**THE SOUTH AFRICAN INSTITUTE OF MINING AND METALLURGY**

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## AUSTRALASIAN INSTITUTE OF MINING AND METALLURGY

*Coal and Mineral Sizing*
ISBN 0 909520 82 8; 281pp; 200×275mm; illus; 1984
**Review: October 1985**

## CANADIAN INSTITUTE OF MINING AND METALLURGY

*Mining Exploration Agreements*
**By W.B. Gordon Walker**
ISBN 0-919086-07-1; 82pp; 215×280mm; 1984
**Review: October 1985**

## INSTITUTE OF MINING AND METALLURGY—U.K.

*Prospecting in Areas of Desert Terrain*
ISBN 0 90048881 6; 283pp; 210×300mm; illus; 1985
**Review: October 1985**

*Extraction Metallurgy '85*
ISBN 0 900 488 824; 1124pp; 155×235mm; illus; hard cover; 1985
**Review: January 1986**

## MINING JOURNAL BOOKS LTD—U.K.

*Mining Annual Review 1985*
ISBN 0 900 117 397; 556pp; 200×270mm; illus; 1985
**Review: January 1986**

## BRITISH GEOLOGICAL SURVEY—U.K.

*World Mineral Statistics 1979–83*
ISBN 0 11 884286 2; 275pp; 210×290mm; 1985
**Review: October 1985**

*United Kingdom Mineral Statistics 1984*
ISBN 0 11 884283 8; 162pp; 210×295mm; 1985
**Review: October 1985**

## INSTITUTE OF METALS—U.K.

*Heat Treatment '84*
ISBN 0 904357 67 8; 428pp; 215×300mm; illus; hard cover; index; 1984
**Review: October 1985**

*Dislocations and Properties of Real Materials*
ISBN 0 904357 74 0; 283pp; 210×280mm; illus; index; 1985
**Review: January 1986**

*Stainless Steels '84*
ISBN 0 904357 68 6; 587pp; 210×295mm; illus; index; 1985
**Review: February 1986**

## SOCIETY OF MINING ENGINEERS OF AIME

*Au and Ag Heap and Dump Leaching Practice with Panel Discussion Water Chemistry of Heap Leach Operations*
**Edited by: J. Brent Hiskey**
ISBN 0-89520-425-8; 162pp; 215×280mm; illus; index; 1984
**Review: January 1986**

*Mining 1985*
**Published by: Longman Group Ltd**
ISBN 0-582-90329-7; 536pp; 190×245mm; hard cover; 1984
**Review: July 1985**

*The 1985 Loadstar Bulk Handling Directory*
**Published by: Loadstar Publications**
ISBN 0 9510103 0 1; 288pp; 210×295mm; illus; index; 1985
**Review: October 1985**

*Vein-Type and Similar Uranium Deposits in Rocks Younger than Proterozoic*
**Published by: International Atomic Energy Agency, Vienna**
ISBN 92-0-041082-0; 389pp; 158×240mm; illus; 1982
**Review: October 1985**

*The Cost and Availability of Colombian Coal*
**Published by: IEA Coal Research**
ISBN 92-9029 112 5; 75pp; 210×290mm; illus; 1985
**Review: January 1986**

THE FOLLOWING BOOKS WERE DONATED TO THE LIBRARY BY **MRS MARGARET RICHARDSON**

*Mine Valuation (Rand Practice)*
**By J. Otter Jackson**
Published by: Louis Gordon Bookseller
155pp; 150×245mm; illus; hard cover; 1947

*The Geology of the British Empire,* 2nd Edition
**By F.R.C. Reed**
Published by: Edward Arnold & Co.
764pp; 150×220mm; illus; index; hard cover; 1949

*Mine Economics: Sampling, Valuation, Organisation & Administration*, 2nd Edition
**By S.J. Truscott**
Published by: Mining Publications Ltd
366pp; 155×235mm; illus; index; hard cover; 1947

*Mining Geology*
**By Hugh Exton McKinstry**
Published by: Prentice-Hall, Inc.
680pp; 155×235mm; illus; index; hard cover; 1949

