SPOTLIGHT
on APCOM 87

Collated by V.J. MOORE*

Introduction

Although months have passed since APCOM 87, held from 19th to 23rd September, 1987, the vivid memories of all aspects of its activities remain as clear in one's mind as if it all happened only yesterday. The Symposium, which was held at the Johannesburg Sun Hotel, was organized by The South African Institute of Mining and Metallurgy in collaboration with the Council for Mineral Technology (Mintek), supported by The Geostatistical Association of South Africa, The Operations Research Society of South Africa, and the Computer Society of South Africa, and was backed financially by the Chamber of Mines of South Africa.

The total number of registrants amounted to 375 delegates and 50 affiliates: 100 of the delegates were from outside the Republic of South Africa and represented 15 countries, namely Australia, Brazil, Canada, Chile, France, Great Britain, Greece, Italy, Namibia, Phillipines, Sweden, Turkey, United States of America, West Germany, and Zimbabwe.

Workshops

During the week before the Symposium, a series of workshops was held, all of which were highly successful. They dealt with Computing in Mine Management, Geostatistics for Skew Distributions, Measurement, Process Control and Optimization, and Advanced Computer Systems.

Social Functions

The first of the social functions was an outstanding welcoming reception, at which an international array of dishes was served. One could sample traditional dishes from countries like France, Germany, Great Britain, the South Sea Islands, Italy, and Mexico. (Even the USA's hot dogs were of top quality.) From this moment on delegates and their guests were firmly esconced on magic carpets, which during the week calmly, quietly, and efficiently called in at the other ports of call. These included the Mayoral barbecue with its musical fountains on 19th October; a street party the night after, at which the overflowing marquee vibrated with laughter, song, and can-can girls; and, finally, the closing luncheon on 23rd October, which, although formal, was a happy yet nostalgic event for all.

The affiliates were entertained royally during the week. Their hostesses, plus an occasional host lurking in the background, were determined to ensure that the affiliates saw a wide spectrum of the South African way of life during trips to the Boutique, the Council for Scientific and Industrial Research, the South African Bureau of Standards, the Premier Diamond Mine, and Gold Reef City in more detail than was possible during the street party.

One-day Technical Excursions

On 21st September, six full-day and two half-day excursions departed from the Johannesburg Sun, giving delegates a much-needed relaxation period during which they were given the opportunity of seeing something of South African industry. The tours included the South African Mint, the Johannesburg Stock Exchange, East Rand Gold & Uranium Co. Ltd, Mintek, Rand Mines Milling & Mining Company's City Deep Plant, the No. 1 Shaft, Gold Plant, and the Rockburst Research and Production Centres of Western Deep Levels, the New Vaal Colliery and Lethaba Power Station, Sasol 2 and 3, the Rand Refinery, and Gold Fields' East Driefontein Gold Plant. The tours were voted a great success, and one computer-oriented delegate proved his mechanical prowess by repairing a fault in a broken-down coach.

Exhibitions

Vendors of software and hardware exhibited their products throughout the week in the exhibition room. More specialized in-depth demonstrations were given in the various board rooms at the hotel.

Technical Sessions

The technical sessions ran like clockwork, the sessions on major areas of interest—Mining, Extractive Metallurgy, and Geostatistics—running concurrently. There was much favourable comment when, on registration, delegates were presented with three bound volumes containing all the technical papers presented during the Symposium.

Official Opening

The opening address was given by Professor G. Matheron, Centre de Geostatistique, Fontainebleau, France, through Dr W.J. Kleingeld, who referred to the two phases of his association with South Africa. The first phase was during the fifties when the work being done by D.G. Krige and H.S. Sichel was achieving prominence throughout the world, and the second was from 1980 as a result of research work with De Beers and the search for local ore-evaluation techniques for application to complex diamond deposits. This work had led to the development of isofactorial discrete representation models that are specific to discrete particle distributions and that will also have application to other types of mineralization.

Keynote Address

The keynote address, which was given by Mr T.I.

