

quality of the Hartz River, and is affecting the operating costs of the Rand Water Board. Conditions, however, do appear to be showing improvement in some respects.

Coal mining in Natal is adversely affecting the quality of the rivers. The pollution at present is masked by dilution and self purification, but appears to be getting worse. Areas such as the St. Lucia Lake could be affected by mining in the Vryheid area. Stricter control is necessary in this area.

The opening of fluor spar mines with beneficiation plants in the Marico-Zeerust area is being watched so carefully that the pollution of the valuable underground resources

of this area, on which it is dependent for its very livelihood, is thought to be unlikely. This is having a stimulating effect on the design and siting of slimes dams, as well as on the more intensive study of the geology of the area, which is necessary for proper siting of the dams and ensuring that they will not cause pollution.

Slimes dams therefore have an enormous impact on large tracts of country both within and outside the mining areas where they are built.

#### ACKNOWLEDGEMENT

The figures for the sulphate content of the Lower Vaal, Sand, Vet, and Hartz Rivers were taken from

the records of the Division of Hydrology, Department of Water Affairs.

#### REFERENCES

1. THOMAS, B. A. The effect of the mining industry on public streams: eighty years of mining and pollution prevention measures. Association of Mine Managers of South Africa, *Papers and Discussions*, 1968-69.
2. TURVEY, L. G. S. Report to the Secretary for Water Affairs on mine pollution of Mkuze River. 1961.
3. TURVEY, L. G. S. Report to the Secretary for Water Affairs on Vaal Barrage water quality. 1972.
4. VERSTER, G. P. An addendum to an investigation of the mineral pollution in the Vaal River Barrage. Institution of Water Pollution Control, Symposium on Dissolved Solid Loads in the Vaal Barrage Water System, Apr., 1970.

## NIM Reports

The following reports are available free of charge from the National Institute for Metallurgy, Private Bag 7, Auckland Park, Johannesburg.

#### *Report No. 1563*

*Neutron activation analysis of samples from the Kimberley Reef Conglomerate.*

The technique of instrumental neutron activation analysis as applied to the analysis of geological material has been studied, with particular emphasis on methods for the reduction or elimination of analytical errors.

The analytical technique developed has been applied to a problem of interest to the gold-mining industry in South Africa, namely the identification of sedimentary strata within a known succession. A quantitative

method based on trace-element patterns has been found to be successful.

A series of conglomerate and quartzite samples from the Kimberley Reef Conglomerate at the Durban Roodepoort Deep Mine have been analysed, and 28 trace and minor elements determined. Multivariate statistical techniques have been used to determine trace-element patterns characteristic of each stratum. Six strata have been investigated, and a 100 per cent accuracy of separation has been achieved by the use of homogeneous powdered samples. It has also been shown that whole-rock conglomerate chip samples can be classified with 87 per cent confidence, and quartzite chip samples with 100 per cent confidence.

#### *Report No. 1569*

*The use of DDTU as an analytical reagent for the noble metals.*

The distribution coefficients of the noble metals and associated base metals between N,N'-diphenyl-s-(1-decyl) isothiurea (DDTU) and varying molarities of hydrochloric acid are given. DDTU is satisfactory for use as an analytical reagent in the liquid-liquid extraction of noble metals as a group from most of the associated base metals. Base metals that are extracted with the noble metals can be removed from the organic phase by washing with 1 M hydrochloric acid, the only noble metal lost in this washing step being iridium (10 per cent loss).

## Special general meeting

A Special General Meeting of the Institute was held in Kelvin House, Johannesburg, on Wednesday, 14th November, 1973.

The President, Mr P. W. J. van Rensburg, opened the meeting at 9 a.m. and read the notice of the meeting, which was as follows:

To consider, and if approved, adopt with or without amendment, the proposal made by Council to add to and amend the following clauses of the Constitution:

1. THE INSTITUTE: This clause added after paragraph 1.1.

'The Institute shall be capable, in its own name, of suing and being sued and of purchasing or otherwise acquiring, holding and alienating property, movable or otherwise, or any interest therein. In any legal proceedings by or against the Institute, the Council shall in their capacity as such sue and be sued on behalf thereof.'

