DEPARTMENT OF NATIONAL RESOURCES

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

Record 1978/98

MINERAL RESOURCES BRANCH

SUMMARY OF ACTIVITIES FOR 1978

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INTRODUCTION

by J. Ward
Assistant Director, Mineral Resources Branch

During 1977 the work of the Branch continued along two main functional lines - the monitoring and analysis of the mining industry both on a national scale and in an international context, together with dissemination of information resulting from this work; and the assessment of mineral resources at a national level.

In common with other Branches of the Bureau efficient operation of the Mineral Resources Branch was subjected to considerable strain because of the continuing implementation of staff ceilings, particularly as much of the work of the Branch has to meet exacting deadlines. In spite of this, timeliness of branch publications was improved, and I wish to record my appreciation of efforts by mineral commodity specialists, statistical officers, and editorial staff that made this possible.

During the year, officers of the Branch continued to provide expert information and specialist advice to the Department and other Government departments and agencies mainly as a background to policy formulation. This applied particularly to departmental briefing in connection with international commodity organisations dealing with lead-zinc, tin, tungsten, and bauxite. Interdepartmental advice ranged from comment on environmental studies on the impact of bauxite and uranium projects, to the preparation of detailed papers for the committee on Structural Change in Industry chaired by Sir John Crawford, and the possible effect of proposals of the Informal Composite Negotiating Text (ICNT) of the Law of the Sea Conference on the Australian mining industry. Paragovernmental organisations briefed included the Prices Justification Tribunal, the Industries Assistance Commission, the Australian Industry Development Corporation, Export Development Grants Board, and the National Energy Advisory Committee.

Much of the information and technical advice provided to the private and public sectors is of an ad-hoc nature; in fact, about 20 percent of the commodity specialists' time is taken up responding to ad-hoc requests for information which can be handled without a great deal of time-consuming research. However, some demands involve projects in their own right and as such require a major input of specialist manpower, an input difficult or at times impossible to provide in view of the many deadlines to which Branch officers are subjected. I reiterate the need for a small, qualified, competent group within the Branch, sheltered to some extent from continuing 'routine' demands, with the time to concentrate on major projects and the experience, ability, and expertise to liaise at an intra and inter-Branch level with their scientific colleagues, and to finalise and produce a report in keeping with the high standards expected of a geoscientific organisation.

The Mineral Resources Branch in 1978 continued to provide a lecturer for the Industrial Mobilisation Course conducted by the Department of Defence in the various capital cities. Branch officers presented three papers at the Seventh BMR Symposium held in Canberra in May, and (as official delegates) attended the joint AusIMM-AIME Conference in Canberra in May and the Annual Conference of the AusIMM in Townsville in September. The Chief Mineral Economist presented a paper 'Mineral Resources of Australia 1978' to a Bankers Overseas Trade Course held in Sydney in November. Considerable effort was put into the preparation of a submission to the ASTEC Subcommittee reviewing the functions and level of activity of BMR, and Branch officers contributed to the Canberra section of the seminar organised for the Study Group on Geology and Mineral Exploration from the People's Republic of China.

The Chief Mining Engineer acted as Secretary to the State Chief Inspectors of Mines Conference throughout the year. He was seconded for a short period to the Northern Territory State Minister for Resources and Health earlier in the year. As a contribution to foreign aid, the Branch provides advice on mining and development projects to the Australian Development Aid Bureau of the Department of Foreign Affairs. On behalf of ADAB a mining engineer of the Branch visited Bangladesh for a short period in August to advise on coal, limestone, and mineral sands projects and to comment on the preparation of a Mining Act for that country.

While considerable progress was achieved during the year in the continuing assessment of Australia's identified mineral resources, disappointingly little progress was made in the field of undiscovered resources, particularly as the Branch's only geomathematician resigned in June. On the positive side, mineral economists of the Branch continued to gather data on, and to assess, identified mineral resources; national totals were brought up to date, revised, and published in the Australian Mineral Industry Quarterly vol. 30, no.4. The capital-cost data storage and retrieval program of the BMR cost-model system was well advanced. The highlight of the resources assessment program during the year was the initiation of the Tin Resources Assessment Project (TRAP) - a joint effort involving a mineral economist, an economic geologist, and a mining engineer which will result in an up-to-date assessment of Australia's identified tin resources, both economic and submarginal, in a form suitable for easy updating.

