

# Tenth International Symposium on the Application of Computer Methods in the Mineral Industry

The Wanders Club, Johannesburg Sunday, 9th April, to Friday, 14th April, 1972

DECEMBER, 1971

The Tenth Symposium which is the first ever held outside the North American continent is being organised by the South African Institute of Mining and Metallurgy (with the South African Council for Scientific and Industrial Research and the South African Council for Automation and Computation), in collaboration with the previous co-sponsors.\* The programme includes over 60 papers from thirteen different countries. Attendance promises to be good and interested parties who have not yet registered are earnestly requested to do so without delay. The closure date for registration application is 31st January, 1972.

\*University of Arizona, Canadian Institute of Mining and Metallurgy, Colorado School of Mines, Pennsylvania State University, Society of Mining Engineers of the AIME and Stanford University.

The objective of this symposium is to pool experience and knowledge and to discuss new and potential developments for the planning and control of mineral projects. The papers which are to be presented will indicate the progress which has been made in this direction through the successful application of operations research, mathematical, statistical and computer methods. The intention is to bring together those persons responsible for managing various operations in the mineral industry with those engaged in the development of such mathematical and computer techniques as could assist this management. All interested parties are welcome.

PRE-REGISTRATION (please return enclosed form as soon as possible).

Applications for registration close on January 31, 1972. The fee payable on application will be R70. Late applications may, subject to vacancies being available,

## PROVISIONAL SYMPOSIUM TIMETABLE

SUNDAY 9th April	0900-1300 African Tribal Dancing at nearby Gold Mine			1800-2000 Registration at Rand International Hotel 2000-2100 Informal Coffee Party and Authors' Meeting
MONDAY 10th April	0800-0930 Registration 0930-1100 Opening Session 1130-1230 Exploration	1400-1530 Ore Reserve Assessment	1545-1715 <b>Parallel Sessions</b> Exploration Analysis Industry Wide Projection	1900-2000 Mayoral Reception
TUESDAY 11th April	0830-1030 Project Design and Analysis 1100-1230 Mine Planning	1400-1530 Open Pit Planning	1545-1715 <b>Parallel Sessions</b> Project Design Geological Modelling	1900-2030 Chamber of Mines of S.A. Cocktail Party
WEDNESDAY 12th April	CHOICE OF DAY VISITS 1. Deep Level Gold Mine 2. S.A. Iron & Steel Corporation Works 3. Research Organisation of Chamber of Mines of S.A. 4. Soweto African Township. Krugersdorp Game Park. Sterkfontein Caves 5. De Beers Consolidated Mines, Kimberley 6. National Institute for Metallurgy			Free
THURSDAY 13th April	0830-1030 Production Planning 1100-1230 Production Planning and Control	1400-1530 Ventilation and Rock Control	1545-1715 <b>Parallel Sessions</b> Operations Planning and Control Technical Planning and Control	1900 Symposium Dinner
FRIDAY 14th April	0830-1030 Process Control 1100-1230 Market Analysis	1400-1530 Panel Discussion		Free
SATURDAY 15th April	FREE IN JOHANNESBURG			
SUNDAY 16th to THURSDAY 20th April	Post Symposium Tour	Palabora Mining Company Kruger National Park Highveld Steel and Vanadium		

be accepted as follows: February 1 to March 25 — R80; March 26 onwards — R90.

The fee will cover the cost of preprints, proceedings, teas, lunches, transport from official hotels to the venue of the Symposium and social functions.

Wives of delegates may be registered at a fee of R20 which will entitle them to attend all functions. A programme of entertainment for ladies will be arranged.

### TECHNICAL PROGRAMME

The provisional programme given below includes sixty papers from thirteen different countries. Work in many of the leading international mining companies, research institutions and Universities will be covered.

The technical sessions will be chaired by men of considerable reputation including the following: Dr N. G. W. Cook, Prof J. Elbrond, Messrs J. C. Fritz and W. S. Gallagher, Profs J. C. Griffiths, P. de V. Harris, Mr K. F. Lane, Profs B. W. MacKenzie and E. P. Pfeider, Mr R. A. Plumbridge, Drs W. S. Rapson and R. E. Robinson, Mr B. A. Smith, Prof H. S. Sichel and Mr A. Weiss.

Preprints of all papers to be presented in the parallel sessions will be available to delegates upon arrival. Preprints of all other papers will be distributed about one month prior to the Symposium to delegates registered by January 31st, 1972.

This will permit restriction of the time of presentation of papers to about ten minutes thus allowing detailed discussion of the non parallel session papers. An author of each paper will participate personally.

The discussion in the non parallel sessions, at least, will be recorded and summarised in the volume of the proceedings which will include all papers and will be published by the South African Institute of Mining and Metallurgy shortly after the Symposium.