3. THE COUNCIL: First sentence in paragraph 3.16 to be amended as follows:  
'All assets and property of the

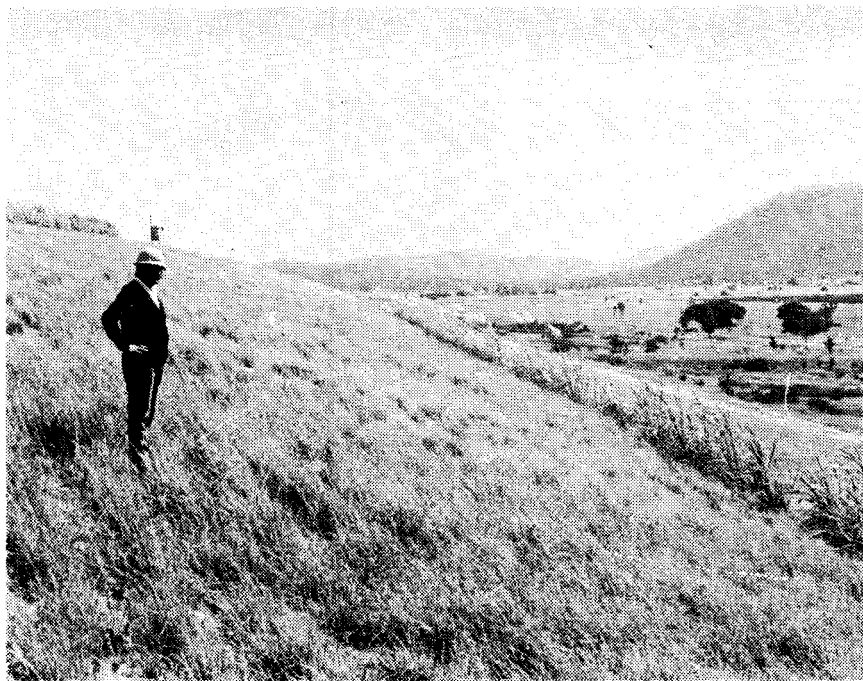
Institute, both movable and immovable, shall be vested in and registered in the name of the Institute'.

After giving the background to these recommendations made by Council, the President proposed the motion and called for a seconder.

Professor R. P. Plewman seconded the motion.

There were no counter proposals, and the meeting agreed that the Constitution should be amended as proposed.

The meeting closed at 9.5 a.m.



**Plate VII—Biological stabilization on the side of a slimes dam to prevent wind-blown sand from affecting adjacent agricultural land: an excellent stand of planted grass (*Cynodon dactylon* and *C. aethopicus*) with windbreaks at Mangula Mine.**

- port to Mine Dumps Sub-Committee of Natural Resources Board, Salisbury. Cyclostyled report. 1962.
4. NATURAL RESOURCES BOARD. Reclamation works—Camperdown Mine: Selukwe Intensive Conservation Area. Final report. Cyclostyled. 1970.
  5. RHODESIA MINISTRY OF MINES. Unpublished reports. Salisbury.
  6. SMITH, R. A. H., and BRADSHAW, A. D. Stabilization of toxic mine wastes by the use of tolerant plant populations. *Trans. Instn. Min. Metall.*, Sect. A, vol. 81. 1972. pp. A230-A237.
  7. DICKINSON, S. Experiments in propagating plant cover at tailing basins. *Mining Cong. J.*, Oct. 1972. pp. 21-26.
  8. MCMAHON, R. G. P. Revegetation of tailings dams. *Bull. Aust. Mineral Dev. Labs.*, No. 12. 1971. pp. 81-100.
  9. STREET, H. E., and GOODMAN, G. T. Revegetation techniques in the Lower Swansea Valley. *The Lower Swansea Valley Project*, ed. K. J. Hilton, London, Longmans Green. 1967. Chap. 5.
  10. CHENIK, D. The promotion of a vegetative cover on mine slimes dumps and sands dumps. *J. S. Afr. Inst. Min. Metall.*, vol. 60. 1960. pp. 525-555.
  11. WHYTE, R. O., and SISAM, J. W. B. The establishment of vegetation on

