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PREFACE

APCOM '87, the twentieth in this series of international meetings, places major emphasis on the practical application of computers in the workplace to implement the theoretical techniques. This theme is indeed appropriate for a symposium being held in Johannesburg, the heart of the world's most dynamic minerals industry. It is fifteen years since an APCOM Symposium was last held in Johannesburg and it is gratifying to know that many of the contributors to the 1972 meeting will again attend in 1987. Several pioneering contributions were made in 1972, and many of those new theoretical ideas are now accepted as standard procedures.

Modelling, simulation and process control still seem to attract the major research effort. Modelling of milling and flotation have a long history but are still active areas for research. Pyrometallurgy, gold recovery, separation processes with distributed partition functions like screening and gravity separation, and electrowinning, are also attracting attention. Computer-aided design (CAD) is becoming a lot more usable and available throughout the industry. Process control is at the door of a new era, with the combination of sensor technology, reliable on-plant computers and viable theoretical techniques now becoming available as never before. CAD and process control have also given new impetus to the need to develop and test computer-based models of a wider range of unit operations.

All of us working in this area have witnessed, at first hand, some remarkable changes in technology. Now it is the rule, rather than the exception, for new engineers and technicians entering the metallurgical industry to be familiar with the use of computers. We stand now at the twentieth APCOM Symposium, one year before the anniversary traditionally associated with having reached 'maturity' and past half the reputed 40-year period for acceptance of a new technology. The rate of progress will continue to increase.

To reap the benefit of innovation we must ensure that our developments are not lost but are passed on to others. APCOM remains the most important forum for the discussion of new developments in the application of computer methods and mathematical techniques in the metallurgical industry, and the published Proceedings form an important record of technological innovation in the field.

The production of the Proceedings from camera-ready copy in time for distribution to all delegates at the Symposium has been an enormous task in spite of the ubiquity of word processors. All papers were thoroughly reviewed and selection of papers was sometimes difficult. We attempted to achieve a good balance between theory and application but did give some preference to papers that emphasised practical applications. It is anticipated that many of the innovative procedures discussed in the papers will be on display at the Symposium exhibition.

We are grateful to the authors for meeting our requirements for camera-ready copy. Without this co-operation it would not have been possible to prepare the published Proceedings in three permanent volumes of such high quality. A debt of gratitude is due to our many referees, who must remain anonymous, for their contributions. Many papers were significantly improved for publication as a result of their suggestions.

The credit for the high standard of this volume must go largely to John Austin, who chaired the Publications Committee, and our Technical Editor, Matthew Seal. Together they planned the volumes and solved the many technical problems that arose during the course of production. Matthew Seal undertook the enormous task of technical editing and the high standard that he has achieved will be a long-lasting tribute to his industriousness and care.

We are confident that this collection of Proceedings of APCOM '87 will remain as an important reference work for many years to come.

R.P. KING
I.J. BARKER

August 1987
FOREWORD


Following its inception in 1961, the APCOM symposia have developed into a fully international series with participants from a wide spread of countries. Including APCOM '87, the symposia will have been hosted six times outside the USA, i.e. in Canada, South Africa, Germany, Australia and the United Kingdom.

APCOM has an established reputation for the high standard of the technical papers published in its Proceedings. This is due very largely to the fact that APCOM attracts the participation of internationally known specialists of high calibre and to the commitment of a number of dedicated individuals who serve on the International Committee and from time to time on the local Organizing Committees.

The International Committee has in the past and still operates on an informal basis, with 'permanent' representation from the USA (Arizona, Colorado, Penn State and the Society of Mining Engineers), Canada, South Africa and Germany, and ‘temporary’ membership of other past and future hosts.

APCOM symposia provide a medium of exchange of technical expertise and experience for practitioners in the general field of applications of computers, operations research, mathematical and geostatistical techniques in the mineral industries. Contributors represent mine and plant personnel, academic and government or semi-government representatives, and the topics covered range from mining and metallurgical techniques and planning to financial analysis, project valuation, information systems, computer graphics, geostatistics, etc.

For the 20th APCOM, the Proceedings have been divided into the three broad categories of mining, metallurgy and geostatistics, and are grouped accordingly into the three published volumes.

The success of any APCOM symposium depends critically on the backing of the host organizations, the contributions from members of the various committees involved, the authors of the technical papers, session chairmen and keynote speakers, and also on the support of the mining and mineral industries within the host country concerned. The Organizing Committee for the 20th APCOM wishes to record its deep appreciation to all the individuals and bodies which have contributed so generously to the success of this Symposium.

D.G. KRIGE

September 1987
APCOM 87
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Abbreviations
COM Chamber of Mines of South Africa Research Organization
CSSA Computer Society of South Africa
GASA Geostatistical Association of South Africa
MINTEK Council for Mineral Technology
SAIMM The South African Institute of Mining and Metallurgy

SESSION CHAIRMEN
The following people acted as Chairmen of the various technical sessions:

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