Staff restraints maintained in line with government policy throughout the year were exacerbated by the absence of senior staff, the Chief Mineral Economist on furlough, the Chief Mining Engineer on sick leave, and a Supervising Mineral Economist on a protracted Executive Development Scheme of PSB. While it is hoped that most positions in the Mineral Economics Section will be staffed again by mid-1979, the lack of formal geomathematical expertise appears likely to continue, while

the staffing position in the Mining Engineering Section remains critical. During the year, a detailed submission was made to the Director in which reorganisation of the Branch to include a Mineral Assessment Group and a Special Projects Group was spelt out. However, the submission has not gone forward pending the outcome of the report of the ASTEC Subcommittee.

MINERAL ECONOMICS SECTION

INTRODUCTION

The Section's two broad and interrelated functions are to study the various sectors of the mineral industry, both in the national and international spheres, and to assess Australia's mineral reserves and resources. These functions are maintained on a continuing basis. Against this background, and using the data and information collected by it, the Section is able to respond to the many requests for information that it receives from government, the industry itself, and the public, as well as to publish information at regular intervals.

Although the Section's work concentrates on the Australian mineral industry and on Australia's mineral resources, it necessarily extends world-wide because the industry in Australia is an integral part of the world industry, and because Australia is largely dependant on overseas markets for its mineral products and is an important supplier, to the world, of most major mineral commodities. The Section's mineral-industry studies follow two main lines - commodity studies and special studies.

Commodity studies are continuing reviews of all aspects of mineral commodities, from exploration to consumption, and including production, processing, distribution, and marketing of the commodity. These studies generate the broad information base on which the Section relies to answer the many and varied enquiries put to it, and from which it draws the information it publishes.

Special investigations focus on details of a particular facet of the industry, such as the exploration sector, or they review a commodity in greater detail or study some particular aspect of a commodity. Special studies are made for two reasons: they are programmed by the Section and done to fill a knowledge gap or to meet an anticipated need; or the Section is directed along a particular line of study in response to specific requests for information and advice, particularly from its own Department of National Development and the Department of Trade and Resources, but also from agencies such as the Industries Assistance Commission (IAC), the National Energy Advisory Committee (NEAC), and the Office of National Assessments (ONA).

The Section prepares the Australian Mineral Industry Annual Review and (with the Australian Bureau of Statistics) the Australian Mineral Industry Quarterly; details of publications and of papers published in Quarterlies or outside journals, are listed separately.

Much of the Section's work depends on statistical data on production and trade, and it therefore maintains a close working relationship with the Australian Bureau of Statistics (ABS), through the Statistical Officer (Mining), an ABS Officer outposted to the Section. By arrangement

with ABS, the Section also carries out special statistical collections. The results of these are issued by BMR as bulletins which are available for mineral sands, copper, lead and zinc, sulphur, sulphuric acid and superphosphate, and tin. The data are also used by ABS.

STAFF

Staffing at 31 October 1978 was as follows:-

Science 5 (Mineral Economist)	I.McLeod
Science 4 " "	L.C. Ranford
	Vacant
Science 3 " "	A.J. Gourlay
	D.J. Perkin
Science 2 " "	A. Driessen
	G. Hillier
	K. Patterson
	R. Pratt
Science 1 (Geologist)	C. Mock
Clerk Class 4	G. Mortimer
	S. Westerhuis
Clerk Class 2/3	S. Styles
Clerical Assistant Grade 4	J. Ramsey

A. Driessen is presently acting in a Science 3 position and N. Knight in a Science 2 position. B.G. Elliott, the former occupant of the vacant Science 4 position, was promoted in October 1978 to lead the newly-formed Exploration Policy Section of the Department of National Development.

A Clerk Class 8 continues to be outposted to the Section from ABS, as Statistical Officer (Mining); the position was held by L. Wright throughout the year.

R. Collin, who was temporarily attached to the Section as a supernumerary, following the abolition of the Division of Northern Development in the Department of National Resources, transferred to the Department of Trade and Resources at the end of June.

L. Ranford has been detached from the Section for 12 months from 21 May to participate in the Public Service Board Executive Development Training Scheme.

