds worth £500,000 in the past quarter. On the other side of the picture, besides hindering prospecting and leading to unduly rapid exhaustion of reserves of some materials, war-time conditions have caused great disruption to the important Malayan tin industry, which has twice suffered a 'scorched earth' policy, once at British and again at Japanese hands. Here progress towards recovery is now being made; production has risen from 27,000 tons of tin in 1947 to 45,000 in 1948 according to Mr. A. H. M. Cretch. It is expected, however, that the easily found alluvial deposits will become exhausted in a measurable (though unstated) time, and it was urged that attention should be turned to the more difficult task of locating the primary deposits in the bedrock.

In presenting the paper on India, Dr. S. K. Chatterjee said that his country contains resources of four minerals in amounts which should be regarded as of world importance: iron ore, titanium ore, thorium ore and mica. According to Sir Lewis Fermor, the iron ore reserves may well amount to 10,000 million tons. Canada is likewise already exporting iron ore, and a plea was made during the discussion that at least part of the high-grade ore from the new Labrador–Quebec district should be made available to the British iron and steel industry. In South Africa there are large iron ore reserves, but the industry is unable to meet present demands for steel in the Union. Australia's reserve of 200 million tons is regarded as adequate for domestic needs, but Prof. J. N. Greenwood pointed out that this is by no means a large reserve, when the size of that continent is taken into account. Considerable supplies of manganese exist within the Commonwealth, notably in India, on the Gold Coast, and in South Africa. The Commonwealth also contains some of the great base-metal producing units of the world; for example, the Australian Broken Hill, Mount Isa and the Canadian Sullivan lead–zinc mines, and the Sudbury nickel–copper mines. The fear was expressed that the concentration of production of these metals into a few large units of this sort is having the effect of making the disposal of parcels of ore from small operators difficult.

Considerable interest was shown during the discussion in the possible uses of titanium. Substantial sources of this metal exist in the newly developed Allard Lake deposit on the Gulf of St. Lawrence, and there are great untapped reserves—estimated at 2,000 million tons—in the Bushveld igneous complex, South Africa. Other sources include the zircon–rutile–ilmenite–monazite sands of the New South Wales and Queensland coasts, the 'black sands' of Travancore (also important for their uraniferous monazite) and the *amang*, the waste material remaining from tin-recovery operations in Malaya. At present the principal application of titanium is for the manufacture of the white oxide, which makes an excellent pigment; but experimental production of the metal is being carried out by the Dominion Magnesium Company in Canada. This metal offers a challenge to the metallurgist, for it has so far proved to be difficult to smelt free from carbon, and the presence of carbide has a detrimental effect upon

its rolling properties. Prof. W. R. Jones directed attention to the working of another new industrial mineral in Canada, the feldspathoid nepheline, which is finding extensive application in ceramic manufacture.

The 'evaporite' group of minerals received scant attention in the discussion, though Sir Edmund Teale mentioned the soda deposits of Lake Magadi in Tanganyika, which are of volcanic origin. Reserves of gypsum, anhydrite and halite occur in many Commonwealth countries, but in most cases have not yet been extensively developed. Mr. V. P. Sondhi stated that a source of gypsum for mining at the rate of 2,000 tons a day is being sought in India. In Canada an occurrence of potash, perhaps comparable with the New Mexico–Texas potash field, has been found beneath the Great Plains, but this, too, awaits development.

A remark of Sir Henry Tizard during his address to the Congress at Grosvenor House, London, on July 11, to the effect that the classical days of prospecting by geological methods are ended, might be held to be negatived by the valuable discoveries made by the Colonial Geological Surveys in the past two decades. Dr. Junner, for example, recorded the finding of deposits of diamonds, gold, platinum, iron and chrome ores during this period by the Gold Coast Geological Survey. So necessary is the work of such Surveys that the Colonial Office, at the suggestion of a committee jointly set up by the Institution of Mining and Metallurgy and the Geological Society of London, has established a central directorate of Colonial Geological Surveys, and enlarged greatly the staffs of the several Surveys. Dr. F. Dixey, the director, stated that there would shortly be 110 on the scientific staff, and a figure of two hundred is aimed at.