- industrial waste land. *C.A.B. Joint Publication*, No. 14. 1949.
12. LE ROY, J. C., and KELLER, H. How to reclaim mined areas, tailing ponds, and dumps into valuable land. *Wld Min.*, vol. 25, no. 1. 1972. pp. 34-41.
  13. WILD, H., and WILTSHIRE, G. H. The problem of vegetating Rhodesian mine dumps examined. *Chamber of Mines J.*, vol. 13. 1971. pp. 26-30.
  14. HILL, J. R. C. The mine dump problem in Rhodesia. *Rhod. Agric. J.*, vol. 69, No. 4. 1972. pp. 65-73.
  15. GREGORY, R. P. G., and BRADSHAW, A. D. Heavy metal tolerance in populations of *Agrostis tenuis* Sibth. and other grasses. Dept. Agr. Bot., Univ. Col. of North Wales, Bangor, *New Phytol.*, vol. 64. 1965. pp. 131-143.
  16. TURNER, R. G. The subcellular distribution of zinc and copper within the roots of metal-tolerant clones of *Agrostis tenuis* Sibth. *New Phytol.*, vol. 69. 1970. pp. 725-731.
  17. BRADSHAW, A. D. Populations of *Agrostis tenuis* resistant to lead and zinc poisoning. *Nature*, vol. 169. 1952. p. 1098.
  18. WILD, H. Geobotanical anomalies in Rhodesia. 1—The vegetation of copper bearing soils. *Kirkia*, vol. 7, No. 1. 1968.
  19. ADAMS, F. Notes on the establishment of grass and trees on slimes dams. Cyclostyled report, 1971.
  20. JAABACK, G., and MUZZELL, P. The establishment of vegetation in civil engineering work. *Proc. Grassld. Soc. S. Afr.*, vol. 6. 1971. pp. 181-184.
  21. WILKINS, D. A. A technique for the measurement of lead tolerance in plants. *Nature*, vol. 180. 1957. pp. 37-38.
  22. WILKINS, D. A. The measurement and genetical analysis of lead tolerance in *Festuca Ovina*. *Report Scottish Pl. Breed. Sta.*, 1960. pp. 85-98.
  23. JOWETT, D. Population studies on lead-tolerant *Agrostis tenuis*. *Evolution*, vol. 18. 1964. pp. 70-80.

## Colloquium and general meeting

### CONSTRUCTION OF SLIMES DAMS

A General Meeting and Colloquium on the above topic was held on November 14th and 15th, 1973, at Kelvin House, Johannesburg.

Mr P. W. J. van Rensburg (President) was in the chair.

The Colloquium was attended by 135 delegates and was opened by the President at 9.10 a.m.

### MEMBERSHIP

*The President:* I have much pleasure in announcing that the names of the undermentioned candidates, having been published in accordance with By-Law 5.2.2.,

Council has elected them to membership of the Institute in the following grades:

#### Fellow

K. O. R. Gebhard

#### Graduates

A. M. Childs, R. H. A. Plaistowe, L. Prinsloo, P. C. Pretorius, M. R. Storey, J. W. Wilson

#### Associate

P. A. G. Collett

#### Student

T. M. Ferreira

#### Transfers

##### From Graduate to Member

R. D. Beck, I. E. Francke, N. Kamp, C. G. Knobbs

##### From Student to Member

R. F. Hadfield, R. P. W. Henrard, R. A. Lindsay, B. N. B. Lund

##### From Student to Graduate

J. R. W. Lindsay, I. N. Sinclair.

I welcome the newly elected members to the Institute and congratulate those who have been transferred to a higher grade.

### GENERAL

The President announced that the Cocktail Party, which the Chamber of Mines had kindly offered to hold for the delegates at the Colloquium, would be held at the Chamber of Mines Sports Club at 5.30 p.m.

The meeting ended at 9.20 a.m.

# Orange Free State Branch

## PROCEEDINGS OF THE ANNUAL GENERAL MEETING

The Annual General Meeting of the Branch was held in the Western Holdings Canteen on Tuesday, 11th September, 1973, at 7.00 p.m.

Mr C. J. Isaac was in the Chair.