* Council Member of The South African Institute of Mining and Metallurgy and Consulting Metallurgist, Gold and Uranium Division, Anglo American Corporation of South Africa Limited, P.O. Box 61587, Marshalltown 2107, Transvaal.

Steenkamp, President of the Chamber of Mines of South Africa, is given below.

It is most fitting that an important conference like this on computers and mathematics in the minerals industries should be held in Johannesburg. We still like to think of our town as the mining capital of the world. Our minerals provide direct employment for two-thirds of a million breadwinners from South Africa and her neighbours, and indirect employment for many more in service and supply industries. Of course, exploiting the wealth of this mineral treasure-house has never been easy. It is arduous and physically demanding, and a hundred years ago was carried out with no more than picks, shovels, and winches.

In the intervening years it has been science that has provided the technical key to confront and overcome often onerous engineering challenges, and it is now to the people in computing that the industry looks to resolve even more complex current challenges. The challenges essentially reflect increasing mining costs and growing international competition, together with the necessity for exploiting less attractive orebodies.

Application of Computer Technology

I would like to outline some of the ways in which computer technology is already aiding us, and to look at the future role of computers in the mineral industries. I begin with gold, the most significant component of our mineral earnings, and the mineral responsible for our primary mining problems of the future.

The geology of our mineable gold-ore reserves is changing. In the past, we were able to exploit high-grade ores on our mines from lease boundary to lease boundary. The term *selective mining* had virtually no place in our vocabulary. The only restrictive dictate on mining was not geology but the government requirement to mine to average grade. This we were able to do happily in the plum orebodies, leaving aside the low-grade and mixed high- and low-grade ores.

That situation no longer exists. We are now obliged to consider less attractive ore reserves in order to increase the life of our industry. Areas like the Potchefstroom Gap, which are being feverishly explored today, were known to us in the 1930s but disregarded. But mining lower-yield areas means that we must be particularly selective in extraction. It is no longer a question of mining from boundary to boundary. Future reserves must be meticulously calculated in our feasibility studies before a confident 'go' or 'no go' decision can be taken.

In addition, if we are to continue to attract investors to our gold-mining ventures, we must be able to convince them that a future low-grade venture will be viable. Of all the risk variables that have to be considered in mining-investment analyses, the evaluation of ore reserves is the only parameter that can be assessed objectively and accurately from the outset. Other factors such as labour relations, product price, and working costs can and do vary as the mine develops towards production.

Lower average grades will require larger capital expenditure, greater rates of production, and more sophisticated milling techniques to enhance recovery efficiencies and minimize processing costs. At the same time, the error limits of mining and processing systems for marginal deposits must be substantially reduced.

So the evaluation of lower grade ores will be the first critical forum for the use of computers in the mineral industries. As a prelude to determine the extent of mineable ore reserves, computer-aided modelling will become absolutely crucial in creating geological—and subsequently geostatistical—simulations of an orebody.

Today, geostatistical methods of determining the nature and grades of an orebody have been refined to an advanced level of sophistication. Using points of known information in an orebody, such as borehole data, we are now able to assess grade conditions. However, to do this we must first have a fairly good idea of the geometry and geology of an orebody if our predictions are to be relevant. it is here that computer-aided techniques are beginning to play an indispensable role and are achieving outstanding results.

ERPM Mine

Already one gold mine on the East Rand, which has produced since the end of the last century, is looking forward to a long and fruitful renewed lease of life as a result of such computer-enhanced geological and geostatistical techniques.

ERPM, suffering from falling grades and reserves, was thought to be reaching the limits of its economic life. However, computer-aided modelling based on sampling information gathered since the mine was opened in 1894, showed a different picture. In fact, good reserves were indicated in an unsuspected area where the reef is thinner, rather than thicker. Because the mathematical limits of conventional geostatistics could not penetrate far enough beyond the known sample area into new ground, a computer-generated prediction of the adjacent geology to the southeast of the mine was used as a basis for extending the geostatistical network. The result has been a decision to sink the far east vertical shaft. Rand Mines is so confident of its computer-based predictions that no auxiliary confirmatory boreholes were sunk before the 'go-ahead' was given to this new project.