COMMODITY STUDIES

The objective of commodity studies is to maintain an up-to-date information base on all aspects of the mineral industry, from exploration to final consumption and covering all sectors in between, such as mining, processing, distribution, and marketing. The wide coverage allows realistic assessments to be made of the effects of change in one sector on the other sectors in the industry. The effects of

fluctuating prices and market opportunities, for example, can have a very marked effect on exploration activity and other investment activities. Although the emphasis is on monitoring the industry in Australia, the work is necessarily expanded to cover worldwide developments because the industry is an integral part of the world industry and because Australia holds a very prominent position among world suppliers or potential suppliers of several important mineral commodities, particularly bauxite, coal, iron ore, lead, mineral sands, nickel, uranium, and zinc.

Much of the industrial and commercial information held in the Section has come from both government and industry sources, in Australia and overseas, and by way of many trade and technical journals, newsletters, and newspapers. The Section maintains a specialised library, outposted from BMR's main library, and indexes and references its own material. Some bibliographic references, particularly those pertaining to the Australian mineral industry, are also provided as input to the Australian Earth Sciences Information System (AESIS).

As another part of commodity studies, commodity specialists also maintain close personal contacts with the many companies and organisations comprising the industry, and the Section gratefully acknowledges the assistance and goodwill proffered by the industry through informal discussions and visits by commodity specialists to mines and plants.

Information is also exchanged with visitors to the Section, of which there were about 110 in the 12 months ended 31 October 1978. Commodity specialists also participate in industry symposia and conferences each year, as well as technical courses, to keep up with the latest developments in the industry. Details of attendances are listed separately.

The Section's information base meets various needs, each by way of providing information, but by different channels. As an ongoing function the Section provides information through its regular publications, the Australian Mineral Industry Annual Review and the Australian Mineral Industry Quarterly. It also compiles and distributes quarterly Bulletins containing statistics on mineral sands, copper, lead and zinc, and tin, an annual Bulletin on sulphur, sulphuric acid, and superphosphate statistics, and a series of Preliminary Annual Summaries providing timely but preliminary statistics and commentary on developments concerning the more important commodities.

During the year, specialist contributions were also provided for several encyclopaedias. N. Knight and G. Hillier prepared a section 'Molybdenum in Australia' for a new International Molybdenum Encyclopaedia.

R. Pratt prepared material on iron and steel in Australia and New Zealand for the Australasian volumes of the World Book Encyclopaedia, and supplied an article on iron ore in Australia for the Horwitz Group Books Pty Ltd Encyclopaedia of Australia.

The information base also satisfies many ad-hoc enquiries received by the Section from government, the industry, and the general public. Many queries are quickly answered, but others require more preparation.

Much of the Section's accumulated experience is also directed to the preparation of papers, briefing notes, and other material required for various commissions of enquiry, Australian and international commodity groups, and other organisations such as United Nations agencies; these include the UNCTAD Export Group on Copper, UNCTAD Committee on Tungsten, International Lead and Zinc Study Group, International Bauxite Association, and the International Tin Council. Regular contributions are prepared on forecasts of mineral export income, and on employment trends in the mining industry. In the 12 months to 31 October 1978, commodity specialists spent about 480 man days (20 percent of total man days of staffed positions - excluding leave) on responding to various requests for information from government (especially the various bodies detailed above), the industry, and the public. Notable contributions, eight of which were prepared as Professional Opinions, were provided for the National Energy Advisory Committee (NEAC), the Committee on Structural Change in Industry (chaired by Sir John Crawford), and on matters relating to the Law of the Sea Conference.

SPECIAL STUDIES

The Section's capacity to carry out programmed special investigations is limited by its commitment to respond to the many enquiries it deals with, which, by their nature, take priority over longer-term projects. In the year under review this restriction on the opportunity for carrying out programmed special studies was further exacerbated by staff turnover and by staff being otherwise unavailable to carry out such work. The Section's work in recent years in studying the various methodologies of resource assessment and in developing methods suitable for assessing inferred reserves, was severely curtailed by the resignation of Dr J. Cottle, the Section's sole specialist geostatistician, and by the temporary detachment of Mr Ranford. However, a detailed tin resource assessment is presently being carried out, with assistance from the Mining Engineering and ADP Sections. Work on known resources of the various minerals, using information available to the Section, is also continuing; the results of this ongoing work are published annually in the fourth quarterly number of the Australian Mineral Industry Quarterly. The results to date of the Section's work on resource assessment were presented at the BMR Symposium at which L. Ranford presented a paper entitled 'Australia's non-renewable energy resources' and J. Cottle presented a paper entitled 'The calculation and expression of national estimates of inferred mineral resources'. L. Ranford also presented a paper on Australia's energy resources at the Australian National University.