The Panel discussion on the Friday afternoon will be led by the well-known broadcaster and former Prof of Applied Maths, Prof A. E. H. Bleksley. Members of the panel, like the session chairmen some of whom will be included, will be world technical and managerial leaders. Discussion will be informal and spontaneous and will centre on questions such as whether or not the real practical worth of computer applications has been exaggerated, reasons for failures which are not often mentioned and the directions of future developments.

### MONDAY

#### EXPLORATION

The Engel Simulator and the search for Uranium. Griffiths, J. C., Singer, D. A.; Penn. State Univ. (U.S.A.).

Corporate exploration strategies. Mackenzie, B. W.; McGill Univ. (Canada).

#### ORE RESERVE ASSESSMENT

A model of Bougainville Copper's Panguana orebody. Blackwell, M. R. L.; Bougainville Copper (New Guinea).

Geostatistical ore reserve estimation. David, M., Blais, R. A.; Ecole Polytech. (Canada).

Statistical valuation of diamondiferous deposits. Sichel, H. S.; Witwatersrand Univ. (R.S.A.).

#### PARALLEL SESSIONS

##### *Exploration Analysis*

A drill-hole data bank. Anderton, M. R.; Roan Cons. Mines (Zambia). Research in oil exploration decision making. Harbaugh, J. W.; Prelat, A.; Stanford Univ. (U.S.A.).

Optimum spacing for soil sample traverses. Hodgson, W. A.; Rhodesia Univ. (Rhodesia).

Evaluation of geochemical data. Lenz, C. J.; Prosp. Ventures (Rhodesia).

Ore reserve estimation and depletion planning for a beach diamond deposit. Oosterveld, M. M.; Cons. Diamond Mines (S.W.A.).

##### *Industry Wide Projection*

Optimising the public gains from the exploitation of mineral resources. Azis, A., Swartendyk, J.; Dept. Energy, Mines & Res. (Canada).

Possible modes of government participation in marginal mining operations. Collins, J. L., Dube, A., Galibois, A., Monette, H.; Laval Univ. (Canada).

A forecast of the coal and uranium requirements for electric power generation in South Africa. Maunders, E. J.; Atomic Energy Board (R.S.A.).

### TUESDAY

#### PROJECT DESIGN AND ANALYSIS

Profitability analysis of a mining venture. Beasley, C. A., Pfeider, E. P.; Virginia Polytech. & Univ. Minnes. (U.S.A.).

Design of crushing plant flow sheets by simulation. Gurun, T.; Parsons Jurgen Corp. (U.S.A.).

The impact of transportation networks upon the potential supply of base and precious metals from Sonora, Mexico. Harris, P. de V., Euresly, D. E.; Penn. State Univ. (U.S.A.).

Technological innovation and its potential effect on the opening of new gold mines in South Africa. Joughin, N. C.; Chamber of Mines of S.A. (R.S.A.).

#### MINE PLANNING

Aids to planning production in coal mines. Deist, F. H., Roberts, M. P.; Chamber of Mines of S.A. (R.S.A.).

Ore reserve evaluation and open pit planning. Marino, J. M., Slama, J. P. Comm. Energie Atom. (France).

Capacity calculations, investment allocation and long range production scheduling in German coal mines. Wilke, F. L.; Tech. Univ. Clausthal (West Germany).

#### OPEN PIT PLANNING

Optimum design of an open pit. Phillips, D. A.; Roan Cons. Mines (Zambia).

An open pit design system for stratiform ore bodies. Pronk van Hoogeveen, L. A. J., Cutland, J. R., Weir, M.; Nchanga Cons. Mines (Zambia).

An open pit design model. Robinson, R. H., Prens, N. B. Atlantic Richfield Ref. & Cyprus Mines (U.S.A.).

#### PARALLEL SESSIONS

##### *Project Design*

Economic surface mining of multiple seams. Falkie, T. V., Porter, W. E.; Penn. State Univ. (U.S.A.).

Optimisation of a large mining venture. Paynter, J. C., Loveday, B. K.; Robinson, C. G.; N. Inst. Metall. (R.S.A.).

Ore depletion planning. Nemeč, V.; Geoindustria (Czechoslovakia).

Mine-mill production scheduling by dynamic programming. Roman, R. J.; N. Mexico Bur. Mines (U.S.A.).

##### *Geological Modelling*

Harmonic analysis of copper and gold occurrences in the Arbitibi area of the Canadian Shield. Agterberg, F. P., Fabbri, A. G.; Geol. Surv. Can. (Canada).

An exploration model for tabular orebodies. Koch, G. S., Link, R. F.; Univ. Georgia, Artronic Info. Sys. (U.S.A.).