This type of work has been taken further. From some 40 million unconnected sample measurements taken over the decades, the whole of the old central Rand Mining area has been computer-modelled, to the extent that even ancient water courses leading into the Witwatersrand Inland Sea have clearly emerged. This has given rise to new theories as to the genesis of our goldfields.

Principal Problem Areas

Exploring new but less inviting deposits in gold mining means that we are being obliged to move into very deep, ultra-stressed ground. As a result, achieving an accurate appreciation of rock behaviour has become a prerequisite for safe, efficient mining. Depth is also synonymous with heat, and the optimizing of refrigeration and cooling capacity is now becoming critical.

In addition, we are facing increases in working costs that are forcing us to squeeze our working efficiencies and maximize productivity in every sector. Some of these rising costs are created by engineering requirements but, inevitably, in the evolving industrial-relations environment of South Africa, the cost of labour becomes an increased premium on top of already rising production

expenditure.

If future reserves lie at remote depths and require large capital expenditure in order to exploit them, and this occurs concurrently with high labour costs, it will be imperative to make the best use of our manpower resources. We can expect to see a diminution of the unskilled labour-intensive component of our workforce, in favour of a smaller, more skilled workforce. This is already evident on a few more-mechanized mines. Here, advanced maintenance abilities are a critical factor in guaranteeing continued effective operation.

Furthermore, some of our minerals are coming under increased competition from substitute materials such as ceramics. Synthetic substitution therefore forms a further economic force encouraging enhanced competitiveness in our industry.

Bulk commodities such as coal remain susceptible to marginal pricing fluctuations, which can temporarily favour one international producer against another. But at a time of low demand for coal, strong competition from newcomers in the coal market such as China and Colombia, in addition to long-established producers like Australia and the USA, places growing stress on South Africa's competitive edge. Here again, the hunt for efficiency to depress working expenditure leads us into greater dependency upon sophisticated technologies.

Not the last of our contemporary priorities are loss control and safety performance. Today many of our mines are armed with a formidable array of fire-detection systems. They are capable of sensing the slightest deviation from established carbon particle and carbon dioxide levels in the daily mine atmosphere. Similar sentinel systems monitor methane concentrations.

If our industry is still struck by tragic accidents and loss of life, it is not through a lack of willpower or money that we suffer these disasters. Inevitably, and correctly, the spotlight of publicity falls upon our remaining safety inadequacies and moments of failure. But it is impossible to quantify the degree of protection that our safety systems provide to workers every minute of the working day.

Health aspects of safety have led to urgent attention being paid to environmental control. Here microprocessor and computer-based systems will soon be widespread in monitoring and regulating ventilation and fume-dilution control, as well as refrigeration control. Computerized networks that monitor barometric pressure and give instant warning of any lowering of air pressure—which could herald a potentially hazardous release of methane into a mine—are now common.

Some of the Solutions

I mentioned that one of the primary causes of concern in gold mining is that associated with greatly increasing depth. A scenario for tomorrow's gold-mining industry involves the exploitation of orebodies lying 4, 4½, and even 5 km underground. At such depths, rock pressures and temperatures reach levels never encountered before. We have faced rock-pressure problems for a long time and have been countering them with a variety of solutions. These include installing props, leaving *in situ* pillars, and now introducing backfilling technology (where milled waste is packed into old empty stopes). But the main future development of a strategy against rock-pressure problems lies in strategic mine design. This again leads us directly into the world of computer-based simulation. To be able to model the high-stress environment encountered at depth, and to generate mining layouts intrinsically capable of countering these harsh ambient pressure conditions, depend totally upon high-technology aids. Today, computer-aided drawing and design units, or Cadd units, are an integral tool in mine planning.