The discussion failed to throw any further light on what, according to Mr. Hugh Gaitskell, Minister of Fuel and Power (speaking at the Congress banquet at the Guildhall on July 11), is the most urgent need of the British Commonwealth—new substantial sources of petroleum. Trinidad has for many years been the leading Empire producer, but it has now been surpassed by the Far Eastern island of Brunei. Some optimism was expressed regarding Canadian possibilities; exploration in Australia, on the other hand, has so far been unsuccessful.

The definition of what may or may not be regarded as a useful mineral reserve is so far determined by economic factors that it was resolved at the next Congress to devote one section to a consideration of the economics of mineral exploitation.

K. C. DUNHAM

AGGRESSION IN NATURE AND SOCIETY

THE conditions making for undue aggression in modern society, the need to recognize healthy and valuable forms of aggression as well as the more dangerous kinds, and the place of aggression in the biological scheme as a whole, were the main themes of a symposium held by the Medical Section of the British Psychological Society on June 22. The subject was introduced by Dr. D. A. Hanson of the Department of Anatomy, the Medical School, Birmingham, Dr. P. M. Turquet of the Social Medicine Research Unit (Medical Research Council), and Prof. D. W. Harding (Bedford College).

Dr. Hanson put the problem in its broad biological setting in order to judge what the study of aggression in animal groups can contribute to the understanding and control of aggression in human society. He treated aggression as one of the methods by which animals seek to establish satisfactory relations with other animals, and saw it as having developed concurrently with social relations themselves. The earliest aggregations of living organisms probably resulted from the operation of physical forces over which the organisms had no control (winds, tidal currents and so forth), and which eventually led to the selection of those having an evolutionary advantage in the position thus imposed upon them. Their genetic character and consequently their physiological requirements would then contribute to the maintenance of aggregations. "At first ecological, and later physiological, factors are the origin of the social contract," said Dr. Hanson.

Aggregation demands in each individual two social characteristics: some degree of tolerance for other individuals and also the capacity to compete with others when congestion brings the resources of life into short supply. Those individuals best able to obtain food and a mate become dominant in the social group. Different species exhibit different degrees of tolerance and domination within their organisations, and it seems likely that at least to some extent these differences are determined genetically. Zuckerman showed that the male baboons he studied at the London Zoo are organised into a strict order of precedence for food and females, and test the order by frequent combats; but the howling monkeys studied by Carpenter in Panama exhibit a stable organisation in which co-operation between individuals seems highly developed and fighting for food or females rarely occurs.

Aggression between groups is not a prominent feature of sub-human societies. However, group aggression has been reliably observed in defence of territory, for example, by Eskimo dogs in East Greenland, where packs of five to ten members defend their group territory against all other dogs, the young animals learning the boundaries of other packs' territories and defending their own only when they approach sexual maturity. Little is known of the extent of communal defence of territory among the higher primates, though it seems that some such group efforts, probably not much organised, do occur.

In conclusion, Dr. Hanson emphasized the wide differences between human and other animal societies, especially the differences arising from the human possession of cultures based on language. Just as anthropomorphism hindered progress in early studies of the social life of animals, so 'anthropoidomorphism' could be a danger if the scientific studies of animal groups were applied by uncritical analogy to human life in society.

Dr. Turquet based his treatment of the theme on two postulates. The first was that the presence of an inborn propensity to aggression in human beings is less important than its subsequent fate at the hands of the family and other social forces. The second was that aggression is one of several possible responses to the frustration of an impulse. Dr. Turquet therefore examined the main sources of frustration in our society.

The first he found to be the process of socialization during infancy and childhood, whereby simple naturally preferred ways of behaving are interfered with or replaced by more complicated and arduous