*Geophysical Exploration*
**By C.A. Heiland**
Published by: Prentice-Hall, Inc.
1013pp; 155×235mm; illus; index; hard cover; 1946

*A Mining Engineer's Survey Manual*
**By J.E. Metcalfe**
Published by: Electrical Press, London
341pp; 145×220mm; illus; index; hard cover; 1951

*Mineral Deposits*, 4th Edition
**By Waldemar Lindgren**
Published by: McGraw-Hill Book Company, Inc.
930pp; 155×235mm; illus; index; hard cover; 1933

*Gold Mining on the Witwatersrand* (Volumes 1 & 2)
**By C.B. Jeppe**
Published by: The Transvaal Chamber of Mines
1820pp; 155×235mm; illus; index; hard cover; 1946

**Handbook of Mineral Dressing — Ores and Industrial Minerals*
**By Arthur F. Taggard**
Published by: John Wiley & Sons, Inc.
1917pp; 145×215mm; illus; index; hard cover; 1953

*Mining Engineer's Handbook*, 3rd Edition (Volumes 1 & 2)
**By Robert Peele**
Published by: John Wiley & Sons, Inc.
2505pp; 145×215mm; illus; index; hard cover; 1952

# Surface effects of underground mining

South Africa is blessed with vast mineral resources. It is essential to exploit those reserves if the country is to remain economically viable. In the light of increasing costs and against the background of diminishing mineral resources, the need for more complete extraction of available reserves is ever-increasing.

Apart from the mining challenge that this has posed, it has resulted in effects on surface. High extraction of shallow resources, such as coal, chromium, and platinum, more often than not results in subsidence of the surface, which has an effect on the agricultural potential of the land, not to mention the effects on structures such as roads, railway lines, power pylons, and buildings. It has been estimated that approximately 30 per cent of all coal reserves are at present overlain by structures qualifying for protection. With population increases, that percentage can only increase.

Very deep mining, such as gold mining, can indirectly result in surface subsidence by the dewatering of dolomitic strata. Furthermore, seismicity can affect surface structures.

As the surface owner has a right to utilize his property for whatever purpose, so the minerals owner has a right to extract his minerals. These activities need not be mutually exclusive. The time has come to examine the interaction of surface and underground interests, and to establish a forum for the discussion of this complex matter.

The South African National Group on Rock Mechanics is to provide such a platform by presenting a symposium on 'The Effects of Underground Mining on Surface' towards the end of 1986—probably in late October. Participation is invited from all interested parties: rock mechanics engineers, seismologists, mining engineers, civil engineers, agricultural experts, road and railway construction engineers, etc.

More information is available from

Miss Shirley Thorpe
Secretary
SANGORM
P.O. Box 61809
Marshalltown 2107.

# Surface-mining equipment

The Goldfields Mining Expo '86 is to be held in Kalgoorlie, Western Australia, from 30th October to 1st November, 1986, in conjunction with the Annual Conference of the Western Australian School of Mines. Although the theme of the Expo is 'Surface Mining', it will include exhibits from all facets of the industry. The Expo provides the opportunity for manufacturers and distributors of mining equipment, products, supplies, and services to exhibit before a major representation of the industry from all corners of Australia. It provides the mining industry with a close look at the best equipment available to promote better and more efficient mining methods, as well as providing a forum for members of the industry to discuss mining-related matters.

Further details of the Expo are obtainable from

The Director
Goldfields Mining Expo
P.O. Box 758
Kalgoorlie, Western Australia, 6430.
Telex: AA91080
Telephone: (090) 21 2877.

# Mintek reports

The following reports are available free of charge from the Council for Mineral Technology, Private Bag X3015, Randburg, 2125 South Africa.

**Report M142D**

*Characteristics of gold and pyrite flotation at the Chemwes plant.* (1st issued May 1984.)

The flotation plant at Chemwes produces a gold-containing pyrite concentrate from leached dump material. In general, it obtains significantly lower recoveries of both sulphur and gold than similar dump-retreatment plants.

