

## **Association Announcement**

### **Seventh William Christian Krumbein Medalist: Daniel Gerhardus Krige**

When the International Association for Mathematical Geology was founded in Prague, Czechoslovakia in 1968 during the XXIII International Geological Congress, Professor William Christian Krumbein was not present; it had been his intention to be at the founding meeting, but, because of the then-troubled world situation, he got stopped in London en route between Evanston (Illinois, U.S.A.) and Prague. This did not prevent Krumbein from being enthusiastically elected to the strange office of Past President for 1968-1972, recognition of the fact that many referred to him as the father of mathematical geology because of his



pioneer work in fostering quantitative methods in a wide range of earth sciences in the days before the advent of electronic calculators and computers.

As its highest honor, IAMG annually awards the William Christian Krumbein Medal to the scientist deemed to have made exceptional contributions in the field of mathematical geology through original contributions, service to the profession, and support of the Association. The selection is made by a different international committee appointed by the Association's President. In 1982, the committee of five represented five countries and three continents. The medal itself is a large bronze piece designed by the well-known international sculptor, Abbott Pattison, who lives in Winnetka, Illinois and was a friend of Krumbein's. The medals themselves were struck at Fonderia F. Marinelli, Florence, Italy, and the first recipients were

- 1976 Emeritus Professor J. C. Griffiths, U.S.A.
- 1977 Professor W. Schwarzacher, U.K.
- 1978 Dr. F. P. Agterberg, Canada
- 1979 Professor R. Reyment, Sweden
- 1980 Professor A. B. Vistelius, USSR
- 1981 Professor Daniel F. Merriam, U.S.A.

Memorializing as it does the father of mathematical geology, it is fitting indeed that the 1982 recipient should be Professor Daniel Gerhardus Krige. Danie Krige can, with justification, be thought of as the father of mathematical mining geology. Numerous scientists in his native Republic of South Africa and in other parts of the world have also played important roles in developing quantitative techniques for evaluating mining properties. However, his continuing work, largely based on evaluation of the gold and uranium content and distribution in the Witwatersrand conglomerates, has been pivotal in the development of the whole branch of mathematical geology which recently became known as geostatistics. The original weighted moving-average techniques (e.g., Krige, 1966) which proved so successful in the Witwatersrand in the sixties were steadily expanded and developed in South Africa and in other countries, but, in particular, by Professor Georges Matheron and his associates at the Ecole des Mines, near Paris. The latter group developed the sophisticated estimation procedure which they called Kriging (krigeage); various additional types of Kriging (e.g., universal Kriging, co-Kriging, disjunctive Kriging) are now widely used in regionalized-variable theory. It has been shown that, by comparison with other available mathematical techniques, probabilistic stochastic models using Kriging provide significantly more accurate (a) assessments of spatial composition and variability, and (b) statements about the confidence levels to be associated with such predictions. Although primarily used in the mining industry for the prediction of ore in specified mine blocks or ore bodies, the techniques are rapidly being extended to most disciplines where the composition of spatially variable domains must be assessed accurately on the basis of expensive sampling.

Danie Krige was born in the Orange Free State in 1919, and his career has been wholly based in South Africa. His scientific accomplishments have resulted from an intimate intertwining of academic and on-the-job experience. Formal degrees B.Sc. (Eng.) 1939, M.Sc. (Eng.) 1951, and D.Sc. (Eng.) 1963, from the University of the Witwatersrand were capped by the honorary D.Eng. conferred by the University of Pretoria in 1981.

After early work with various gold-mining companies and eight or so years with the office of the Government Mining Engineer in South Africa, Danie Krige's main professional and scientific contributions came while he served as Group Financial Engineer for the Anglovaal mining group, for whom he worked from 1952 through early 1981.

Although a part-time lecturer in the Department of Mining Engineering, University of Witwatersrand, since 1961, Dr. Krige became a full-time academic only in 1981 when appointed to that university's new Chair of Mineral Economics.

Having been employed in industry with the Anglovaal mining group for almost 30 years, it is particularly noteworthy that Dr. Krige's bibliography extends to over 50 publications. Additionally, Krige is well known throughout the world because of his frequent active participation in a wide range of scientific meetings. Over two decades it has been a great personal pleasure to have participated in numerous scientific meetings on three continents with Danie Krige.

While Professor Krige was named seventh Krumbein medalist largely because of his contributions to mathematical mining geology, he has made noteworthy contributions in business applications. As Professor A. N. Brown (1981, p. 322) has noted these included

“... the science of investment, financial mine valuation, and mining taxation, as is evidenced by local and overseas publications. Among them is one that appeared in 1955, possibly the first in the world dealing with a subject that is known today as risk analysis of new mine ventures. In the same field, he served on a sub-committee of the Economic Advisory Council, which investigated [South African] State aid for gold mines. He was responsible for the design of the State formula for marginal gold mines enacted in 1968, which enabled a number of mines to survive the critical period of low gold prices. The application of State aid made a significant contribution towards stabilizing the gold-mining industry, and therefore the [Republic of South Africa's] economy as a whole, over a difficult period.”

Over the years, Krige has lectured or given courses at several universities in South Africa, the United States, Germany, and Australia. Krige's ability has not gone unnoticed by his peers. The South African Institute of Mining and Metallurgy has awarded him four Certificates of Merit, a Silver Medal, and two Gold Medals. In addition, he received the Gold Medal of the South African Academy for Science and the Arts in 1982. In his new role as a full-time professor, Danie

Krige continues an active role in several engineering, mining, and statistical professional societies.

The Association is proud to recognize a truly distinguished scientist who is particularly noteworthy for having focused on and demonstrated the practical and economic usefulness of some mathematical geology tools. This engineering use of our subject, establishing the practical usefulness of an aspect of mathematical geology, is a facet of Krige's work which will be a stimulus and challenge to ongoing students of the subject. Now that Danie Krige is translated on a permanent basis into the ivory towers of academe at Witwatersrand, we all look forward to learning increasingly from his stimulus, insights, and ongoing research, because members of this Association must seek out and enhance the practical usefulness of mathematical geology through the '80s.

### REFERENCES

- Brown, A. N., 1981, Spotlight on geostatistics—Professor D. G. Krige: *Jour. S. Afri. Inst. Min. Metal.*, p. 321–22.
- Krige, D. G., 1966, Two-dimensional weighted moving average trend surfaces for ore evaluation: *Jour. S. Afri. Inst. Min. Metal., Proc. Symp. Math. Stat. Comput. Appl. Ore Valuation*, p. 13–79.

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