

Introducing Frank Egerton

Frank Michael Gowar Egerton was educated at Jeppe High School for Boys and the University of the Witwatersrand, both in Johannesburg. He holds a B.Sc. degree in mining engineering, and has attended numerous courses on management, finance, and industrial relations. In the Executive Development Programme run by the University's Business School in 1981, he was voted the student who had made the greatest contribution to the programme.

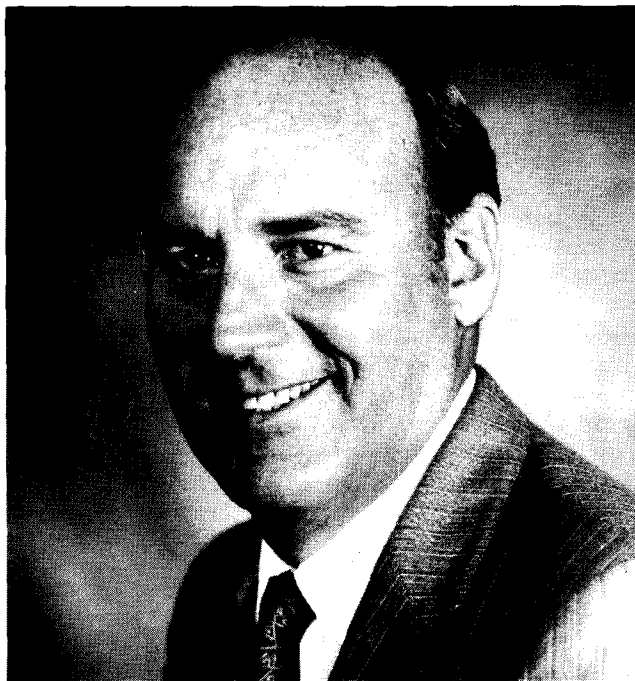
Frank joined Gencor (Union Corporation) in 1960 and worked for the group until 1992, holding the position of general manager at various mines from 1979 to 1992. In those posts he was responsible for the mining of gold or platinum ore and the metallurgical production of the value, together with the engineering, manpower, and administration functions associated with these responsibilities.

Taking early retirement from the mining industry, Frank has elected to lecture at the Technikon Witwatersrand, where he is passing on his knowledge and experience to the students in the faculty of Mining and Engineering.

Frank is a member of several professional bodies, including the Engineering Council of South Africa (Pr. Eng.), and is a past district governor of Lions Clubs International and a member of the National Executive of the Boy Scouts of South Africa.

His leisure activities include golf and road running (he has completed the Comrades Marathon eight times). These he combines with a keen interest in ornithology.

Frank is married and has three daughters.



Mr Frank Egerton

RECENT Publication

Guide to the evaluation of gold deposits*

*Guide to the evaluation of gold deposits**, by M. Vallée with M. David, M. Dagbert, and C. Desrochers. Montreal, Canadian Institute of Mining, Metallurgy and Petroleum, 1993.

Proper appraisal of mineral deposits at all stages of mineral development is essential to ensure the technical and economic efficiency of the mineral development process, and to ensure that investors receive an appropriate economic return. This *Guide* (Special Volume 45) reviews the various steps and components in the evaluation of gold deposits and the classification of reserves; the objective is to improve the accuracy of the estimates and reduce the risks of financial losses that are tied to investment decisions in the mining sector.

Part 1, Evaluation Methods, systematically reviews the components of mineral-deposit evaluation in the successive stages of mineral development. These stages are based on the main axes (or domains) of knowledge: geology, engineering, and economics.

First presented is an outline of the context and problems of mineral development and mineral-reserve inventories (Chapters 1 and 2). The steps and procedures that con-

tribute to metal losses and ore dilution are reviewed systematically because these factors are direct drains on the efficiency of all phases of mining evaluation, extraction, and ore-dressing.

In the geological domain, the *Guide* describes the characteristics of geological appraisal work (Chapter 3), sampling methods (Chapter 4), and assaying methods and procedures (Chapter 5). The various steps and methods for the estimation of volumes, masses, and grades of mineral deposits are covered in Chapter 6. To help quantify the non-statistical concept of precision of the estimates, the terms *margin of error* and *confidence level of the estimates* are used throughout.

In the engineering domain, mining and ore-dressing aspects are reviewed in detail (Chapters 7 and 8). The objectives, again, are to define ore/metal losses and dilution, and to improve the engineering aspects of projects. The key emphasis is on the interrelation between ore-deposit features and mining/milling methods. Ore dilution and ore losses are directly related to the methods that are chosen. The direct relation of appropriate, rigorous sampling of gold ore to achieve accurate control and auditing is emphasized. Chapter 9 reviews the legal and regulatory requirements of environmental protection for development

* Available from CIM, 3400 de Maisonneuve Blvd W., Montreal, Quebec, M3Z3B8, Canada.

projects and mine exploitation; these have become an integral part of the engineering requirements.