A second consequence of deep mining is the heat load placed upon the underground environment. If men are to mine at depth, environmental monitoring and control are essential. Also, as society's general expectations of healthier living and working conditions grow, mines must make increasing efforts to improve underground working conditions.

Of the many factors involved in producing a satisfactory underground environment, heat is dominant. Men can work safely in temperatures not exceeding 28°C. Below that temperature, working comfort is enhanced, but above 28°C the likelihood of heat stress and physiological problems rises dramatically. Designing mines to minimize heat ingress, to subdue humidity levels, and to optimize refrigeration capacity brings us back to the powers of computing. We are now able to simulate all components of a mine's heat load for an infinite number of hypothetical layouts and so create a network in which these loads are balanced against the various cooling options at our disposal.

This ability enables us to ensure that air coolers are best positioned underground. It also allows us to postulate consequences of, for example, a breakdown in a key installation. In addition, it enables us to assess instantaneously the heat-load implications of changing the rate of face advance or some similar variable—a flexible and indispensable tool indeed.

We can then couple a heat-load plan with a computer-aided analysis and design of mine-ventilation requirements to increasingly optimize our costly ventilation resources. Again, we have the ability to pose negative questions, such as those relating to the consequence of breakdowns, or positive questions such as those relating to the effect of recirculating a loop of good air for a second time round a distant stoping area.

A further requirement of deep-level mining is an understanding of the language of seismic events and their precursor signals. Here, the advent of the computer is facilitating a safety project that would otherwise have been inconceivable. Rockbursts are in many ways similar to earthquakes and have been known to measure up to 5,2 on the Richter Scale. They occur on a daily basis on our goldfields. Networks of geophones on a number of mines now record the many thousands of micro-seismic events caused each day by the normal extension of rock fractures ahead of advancing working faces. These particular seismic 'noises' are not associated with major rock movements. However, by listening to the ground in the vicinity of mining operations, we are now making some progress in recognizing the seismic signature that precedes major rockburst events.

With the aid of computers, we have discovered that an increase in micro-seismic activity to a rate of some 3000 to 4000 incidents each hour heralds eventual rock movement and energy release. It has also become clear that,

while micro-seismic events are related to stress relief after mining activity, larger seismic events are more closely related to geological features. Consequently, some 15 gold mines are now covered by minewide seismic networks. Larger-scale regional networks in each mining area scrutinize major geological features and tectonically induced energy releases that can be triggered by mining.

The Future

However, computer technology can be taken further. Integrated, interacting graphic computer systems are able to link together many of the essential functions of a mine. Such a system is described as integrated because each person with a contribution to make to the system, including geologists, surveyors, samplers, planners, engineers, and managers, has his or her own terminal. The information they individually key into the system becomes immediately available to all the other users; meanwhile, the computer instantly modifies and updates the most recent perception of the mine and its functions. The system is referred to as interactive because it talks to its user in a conventional language. A 10-day familiarization course is all that is needed for someone to use the system, which is graphic in that it displays information in a three-dimensional, pictorial form.

The computer's model can now be used to show many different mining variables. An obvious example is grade. A mine manager only has to key in prevailing pay-limit conditions to achieve an instant model of reef areas falling within those parameters. A shift boss, on the other hand, has only to look at the same model to see which shaft must be used most to mine this ore and still retain cost-effectiveness. The same is true for other parameters such as relative values of equipment, the position and disposition of current working faces, and geological features.

The intriguing feature of computer models, which never fails to impress, is their capacity to play complex planning 'what if' games. This means that hypothetical shafts, cross-cuts, and other developments can be visualized, and the cost, excavation time, and profitability of each accurately forecast. It is possible to 'zoom into' the picture, as it were, until one actually feels oneself to be standing inside the mine and travelling down a hypothetical stope. The computer can tell one of the surrounding ore conditions, the proximity and effect of faults, the presence of ground-water incursion, and so on.

Every practical option can be explored visually as though it were happening in reality. Because information once fed into the system is never overlooked, forgotten features from months before that now affect the model suddenly re-appear. This capability helps one to avoid costly mistakes more often than one cares to admit.