There were also present: Dr J. P. Hugo—Immediate Past President of the S.A.I.M.M., and approximately 44 members and visitors.

## MINUTES OF THE PREVIOUS ANNUAL GENERAL MEETING

The minutes of the Annual General Meeting held on 3rd October, 1972, were taken as read. Their adoption, which was proposed by Mr E. T. Wilson and seconded by Mr D. A. Smith, was carried unanimously. There were no matters arising from these Minutes.

At Mr Isaac's request, Dr J. P. Hugo took the Chair during the presentation of the Chairman's Annual Report.

## CHAIRMAN'S ANNUAL REPORT 1972/73

### 1972/1973 Committee

#### Office Bearers

Chairman	C. J. Isaac
Vice Chairman	E. T. Wilson
Immediate Past Chairman	J. M. Meyer

#### Committee Members

Messrs C. Mostert, P. L. Nathan, D. Rankin, D. A. Smith, R. B. Sutherland, and G. C. J. Young.

#### General Meetings

Four General Meetings were held during the year, as follows:

Annual General Meeting, 3rd October, 1972, Present 57;

General Meeting, 31st January, 1973, Present 39;

General Meeting, 6th March, 1973, Present 51;

General Meeting, 16th May, 1973, Present 72.

Attendance at meetings has shown a tremendous improvement, and I wish to thank all members for their support of the Institute.

#### Presentations

The following talks/shows were presented during the year:

'Recruitment and Research for Metallurgists', Professor D. D. Howat;

'Nickel Mining in Canada', Film Show;

'North Slope Alaska', Film Show;

'Research into Gold Extraction',

Mr G. James, and Mr E. van Vuuren;

'Role of the Mines Dept. in the Industry', Mr T. L. Gibbs.

#### Visits

The following visits took place:

18th May, 1973, Vierfontein Colliery and Escom Power Station;

7th August, 1973, Local visit to President Steyn No. 4 Shaft and Task Force Training at Virginia.

Both these visits were informative and of great use to those who attended.

#### Committee Meetings

Two Committee Meetings were held during the year, and I want to thank Committee Members for their help on these occasions.

#### Membership

The total membership of the O.F.S. Branch, as at 15th July, 1973, was 110, a decrease of 14 from the previous year, made up as follows:

Fellows	23
Members	36
Associates	30
Graduates	11
Students	10

110

Our membership has decreased constantly over the past three years, and I ask each member to make a serious effort to recruit one new member during this coming year.

## DECLARATION OF OFFICE BEARERS AND COMMITTEE MEMBERS FOR THE YEAR 1972/73

The Chairman announced that the outgoing Committee had elected the

following office bearers for the coming year:

Chairman	E. T. Wilson
Vice Chairman	D. A. Smith
Immediate Past Chairman	C. J. Isaac

The Chairman then announced that Messrs E. Dunstan, W. B. Evans, C. Mostert, A. N. Shand, R. G. Williams, and G. C. J. Young had been elected Committee Members for the ensuing year.

## INDUCTION OF CHAIRMAN

The Chairman introduced Mr E. T. Wilson to the meeting by briefly and humorously outlining his career and, after congratulating him on his election, called on him to take the Chair.

Mr Wilson after thanking Mr Isaac for his kind introduction, expressed his gratitude to the committee for electing him to the office of Chairman. Mr Wilson moved a vote of thanks and appreciation for Mr Isaac's tremendous efforts. This was carried unanimously.

## GENERAL BUSINESS

There was nothing to discuss.

## ADDRESS BY DR J. P. HUGO

The Chairman called on Dr Hugo to deliver his address entitled 'Atomic Energy'. Dr Hugo conveyed the thanks and good wishes of Council to both the outgoing and incoming Chairman and Committee Members. He then proceeded to enthral those present with his most interesting talk, which was received with applause.

A vote of thanks to Dr Hugo was proposed by Mr A. N. Shand.

## CLOSURE

After thanking all those present for their attendance, the Chairman declared the Meeting closed at 8.30 p.m.

## Book Review

Westwood, W., and Cooper, B. S. **Analytical methods in use in non-ferrous mining and metallurgy: a selective review.** London, Institute of Mining and Metallurgy, July 1973. 54 pp. £3.50.