The Section's work for the National Energy Advisory Committee, in the preparation of reports on Australia's non-renewable energy reserves and resources, tapered off during the year. Its commitment last year, when the reports were being prepared, was particularly heavy but this year's involvement was mainly towards preparing the reports for publication.

OTHER WORK

The growing amount of information handled by the Section and the obvious need for quick and effective access to it is beginning to create a need for better methods of handling and presenting this information. Last year a computer program was implemented to prepare graphs of metal prices. In the year under review a study was begun to assess the feasibility of adopting a unified approach to classifying, recording, and retrieving the diverse information and data about the various commodities, presently managed by the individual commodity specialists. Progress in this project was also curtailed by J. Cottle's resignation; the project remains on program, with assistance from ADP Section to ensure that any techniques developed are compatible with computer processing capabilities.

Microfilming of the Section's holdings of company Annual Reports, begun last year, continued throughout the year.

SYMPOSIA, CONFERENCES, COURSES, AND LECTURES

Those attended by members of the Section during the year ended 31 October 1978 are detailed below:

- 'Commodity trends in mineral exploration and evaluation', sponsored by AMDEL, Adelaide, December 1977 (L. Ranford).
- Seminar on phosphate, sponsored by CSIRO, Melbourne, December 1977 (A. Driessen).
- AMF course 'Mineral developments and government policy', Canberra, February 1978 (I. McLeod).
- 'A survey of recent developments in economics' sponsored by The Centre for Continuing Education, ANU, Canberra, February 1978 (A. Driessen).
- 'International resource management' jointly sponsored by AusIMM and AIME, Canberra, May 1978 (most members of the Section attended selected sessions).
- 'Minerals, politics, and economics' sponsored by the Earth Resources Foundation, Sydney, May 1978 (B. Elliott).
- 'Energy resources and their assessment', sponsored by the Earth Resources Foundation, Sydney, May 1978 (R. Pratt).
- IGCP Project 156, field workshop and seminar, 'Proterozoic and Cambrian phosphorites of Asia and Australia', Mount Isa region and Magnetic Island, August 1978 (A. Driessen).
- AMF course 'Mineral exploration management', Adelaide, September 1978, (D. Perkin).
- AusIMM Annual Conference, Townsville (J. Ward).

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MINING ENGINEERING SECTION

The Mining Engineering Section is a mining research and advisory section within the Mineral Resources Branch. The mining engineers provide information and advice to Government on mining matters, for example on mine feasibility and profitability, methods of mining, recommendations for development programs, and requests for mining assistance submitted to the Government. The section also provides assistance to the mineral resource assessment groups of BMR in their compilation of economic and subeconomic mineral resources by calculating data on capital and operating costs of mining projects. In co-operation with the State Mines Departments, the Section participates in the compilation of a standard mine-operating code of practice. A schedule of State mining royalties and Australian Government mining tax provisions is kept up-to-date, together with State mining legislation amendments. In 1978 the Section further extended the use of computers for the calculation of mine feasibility studies, and continued the design of a mining data bank in a computerised storage and retrieval system.

STAFF

Occupied positions (as at 1 October 1978)

Engineer Class 5	..	E.G. Timoney
Engineer Class 3	..	J.C. Erskine

CONFERENCE OF STATE MINING ENGINEERS

The conference was held at the NSW Mines Department, Sydney, from 27 February to 3 March 1978. Many items of mine safety were discussed, including acceptance by all States of the Commonwealth Code of Practice on Radiation Protection in Mining and Milling of Radioactive Ores, together with standards of atmospheric contaminants set by the National Health & Research Council. Mr Timoney acted as secretary to the conference, and compiled the minutes and distributed them to all States and to the Australian Minerals & Energy Council.