Such an advanced minewide system eliminates frustration, projects that have to be suspended for lack of information, wasted time, and squandered resources. Conversely, it introduces a new capability, allowing staff to keep careful track of all the relevant variables. The net result is greater cost-effectiveness and maximized productivity—the very objectives we must pursue to exploit the ore reserves of the future. This kind of sophisticated system is not a dream of the future. It exists already on a Free State gold mine—President Brand to be exact. It is an indication of our future road, and clearly highlights the responsibilities we have in pooling our knowledge at this Symposium.

Increased Understanding

Our needs are too critical to permit any grey areas of misunderstanding. It is vital that we completely comprehend one another's needs and what each has to offer. We cannot permit the boffins and the hard-nosed mining men to work in isolated ignorance of each other.

We in the mining industry still have an enormous contribution to make to our national economy and the well-being of all our peoples. But we face serious problems. It is good to know that, for many of these problems, the computer industry has the solution.

Closing Session

Professor R.V. Ramani, Chairman of The International APCOM Council, addressed the closing session on 23rd October, which took the form of a closing luncheon. The address is given below.

It is both my privilege and pleasure, as the Chairman of the International Council for APCOM, to make a few observations and remarks on this occasion. The participation of scientists and engineers from South Africa in APCOM has continually grown stronger since the inception of APCOM in 1961. When, in 1972, the Symposium was held for the first time outside the North American continent, the venue was in South Africa.

Background

As a result, the Council was delighted to receive a proposal from The South African Institution of Mining and Metallurgy to host the 20th APCOM. Those of us in the Council who were here in 1972 remembered that outstanding Symposium, the social activities, the proceedings, and, most of all, the many friends we made at that time. Danny Krige, Herbert Sichel, Peter van Rensburg, Peter Williams, and many others have shared their ideas and opinions with us in several APCOMs and played a major role in the development of APCOM. The Council was happy to accept the proposal and looked forward to this 20th APCOM with great expectation. This is also the first time outside the USA that APCOM has been sponsored for a second time in the same country.

South African Organization

It is not an exaggeration for me to say that the South African Organizing Committee does things that become examples for others to follow. In saying this, I am referring not only to the outstanding technical programme but also to the proceedings volume, social programmes, and the entire atmosphere of the Symposium. Several novel ideas from the South African hosts have immensely benefited APCOM. The now familiar APCOM logo was created by the South African Organizing Committee in 1972, and it was embraced gratefully by the APCOM Council in 1973. For this 20th APCOM Symposium, they have created a unique tie and scarf, and developed modular volumes of proceedings that are excellent in content and format. The quality of the technical sessions and the exhibits were also of the highest quality, reflecting the excellence of the other organizers as well: the Coun-

cil for Mineral Technology, the Geostatistical Association of South Africa, the Operations Research Society of South Africa, and the Computer Society of South Africa. Special mention must be made of the painstaking efforts of the exhibitors to provide, not only excellent demonstrations and documentation of their hardware and software, but also ample opportunity for extended discussions and hands-on experience. The foreign delegates to this Symposium are especially appreciative of the arrangements that made it easy for them to settle in and concentrate on the technical and social programmes. The International Council expresses its thanks for a 'class act' by the Organizing Committee and its chairman, Danie Krige, and all the other South African hosts. In addition, the Council would like to recognize Mrs Pam Baartman for her untiring efforts prior to and during the Symposium.

Future of APCOM

At the APCOM Council meeting on Thursday night, several decisions were made. The important ones deal with the establishment of a rotating APCOM Fellowship and suitable recognition of individuals for distinguished achievements and contributions to APCOM's growth. The 21st APCOM will be held in Las Vegas in February 1989, and the 22nd APCOM in Berlin, West Germany, in October 1990. Dr Al Weiss is the General Chairman of the 21st APCOM and Dr Ludwig Wilke the General Chairman of the 22nd APCOM. Professor Y.C. Kim, University of Arizona, was elected the Chairman of the Council for these two APCOMs.