Mathematical models of orebodies. Newton, M. J., Royle, A. G.; Leeds Univ. (U.K.).

Unrolling of Copperbelt orebodies. Perry, J. H. E., Wiik, V. H.; Roan Cons. Mines (Zambia).

### THURSDAY

#### PRODUCTION PLANNING

Long term mine production scheduling. Burne, G. C. S.; Roan Cons. Mines (Zambia).

An application of Linear Programming to investment analysis. Erlandsson, A.; LKAB (Sweden).

Optimising medium term operational plans for a group of copper mines. Splaine, M., Atkinson, D. C., Davison, W., Smith, L.; Nchanga Cons. Mines (Zambia).

The simulation of underground stoping and transport operations in gold mining. Touwen, F. H., Joughin, N. C.; Chamber of Mines of S.A. (R.S.A.).

## PRODUCTION PLANNING AND CONTROL

Linear programming models of copper leach and solvent extraction plants. Duyvesteyn, W. P. C., Cutland, J. R., Russel, J. R. L.; Nchanga Cons. Mines (Zambia).

Planning and forecasting stope production. Kappes, D. W., Moussett-Jones, P. F. X.; Univ. of Nevada (U.S.A.).

Dynamic ore reserve assessment for a caving system of mining. Spinks, A. F., Nichols, S. P.; Nchanga Cons. Mines (Zambia).

Production planning at an underground copper mine. Williams, J. K., Smith, L., Wells, M. P.; Nchanga Cons. Mines (Zambia).

A production scheduling system for operating staff. Winters, H. J.; Geosource Systems (U.S.A.).

## ROCK & VENTILATION CONTROL

Computer applications in rock mechanics. Deist, F. H., Georgiadis, E., Moris, J. P. E.; Chamber of Mines of S.A. (R.S.A.).

Rock mechanics in the design of mine layouts. Hodgson, K., Cook, N. G. W.; Chamber of Mines of S.A. (R.S.A.).

Automated regulation of mine ventilation. Niskanen, P.; Outokumpu Oy (Finland).

## PARALLEL SESSIONS

### *Technical Planning and Control*

Computer aided design of a flash smelting installation. Cocquerel, M. A. T., Gates, R. T., Green, L. A.; Selection Trust (U.K.).

Heat flow models in ventilation planning. Dickson, A. J., Starfield, A. M.; Witwatersrand Univ. (R.S.A.).

Planning of mine ventilation. Reuther, E. U., Dohmen, A.; Tech. Univ. Aachen (West Germany).

Coal mine ventilation systems in the U.S.A. Stefanko, R., Ramani, R. V.; Penn. State Univ. (U.S.A.).

### *Operations Planning and Control*

Planning open pit mining operations using simulation. Bauer, A., Calder, P. N.; Queens Univ. (Canada).

An equipment maintenance system. Dean, D. W., Ryder, J. A.; Leo Comp. Bur. (R.S.A.).

Medium term production forecasting for mines. De Villiers, W. P., Fletcher, A. E. W.; Leo Comp. Bur. (R.S.A.).

Simulation for control of underground liquid flow. Pitts, G. N., Crawford, P. B.; Texas Petr. Res. (U.S.A.).

Evaluation of production strategies in a group of copper mines by linear programming. Williams, P. H., Brooke, J. N., Poulter, D. M.; Nchanga Cons. Mines (Zambia).

## FRIDAY

### PROCESS CONTROL

Computer control of flotation at the Ecstall concentrator. Amsden, M. P., Chapman, C., Reading, M. G.; Ecstall Mining (Canada).

Model for the design and control of flotation plants. King, R. P.; Nat. Inst. Metall. (R.S.A.).

Simulation of multi-component flotation plants. Loveday, B. K., Marchant, G. R.; Kennecott Copper (U.S.A.).

A model for simulating crushing plants. Whiten, W. J.; Queensland Univ. (Australia).

### MARKET ANALYSIS

A dynamic model of control of mining operations in fluctuating price condition. Coyle, R. G.; Univ. Bradford (U.K.).

An economic model of the mineral sands industry. Howe, G. P. A.; Cons. Gold Fields (U.K.).

The relevance of computer methods to the economics of the mineral industry. Perlman, R. A.; Comm. Res. Unit (U.K.).

### ALL DAY VISITS — Wednesday, 17th April

*A choice of six visits is offered:*

1. **A DEEP LEVEL GOLD MINE.** The tour will comprise the surface treatment plant and the underground workings at depths rarely exceeded in the world.
2. **THE SOUTH AFRICAN IRON AND STEEL INDUSTRIAL CORPORATION** works at Vanderbijlpark where there are developments towards integrated computer control of the steel making plant.
3. **THE RESEARCH ORGANISATION OF THE CHAMBER OF MINES OF SOUTH AFRICA**

where digital and analogue computer modelling is applied to mining, transport, heat, dust and strata control systems.