This is the first of a series of review articles to be published by the Mineral Processing and Extractive Metallurgy Editorial Board of the Institution of Mining and Metallurgy. An attempt has been made to include established methods that have proved reliable, as well as new methods that show significant technical advances over earlier practice.

Of the newer instrumental methods, separate chapters are devoted to atomic-absorption spectrophotometry, optical-emission spectroscopy, and X-ray methods.

The chapter on atomic absorption deals with the production of primary radiation, as well as of atomic vapour, and ample references are given to the methods discussed. The precision of atomic-absorption methods is given as about 1 to 2 per cent, and the methods are stated to be particularly suitable for trace analysis and for accurate analysis up to a content of about 5 per cent. For most works-control purposes, the range can be extended to 15 per cent. A table of 72 elements, with references to published procedures for their determination by atomic absorption, is appended.

Optical-emission spectroscopy is reported to be used principally for trace analysis, especially for the screening of samples for a large number of unknown elements. Except in this usage, the authors conclude that atomic absorption is preferable to the use of the d.c. arc. The availability and preparation of standard reference materials for spectroscopy are discussed. Mention is made of recent developments in the manufacture of spectrometers in which 2000 discrete portions of the spectrum can be monitored without any loss of resolution or dispersion. This should increase the

number of elements that can be determined rapidly by this technique. There is an interesting discussion on developments in the preparation of photographic emulsions for spectrographic analysis. The use of these emulsions in conjunction with a new generation of densitometers is stated to permit the direct determination of element concentrations from transmission or opacity measurements, only about 4 or 5 minutes being required for the interpretation of the information relating to twenty elements on a photographic plate.

Among X-ray methods, fluorescence (XRF), electron-probe microanalysis (EPMA), and diffraction analysis (XRD) are reviewed. The versatility and extensive range of XRF methods are emphasized, concentrations of 0.01 to 100 per cent being determinable in powder, metal, and liquid samples. Semiquantitative information for a large number of elements can be rapidly obtained on certain materials without any need for the preparation of standards or samples. In quantitative analysis, accuracies better than 1 per cent of the element present can be achieved if suitable standards are available and the samples are adequately prepared. The systematic errors resulting from matrix effects and various ways of avoiding these are discussed, and mention is made of the use of on-line computers in conjunction with XRF to enable the inherent high speed of the latter technique to be fully realized. Of interest to geological field workers is the information that portable XRF instruments are now becoming available at a fraction of the cost of conventional instruments. These instruments use a radio-isotopic source for generating secondary X-rays.

EPMA, the technique of directing a finely focused beam of electrons into a polished section of mineral or metal and examination of the X-rays emitted, is reviewed with regard to quantitative analysis, information display, and instrumentation. It is

a technique with a resolution of about  $1\mu\text{m}$ , an accuracy of approximately 1 per cent relative, and, in suitable instances, a limit of detection of 100 p.p.m.

The application of XRD in qualitative analysis is greatly assisted by the 'Index to Powder Diffraction File', which is compiled and annually updated by the Joint Committee on Powder Diffraction Standards. Quantitative analysis, depending on the measurement of the intensities of the diffraction lines, is reported to give accuracies of about 1 per cent under favourable conditions.

A chapter on the determination of the gas content of metals is included in the review. Techniques that have found favour are vacuum fusion, inert carrier-gas fusion, and hot extraction. A rather long general discussion on the more common methods in use is given, mention being made of neutron activation, isotope dilution, and the spark-source mass spectrometer. The authors consider vacuum fusion a particularly sensitive and versatile technique, especially when coupled to a mass-spectrometer system. With the aid of samples containing isotopically enriched gases, such equipment is considered to constitute a self-checking analytical system capable of the absolute analyses required for the provision of standard samples for other procedures.

The final chapter reports on metric, volumetric, colorimetric, spectrophotometric, flame photometric, and polarographic methods. A brief discussion on methods of analysis is given for each element (listed alphabetically), and details of the methods are referred to through a list of references following the discussion. About 46 elements, in addition to the lanthanides, are covered in this chapter.

This publication, particularly as a source of reference, should be of value to analysts engaged in metallurgical analysis.

E.B.T.C.