In closing, let me say on a more personal note that it has been fun serving as the Chairman of the Council for the 1983–87 period. It has been a super four years working with the likes of Danie Krige, Ken Lane, Jorgen Elbrond, Ludwig Wilke, Tim Shaw, Al Weiss, Thys Johnson, Y.C. Kim, and other veterans of APCOM. This group of veterans deserves special acknowledgement for their dedicated service to APCOM and their continued contributions towards APCOM's success. Finally, on behalf of the Council, I extend a warm invitation to all of you to the APCOM in Las Vegas in 1989. Dr Al Weiss and the Society of Mining Engineers have been planning for over a year, and have an exciting programme waiting for you.

Post-Symposium Excursion

This seven-day excursion was designed to give delegates and affiliates an opportunity of seeing something of the beauty of the eastern Transvaal and of the mining and metallurgical activities in the region. In all, some 2020 km were covered by coach, and the seven couples and three singles certainly found the excursion rewarding.

Game Reserves

On Saturday, 24th October, the party, although a trifle subdued after the rigorous activities of the previous week's technical, social, and impromptu sessions, departed for Sabi Sabi private game reserve. The blend of nationalities was ideal: eight from Germany, five from South Africa, and two each from Australia and the USA.

From arrival at Sabi Sabi until departure some 41 hours later, it was a choice of being on the move from early morning (05h30) to late evening (22h00), and for both the uninitiated and the initiated the introduction to the flora and fauna of the area was outstanding. The whole atmosphere at Sabi Sabi was casual, yet not time-wasting; the rangers are specialists in discipline, yet not overpowering; and the meals and accommodation are outstanding, five star yet informal. Danie (Professor Krige—for by this time the Germans were experimenting, somewhat shyly, with first names) used his video fully during the trip, and kept the party well entertained at Phalaborwa by running through his films, sound effects and all, much to the embarrassment of some!

On Monday, 26th October, the coach spent the whole day heading through the Kruger National Park for the Phalaborwa gate, and interesting visits were made to Skukuza and Lethaba along the way. Johan talked the driver into an additional loop towards the end of the day, which necessitated his turning into an Alain Prost for the last 30 km to avoid being fined for arriving late at the gate! What was missed at Sabi Sabi was well in evidence in the Kruger Park, namely elephant and crocodile, but the leopard and cheetah still proved elusive.

Plant Visits

Palabora Mining Company and Foskor were visited on the 27th, and everyone was impressed with these huge operations. The evening barbecue served under the stars at Foskor's magnificent guest house and surroundings really capped an outstanding day. Our host, Etienne, remarked that, when the Germans started singing, he knew that Foskor had achieved their objective.

The next day was a long run for the relatively quiet party to Steelpoort, where a most interesting visit was made to Samancor's Tubatse Ferrochrome operations. Although the men departed with small (marble-sized) pieces of the final product, the ladies, who made a separate tour, surprised us all when they emptied out their handbags and pockets in the coach afterwards. We hope the November profits were not unduly affected!

En route for Hazyview, the party spent some time visiting the stores at Pilgrim's Rest and then, as an added bonus, tramped up to God's Window to see the indescribable view. The Hazyview stopover will be remembered by all as the banana episode. Out of the blue, Danie and Ansie introduced the party to an old friend who, in his retirement, is growing bananas, mainly for export. This resulted in the party making an early-morning visit to the farm and, from that moment on, Ansie ensured that all had their rightful shares of the boxes of bananas passed on to the party.