VISITS TO MINES

Mr Erskine made a detailed study and assessment of the Mount Lyell underground copper mine at Queenstown in Tasmania, for a report to Government on its future profitability. He reported to the Department, and in person at Parliament House to a Member of Parliament. The Government did in fact extend the requested financial aid to Mount Lyell. He visited all the tin mines and major tin mining prospects in Tasmania (Aberfoyle, Storeys Ck, the Pioneer area, Renison, Razorback, Cleveland, and Queen Hill), the tin mines and prospects in NSW (Ardlethan, and the Armidale-Glen Innes-Inverell area), and the Greenbushes (WA) tin-tantalite mine, for the assessment of Australia's tin resources.

He examined the unstable rock slopes at the recently abandoned open-pit nickel mine at South Windarra, and the underground development work at Mount Windarra nickel mine. The large underground gold mine at Mount Charlotte (Kalgoorlie) was visited to see the experimental stoping by large-diameter underground blast holes and the preparations for installation of the underground crusher. The Jarrahdale, Dell Park, and Huntly open-pit bauxite workings were also inspected to assess operating methods and costs, and the success of the restoration by tree planting on mined out areas.

GOOGONG DAM PROJECT

Mr Timoney continued to act as mining advisor to the project executive throughout the year.

GENERAL ASSISTANCE TO GOVERNMENT DEPARTMENTS

Government of the Northern Territory

During the interval prior to Statehood and the take-over of the Department of the Northern Territory's Mines Branch, Mr Timoney spent four weeks as mining advisor to the Minister (Elect) for Mines and Energy of the new Northern Territory Government.

Advice was given on:

(a) Mining environmental control and suggested additions to the Mining Ordinance to regulate such control.

(b) Government stamp batteries at Tennant Creek and Mount Wells, together with suggested avenues to increase versatility and performance.

(c) Outline of the Australian mining taxation and royalty system versus Canadian mining taxation and royalty systems, and a comparison of mining incentives. An outline of possible mining incentives that could be applied by the new Northern Territory Government, was also given.

AUSTRALIAN DEVELOPMENT ASSISTANCE BUREAU

Considerable work continues to be generated by the contact between ADAB and the Mining Engineering Section. For example Mr Erskine was sent by ADAB to Bangladesh for a fortnight to report on the following matters:

- The proposed large underground coal mine at Jamalganj
- The underground limestone mine at Jaipurhat
- The future of the beachsands project and pilot plant at Cox's Bazaar
- The writing of a Mines Act for Bangladesh
- The present situation as regards the Bangladesh Geophysical Survey.

The first three of these matters provoked considerable discussion and differences of opinion on technical matters in Bangladesh, and it must be recognised that any officer sent on such assignments to developing countries must be prepared to speak plainly and to disagree with views put forward by consultants. Mr Erskine also attended various meetings to choose an Australian consultant for a major iron ore project in Pakistan, and continues to receive occasional queries about the Thailand lignite project. He also advised ADAB on a consultant for a Phillipine coal project. In this connection major Australian mining companies have recently advised BMR that they are interested in consulting assignments in South East Asia.

GEOSTATISTICS FOR ORE RESERVE ESTIMATION

Following the resignation of Dr J. Cottle from the Branch, the Mining Engineering Section's effectiveness in the geostatistics field was reduced considerably. However, study continues to be done in the basic philosophy, mathematics, and statistics of the subject. For example a two day workshop on geostatistics was conducted at BMR by a geostatistician from BHP, with some success, but although it is apparent that BMR must develop expertise in geostatistics, it is not at present clear how it can be done.

MINING COST ASSESSMENT

Mr Timoney expanded the broad copper computer program on economic open-pit copper prospects of various grades and tonnages, to include similar preliminary studies of gold and silver; copper; copper, gold, and silver; copper, silver, lead, and zinc; silver-lead-zinc, and tin. All programs calculate capital cost, operating cost, cash flow, discounted cash flow, smelting cost, royalty, taxation, and discounted rate of return. As mentioned in 1977, precise mining costs are difficult to obtain. To counter this a statistical program was developed initially to give a 90 percent spread of confidence to estimated costs. This work is continuing.

