

Spotlight

on seismicity in mines

by W. D. ORTLEPP*

The First International Symposium on Seismicity in Mines, organized by the South African National Group on Rock Mechanics in collaboration with the South African Institute of Mining and Metallurgy, was held in Randburg (near Johannesburg) from 13th to 17th September, 1982. It was the first attempt to provide an international forum for the consideration of seismic problems specifically affecting mines or associated with mining.

Seismicity in mining usually means rockbursts, outbursts, or collapses that damage mine workings, but sometimes it takes the form of earthquakes induced by mining that may cause damage elsewhere on the surface without affecting the mine itself. The problem is usually of direct interest to a rather limited number of engineers and scientists from only a few mining districts in the world, although it is usually a problem of major consequence where it does occur.

Indirectly, because of its association with earthquake seismology, mine seismicity has potentially a much wider range of interest and importance.

Although the Symposium turned out to be a relatively small gathering of people, it addressed a problem that is of concern to several countries of the world, and it involved some of the most authoritative experts, who were able to reflect the state of knowledge in the countries concerned. The unanimous opinion was that the Symposium was deserving of international status, and that it should be the first of a continuing succession of symposia on the same topic and with the same title.

Representation

Of the fifteen delegates from abroad, ten were closely associated with the mining-related aspects of the problem while five were involved in earthquake seismology. Their representation, by country of origin, was as follows:

<i>Country</i>	<i>Number of Delegates</i>
U.S.A.	9
France	2
Australia	1
Poland	1
Portugal	1
West Germany	1

Eight of these delegates had been specially invited as well-established experts on particular aspects of the science.

Other notable authorities from Sweden, India, and Poland had also accepted invitations but, regrettably, found later that they were unable to attend. Naturally,

the greater majority of the delegates were South African, mostly from the gold-mining industry.

Realizing the importance of attendance by representatives of the very highest levels of mine management, the organizing committee encouraged limited participation by providing one-day registration. Of the total of 139 local delegates, sixteen were one-day registrants. This response was considered to be a gratifying indication of the importance attached to the problem by leaders of the industry. The Department of Mineral and Energy Affairs was also well represented.

Technical Programme

The technical sessions opened with a brief but pertinent introductory speech by the President of the Chamber of Mines. This was followed by the keynote address, presented by Professor C. Fairhurst of Minnesota University.

The technical content of the symposium comprised 36 papers addressing six themes. These were developed easily and naturally through two sessions on each of three days:

- Session 1 — The mechanism of seismic events
- Session 2 — Monitoring of seismic events
- Session 3 — Geology, mining and seismicity
- Session 4 — Rockburst damage
- Session 5 — Strategy in mine design
- Session 6 — Precursive phenomena.

Perhaps because the three days of technical proceedings did not follow consecutively (or possibly because the somewhat isolated venue did not offer any other distractions), attendance and interest did not flag during the week.

With very few exceptions, the papers prompted lively and informed discussion, the essence of which was quickly captured by the rapporteurs for eventual inclusion in the proceedings. The success of the discussion sessions may have been aided by the fact that all the papers had been made available in preprint form compactly bound in separate volumes, one for each day.

In addition to the papers, seven poster displays presented the details of the several seismic location networks in existence in the country. Together with advertising displays by the main manufacturers of seismic instrumentation and mine supports, these posters provided an interesting and stimulating background to the between-session gatherings in the lobby.

Local Visits

The three days of technical sessions were interspersed with visits to mines on the intervening two days. Eight visits were made to six different mines, involving about

* Rand Mines, P.O. Box 62370, Marshalltown 2107, Transvaal. © 1983.

75 delegates on each of the two days. These underground trips were well organized and informative, and were thoroughly appreciated, particularly by the overseas delegates.

Social Activities

On the Sunday preceding the symposium week the overseas visitors were afforded an opportunity of meeting the committee members and gaining some impression of the local mining scene during a visit to a mine tribal-dance arena and a sheep braai at one of the gold mines on the West Rand. This occasion appeared to be much enjoyed by all who had arrived in time to participate.

Thanks to the generosity of the commercial sponsors, three well-attended social functions were arranged for the delegates. These were an introductory cocktail party, a formal dinner, and an informal farewell gathering.

A series of interesting and social activities was arranged for the affiliates by the ladies committee.

Discussion Panel

Recognizing that much of the benefit of a symposium derives from communication outside the technical sessions and formal discussions, the organizing committee thought that it might be valuable to provide additional opportunities for such communication. Consequently,

a travelling discussion group was organized that spent the week after the Symposium visiting mines in the Carletonville and Klerksdorp districts. Visits were paid to particularly interesting underground sites, seismic systems were exposed to earnest scrutiny, and prolonged discussions were held with the respective rock mechanics and seismic personnel of the mines. The principal participants were Dr Wilson Blake and Mr Fred Leighton, who are both in the forefront of mining-orientated seismological research in the U.S.A. Other contributors were Professor Reg Hardy of Pennsylvania, Dr Don Gendzwill of Canada, Dr Manfred Will of West Germany, Dr Tom Hanks of the U.S.A., and local seismologists Dr Rod Green and Dr Steve Spottiswoode. This proved to be a most enjoyable busman's holiday for the visitors, who at the same time contributed some significant understanding to certain aspects of the problem.

It was particularly reassuring to hear their opinion that local technology is in no way deficient compared with that available anywhere else in the world. At the same time, the sobering message came loud and clear that we are dealing with a very complex problem and that a much greater manpower and communication effort will be necessary to cope with the vastly greater amount of information on this topic that will soon be forthcoming.

Numerical mathematics

The South African Society for Numerical Mathematics and the Computer Science Department of the University of Natal are organizing the Ninth Symposium on Numerical Mathematics to be held in Durban from 18th to 20th July, 1983.

The annual Symposium on Numerical Mathematics is intended primarily as a forum for researchers in and apliers of numerical mathematics from Southern Africa to exchange ideas and discuss new developments in this field. As in previous years, one or more distinguished researchers from overseas will be invited to present papers at the Symposium.

Papers of approximately 25 minutes duration on all aspects of the theory or application of numerical mathematics will be considered for presentation at the Symposium and inclusion in the Proceedings.

Persons interested in attending the Symposium should write to the address below indicating whether or not they intend submitting papers. Registration forms will be sent during March 1983.

Enquiries: Professor J. A. Snyman, Secretary, S.A. Society for Numerical Mathematics, Department of Applied Mathematics, University of Pretoria, Pretoria 0002.