The flotation characteristics of the Stilfontein–Buffelsfontein material treated at Chemwes were investigated both in the laboratory and in plant tests.

It was shown that the low recoveries can be attributed to the slow-floating characteristics of both the gold and the sulphur, which result from the low grades and the fine size distribution. These characteristics are aggravated by competition from significant quantities of pyrophyllite, which is partly hydrophobic. Much of the weakly floating gold, which is recovered in the rougher circuit, is lost in the cleaning necessary for the achievement of the 30 per cent sulphur grade required by the roasters.

Optimum use of gaugue depressant permits the 30 per cent sulphur grade to be achieved, even with the low-grade dump material from Stilfontein now being processed, although the gold recoveries remain low.

Other reagents such as copper sulphate, which has a significant effect on other plants, have not been found to produce reliable or reproducible advantage over the combination of reagents in current use.

Improvements in gold recovery could be brought about by the recovery of the gold lost in the cleaner circuit. This might be achieved by a longer residence time, or a greater cleaner capacity or, in the absence of this, by selective separate retreatment of the cleaner tailings or of all the rougher tailings.

**Report M159D**

*Beneficiation tests on andalusite ore from the Marico district.* (1st issued Aug. 1984.)

Samples representing 10 boreholes and the face of an open-pit quarry were evaluated for their contents of recoverable andalusite, and the quality of the andalusite contained, by the use of a standard evaluation procedure developed at Mintek.

The evaluation of the borehole samples showed that the yield of andalusite would be low, the average yield being less than 6,0 per cent for the Kleinfontein area. The quality of the andalusite, except for one borehole, was generally below that required by the present market, particularly in terms of the high $Fe_2O_3$ content.

The Driefontein ore-body gave higher yields and grades for some areas. The face samples showed that the ore being mined currently has a recoverable-andalusite content of over 9 per cent at a grade of over 58 per cent $Al_2O_3$ and less than 0,9 per cent $Fe_2O_3$, which is acceptable in terms of both yield and grade.

Milling and heavy-medium separation tests on a bulk sample of run-of-mine ore confirmed the results for the face samples, and an average andalusite yield of over 8,0 per cent at a concentrate grade of over 58,5 per cent $Al_2O_3$ and less than 0,8 per cent $Fe_2O_3$ was obtained.

A procedure is recommended for the treatment of the ore.

**Report M164D**

*The recovery of tungsten from South African low-grade scheelite concentrates.* (1st issued Sep. 1984.)

Mintek was asked to investigate the feasibility of leaching the tungsten from a low-grade scheelite concentrate. Three samples of concentrates containing about 20 per cent tungsten trioxide were supplied by the sponsor.

Preliminary tests showed that 99,9 per cent of the tungsten could be extracted by leaching with hydrochloric acid followed by a leach with sodium hydroxide. The consumption of acid was about 1500 to 2000 kg of 32 per cent hydrochloric acid per ton of concentrate owing to the high calcium carbonate content (50 per cent by mass as calcite).

A pressure leach in sodium hydroxide solution at 220°C yielded a dissolution of 54 per cent.

This report also describes laboratory tests aimed at the optimization of the leaching conditions for the recovery of tungsten by the use of sodium carbonate under pressure. The effects of critical operating variables, i.e. excess of sodium carbonate over stoichiometric requirements, liquid-to-solid ratio, temperature, and leaching time, were investigated.

Of the tungsten, 98,7 per cent could be recovered from the third bulk concentrate when a 250 per cent excess of sodium carbonate was used at 230°C, a liquid-to-solid ratio of 3:1, and a leaching time of 2 hours.

Preleaching of the concentrate with dilute hydrochloric acid (with a pH value from 2 to 3) removed 83 per cent of the carbonate, and resulted in upgrading of the concentrate from 24 to 38 per cent tungsten trioxide.

Apatite was attacked only at a higher acid concentration (at a pH value of 1), 70 per cent being removed together with 86 per cent of the carbonate.