In the economic domain, the various elements required to establish the economic feasibility and profitability of a mining project are reviewed, and assessment steps and procedures are proposed (Chapter 10). The final (bankable) feasibility study and the decision it supports must be based on appropriate quantitative estimates of all the aspects involved, so that the profitability of the investments required for mine development is ensured (Chapter 11). At that stage, proper evaluation of all the risk factors that cannot be quantified is essential to ensure proper returns on these investments. Chapter 12 suggests norms for the presentation of professional reports dealing with reserve estimation, feasibility studies, and mine financing.

Part 2, Classification of Reserves and Resources, first presents the various systems for ore, reserve, and resource classifications that have been used since the start of the century (Chapter 13). The main problems encountered, especially in the use of the terms *ore*, *reserves*, and *possible reserves*, are reviewed critically in Chapter 14. Mineral inventory and reserve classification are proposed to inte-

grate the significant features of the existing systems (Chapter 15).

The key elements of the proposed classification system follow current trends. The term *reserve* should be used only when the geological, engineering, and economic knowledge and information ensure that the mining project is feasible. *Reserves* are by definition mining reserves. At earlier stages of deposit development, when quantitative knowledge is mainly geological, the terms *delimited mineralized resource* or *delimited mineral deposit* should be used. Proven and probable reserves can each be subdivided into two classes that better express the many steps of mineral evaluation; similar divisions are used for delimited mineralization. The *possible reserves* category should be replaced by that of *inferred mineralization* (or *resources*); this solution conforms to the U.S. Securities and Exchange regulations and to the recommendations of the Australasian Code. Use of the margin of error of the estimates at a confidence level of 90 per cent is proposed as an objective; implementation would establish the precision of the estimates, and would assist in distinguishing the deposit categories and classes.

LETTER

Safety factors

Mr Janisch's comment* in the August issue on Dick Stacey's remarks about safety factors indeed requires wider debate. The example he quoted to illustrate the successful application of the safety factor concept in coal mining, namely the Salamon formula, is to my knowledge the only recognized application of that concept. Not only that, but that particular formula should be used only for what it was intended, namely to prevent major disasters. It was never intended to indicate long-term pillar stability, and it should not be used for that.

In coal-pillar design, we progressed from the pre-Coalbrook gutfeel method to one of rational design. Extension of the basic method to cover squat pillars and to derive area-specific strength parameters are mere refinements of a basically proven method.

The next quantum leap would be to design for stability over time. We must aim at developing a method that will enable us to quote pillar stability in terms of weeks, years, decades, millennia, whatever—not just a ratio of what we tend to think are constants but are, in fact, variables.

This is not development for the sake of science. Worldwide, pillars that have been stable for anything from a decade to a century are now failing, in certain instances at tremendous cost to the surface infrastructure. To cater for the accelerated trend towards urbanization in South Africa, we will want to develop more and more areas that are standing on coal pillars. Who can really tell how safe that is?

We often hear the silly argument that there is no reason for pillars to fail now if they have been stable for fifty years. Please. If we apply the same argument to our own lives, it implies that we die on the day when our probability of living reaches its maximum.

We need to address the time-related decay of pillar strength scientifically. We now have data that Salamon would only have dreamed about. Computational facilities are mind boggling when compared with what was available in the sixties. We still have trained people. I believe we can do it. I believe we have to do it.

With regard to the general issue of applying safety factors in rock engineering, its absence is more than disturbing. Surely, if we really *design* layouts, support, pillars, whatever, we logically need to know two things: the demands that will be placed on the thing, and to what extent the capability of the thing exceeds the demand. Comparison of these two basic parameters yields a measure of predicted success, whether we express it as a safety factor, failure probability, or whatever.

The fact that we never see such a figure is to my mind an indication that we do not apply rational design procedures. We follow standard guidelines and recipes that have been shown to work. This is not design; it is copying.

It is true that seismicity overshadows the rock-engineering scene. Dick Stacey has also correctly pointed out that we do not know enough about this phenomenon to apply rational design procedures. But surely there is more to rock engineering than seismicity? What about tunnel support in non-seismically active areas? Or coal-mine roof support? Longwall shields?

I believe that there are several aspects that are sufficiently well understood to allow the application of rational design procedures. By knowing the extent to which we are either over-supporting or under-supporting, we can improve either the economics or the safety of mining. We can bring about the improvements only by doing real design. It is time we started doing just that.

† International Society for Rock Mechanics. The South African National Group on Rock Mechanics, 38 17th Street, Orange Grove 2192, Transvaal.

* Journal of The South African Institute of Mining and Metallurgy, Aug. 1993. vol. 8, 1993. p. ii.

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