Mine Visits

The next morning (29th October) saw the party split into two at Barberton, one group visiting Fairview Mine and the other New Consort. Both visits were extremely interesting and somewhat outside the general theme of computer applications, and the enthusiasm and hospitality of the staff at both mines rather overwhelmed us. To cap it all, the Barberton Mines Association provided a really relaxing lunch at the Gold Mine restaurant, where the manager/barman serving the pre-lunch drinks seemed to have been specially imported from London for the occasion. But it didn't finish there for, immediately after lunch, Andrew took us to Belhaven, where dedicated

guides gave us a detailed tour through this historic home. Then, after a long run to Waterval Onder, the last night was spent at the Malaga Hotel. By this time everyone was relaxed, close friendships had developed, and in the back of everyone's mind was the thought that this was the last time we would be wining and dining together. It proved to be a party to remember, although the Germans didn't quite take to our room-temperature schnapps!

The Last Day

Friday, 30th October—the last day—proved extremely rewarding, and we were given an excellent tour of the automated No. 2 iron plant of Highveld Steel & Vanadium, where operating personnel were conspicuous by their absence. It must be lonely on shift! After an enjoyable lunch, where we all had the opportunity of meeting the full spectrum of Highveld's management team, the coach was on its way to Johannesburg, and at Jan Smuts Airport the party started disintegrating when four members were dropped off. Soon, the coach was at the Johannesburg Sun, and within minutes all that remained were the members of the South African contingent (Danie, Ansie, Lyn, and John) sipping tea in the hotel foyer (by special permission of the management) surrounded by cartons (bananas!), cases, baskets, hand luggage, 'samples', and cameras, and Johan waiting for his delayed transport at the door.

Those who participated in the tour will long remember the fellowship, the excitement of game watching, the outstanding hospitality of members of the mining and metallurgical industry, and the togetherness of this widely ranging group of nationalities, who forged future or renewed past friendships.

CIM meetings

The Canadian Institute of Mining and Metallurgy (CIM), the technical society of Canada's mineral industry, will continue to promote the technological interests of its members by hosting a series of meetings in 1988.

12th to 16th June

The Petroleum Society of CIM will be hosting its 39th Annual Technical Meeting under the theme 'Applied Vision—Realizing Our Potential'. The meeting will take place at the Calgary Convention Centre in Calgary, Alberta.

12th to 17th June

The Canadian Institute of Mining and Metallurgy will be hosting the International Conference of Hoisting at the Sheraton Centre Hotel and Towers in Toronto, Ontario. The Conference is aimed at operating, maintenance, and engineering personnel associated with equipment manufacturers, mining companies, government agencies, and universities. A trade exhibition, utilizing the Sheraton Centre's display area, will be held concurrent with the conference.

29th June to 2nd July

The Annual Meeting of The Mining Society of Nova Scotia (101st) will take place at Keltic Lodge, Ingonish Beach, Nova Scotia.

17th to 20th August

The Sixth Meeting of CIM's District 2 (Quebec) will be hosted by the Thetford Mines Branch of CIM at the Thetford Mines Cegep, Thetford Mines, Quebec.

28th August to 1st September

The Metallurgical Society of CIM will be hosting its 27th Annual Conference of Metallurgists at the Sheraton Centre Hotel in Montreal, Quebec.

19th to 23rd September

The Sixth Meeting of CIM's District 1 (Maritimes, Newfoundland, and Labrador) will be hosted by the New Brunswick Branch of CIM at the Lord Beaver Brook Hotel in Fredericton, New Brunswick.

22nd to 24th September

The Eleventh Meeting of CIM's District 4 (Ontario, west of the 86th meridian, Manitoba, Saskatchewan, and the Keewatin District, N.W.T.) will be held in Saskatoon, Saskatchewan.

29th September to 1st October

The 12th Meeting of CIM's District 6 (British Columbia and Yukon) will be hosted by the Crowsnest Branch of CIM in Fernie, British Columbia. The meeting's theme will be 'Creativity', and will feature several technical sessions. A trade exhibition will take place in conjunction with this meeting.

3rd to 5th November

The 35th Annual Meeting of CIM's Newfoundland Branch will be held in St John's, Newfoundland.

Enquiries

Contact

Ivana Savic
Information Officer, CIM
Suite 400
1130 Sherbrooke St W
Montreal
Quebec
H3A 2M8
Canada.
Telephone: (514) 842-3461.