ASSESSMENT OF AUSTRALIAN TIN RESOURCES

A major new assessment of Australian identified tin resources was undertaken during the year by Mr Perkin of Mineral Economics Section, and Mr Erskine. This involved field visits to all the important tin mines in Australia and to some of the major tin prospects. Mr E. Smith of ADP Section (Operations Branch) has written a program which allows rapid assessment of many different ore grades, tin prices, exchange rates, impurities and mining rates, and this program will be used by Messrs Perkin and Erskine to prepare a paper 'Predicting the location, grade and tonnage of Australia's future tin orebodies ' to be presented at the 8th BMR Symposium.

MINING COST ANALYSIS PROJECT

This project involved the writing of a major computer program by Mr Smith in collaboration with Mr Erskine. Negotiations were set in train with the controllers of three large I.C.L. computers (Department of Business & Consumer Affairs, Australian Bureau of Statistics, and the Sydney-based computer company Compunet) with the object of running the program on one of the computers. A console and a modem would have had to be purchased and installed in BMR to be linked by line to the appropriate computer. The data base and the program would have been set up for the chosen computer and accessed via the console as required. However, most of the program development was suspended towards the end of the year because of pressure of other work, although the data base of mine capital costs, which is an essential part of the program, is being continued.

SYMPOSIA, CONFERENCES, COURSES, LECTURES

Mr Erskine presented a paper, in collaboration with Mr Smith,'The logic that underlies a feasibility study and calculations for mining projects', at the 7th BMR Symposium. He also wrote a paper, 'The effect on ore reserves of rising costs and falling prices' which was published in the Australian Mineral Industry Quarterly, Vol. 31, No.2. He attended a one-week Workshop on Rock Mechanics at Kalgoorlie, and a symposium 'Access to Minerals' in Canberra. In accordance with Government intention to encourage closer involvement between Government and Industry he spent two days with the engineers and computer specialists of BHP's Corporate Data Processing Division at their Head Office in Melbourne. Later, one of the BHP geostatisticians conducted a two-day geostatistics workshop at BMR.

VISITORS AND ENQUIRIES

During the year the mining engineers received many visitors and handled many enquiries from mining companies, individuals, Government Departments, Universities and other agencies, on a wide variety of subjects associated with mining

techniques, mineral resources, underground support, mining equipment, mining feasibility economic calculations and similar mining industry matters. The diversity of enquiries is illustrated by the selective examples set out below:

. Confirmation of the practicability of a new development by the company Readings of Lismore to separate chromite from crushed rock in one pass through their wet, high-intensity, magnetic separator. The enquiry came from the Government of New Caledonia and involved separation of chromite from crushed ore in the Lismore pilot plant, at which Mr Erskine was able to take samples at various stages and confirm the accuracy of the results reported previously by Readings.

. Advice to various mining-engineering consultants about the use of Government facilities for expediting and helping to fund their consulting services overseas.

. Provision of some input to the Australian National University committee which is examining ways to reorganise the ANU Centre for Resource & Environmental Studies.

. Answering queries from a mining company re-examining the feasibility of dredging the King's Plains tin prospect.

. Answering many queries about mining costs, from both Government and industry, in particular the detailed break-down of costs for various methods of tin mining, and enquiries from an exploration manager about how to make preliminary estimates of an orebody's mining feasibility.

. Answering queries about how State Mines Departments operate.

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PUBLICATIONS ISSUED IN 1978

Australian Mineral Industry Annual Review 1978

Australian Mineral Industry Quarterly, Volume 30, Nos. 1, 2, 3, and 4; Volume 31, No.1.

BMR Record 1978/9, Mineral Resources of Australia, 1978, by L.C. Noakes and J. Ward.

BMR Record 1978/22, Mineral Processing in Australia: progress and potential, by R.N. Collin.

Articles published in the Australian Mineral Industry Quarterly:

- 'Copper mining in Australia 1953-75 and the sufficiency of present ore reserves', by B.G. Elliott (Vol. 30, No. 1, 9-23).
- 'The Australian sulphur industry 1951-76', by A. Driessen (Vol. 30, No.2, 67-78).
- 'Asbestos in Australia - its occurrence and resources', by R.J. Hughes (Vol.30, No.3, 119-27).
- 'Australian mineral resources, 1977'. Author - BMR (Vol. 30, No.4, 175-79).
- 'Coal exploration in Australia', by R. Pratt (Vol. 31, No.1, 8-12, also to be published in World Coal.
- 'The effect on ore reserves of rising costs and falling prices', by J.C. Erskine (Vol. 31, No.2).