4. **JOHANNESBURG SOWETO AFRICAN TOWNSHIP** including a Kindergarten and an African beerhall. The party will then have lunch at Krugersdorp game park where in 2 000 acres over 1 000 head of wild life are found. Afterwards the party will visit the Sterkfontein caves where man's earliest ancestor, Australo-Pithecus Africanus, was discovered by Dr Robert Broom in the mid 1950's. The site is still being excavated by the University of the Witwatersrand and some very interesting work is currently in progress.
5. **DE BEERS CONSOLIDATED MINES, KIMBERLEY.** This visit to a diamond mine and diamond exhibition will cost an additional R45 per person for the scheduled S.A.A. flight to Kimberley.
6. **NATIONAL INSTITUTE FOR METALLURGY.** This visit to the institute will lay emphasis on the development of special processes in extractive metallurgy which involve the application of computers such as counter current ion exchange, liquid-liquid extraction, comminution and neutron activation.

## SOCIAL PROGRAMME

Sunday, 9th April 0900-1300 — African tribal dancing display at a nearby gold mine. Dances drawn from folk history express traditional celebrations such as initiation ceremonies, weddings, funerals, etc., and are typified in the Bhaca gumboot and Zulu "war" dances.

1800-2000 — Registration facilities at Rand International Hotel.

2000-2100 — Meeting of AUTHORS and SESSION CHAIRMEN. Informal coffee party for all delegates at Rand International Hotel.

Monday, 10th April 1900-2000 — Reception by Mayor of Johannesburg in the form of a wine and cheese party at the Johannesburg City Hall.

Tuesday, 11th April 1900-2030 — Cocktail party given by Chamber of Mines of South Africa at Milner Park Showgrounds.

Thursday, 13th April 1900 for 1930 — Symposium dinner at President Hotel. Lounge suits. Attendance limited to 450 persons. Guests of delegates R10 per head.

POST SYMPOSIUM TOUR — Sunday, 16th April, to Thursday, 20th April, inclusive

This is a tour by air-conditioned motor coach to Palabora Mining Company, to see their huge open-pit operations and the computer based methods of control, the world famous Kruger National Game Park, and

steel production and plans to harness the computer at Highveld Steel and Vanadium Corporation.

The cost of this tour will be R110 per person inclusive and will be subject to a minimum of 20 and a maximum of 60 participants. Further details can be obtained on request.

#### TRANSPORT AT THE SYMPOSIUM

The Wanderers Club at which the Symposium is to be held is 6 miles north of the city centre where the recommended hotels for delegates are situated. Motor coaches will be available at the official symposium hotels to convey all delegates free of charge to and from the Wanderers Club for all business sessions and to and from any official function or visit.

#### OFFICIAL ACCOMMODATION

(All tariffs subject to fluctuation)

Block bookings are held at the following hotels and are available only through official symposium registration.

**TOLLMAN TOWERS HOTEL (★★★★★)** — Single bed, bath, breakfast R16,70 per person per day. Double bed, bath, breakfast R12,40 per person per day.

**RAND INTERNATIONAL HOTEL (★★★★)** — Single bed, bath, breakfast R12,10 per person per day. Double bed, bath, breakfast R9,80 per person per day.

**VICTORIA HOTEL (★★★)** — Single bed, bath, breakfast R8,00 per person per day. Double bed, bath, breakfast R6,50 per person per day.

A deposit of R20 per room must be forwarded with each hotel booking. Thereafter delegates will deal

directly with the official travel agents in all matters relating to accommodation.

#### TRAVEL DOCUMENTS

All intending visitors to South Africa should, as soon as possible, check with the nearest South African Embassy, Consular representative or South African Airways office to ascertain current passport, visa and health certificate requirements.

#### BANKING

One Rand=U.S. \$1,33 (approximately).

Facilities will be provided at the symposium (each day from 0830 to 1030) by the Standard Bank of South Africa Limited.

#### OFFICIAL TRAVEL AGENTS

South African Railways Publicity and Travel Department have been appointed Official Travel Agents and may be contacted direct by writing to:

The Manager, Publicity and Travel Department,  
P.O. Box 1111, Johannesburg, South Africa,  
quoting this Symposium. A representative of the S.A.R. will be in attendance at all times during the Symposium sessions.

#### OFFICIAL CARRIER

South African Airways has been appointed Official Carrier to the Symposium. Overseas delegates are asked to make use of S.A.A. who will be fully informed on all Symposium arrangements.

Application forms available from the South African Institute of Mining and Metallurgy.