

16. CLASSIFICATION AND AGE RELATIONSHIPS
OF THE URANIUM DEPOSITS

The report released by the OECD (1973) concerning the resources, production ~~by~~ and demand for uranium by developed and underdeveloped countries, concluded that the rate of new discoveries must total $2,3 \times 10^5$ tons U_3O_8 per year until 1990. This means that the total potential reserves must increase by $2,5 \times 10^6$ tons U_3O_8 over this period. In basic terms, a further twenty-five deposits with the potential of the Langer Heinrich (10^5 tons U_3O_8) must be discovered over the next fifteen years. As a result greater orientation problems will be encountered during exploration for the hidden uranium ore deposits. g

The establishment of a classification system of uraniumiferous ore bodies would group them in accordance with favourability criteria based on genetic sequences and mode of occurrence. Recognition of the parameters controlling the development of the uranium deposits in the Tumas River Valley has yielded a classification which would improve the efficiency of the location of prospective target areas. This type of regional evaluation is useful in quickly eliminating unlikely zones, and thereby saving time and expenditure. ?

Numerous types of classification of uranium deposits have been proposed. Ruzicka (1971) summarized the classifications of Russian, East European and Canadian deposits. A general classification embracing world deposits has been proposed by Barnes and Ruzicka (1972) and Ziegler (1974).

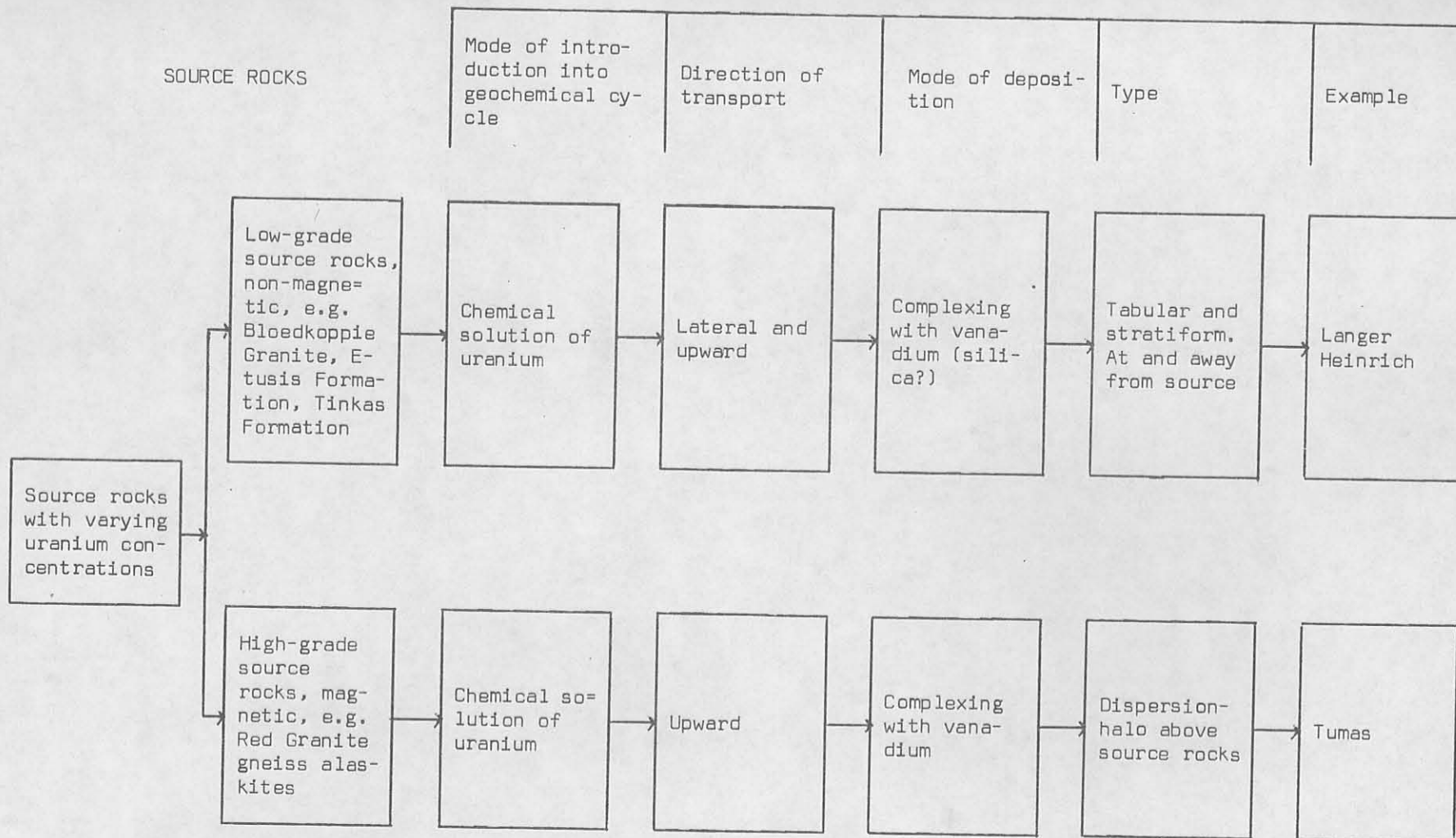
There appear to be four essential themes that run through the various classification systems:

- (a) Morphological relationships to host rocks.
- (b) Genetic associations.
- (c) Metallotectonic controls.
- (d) Element associations.

Barnes and Ruzicka (1972) developed a genetic classification in terms of the geochemical cycle and modes of transport and deposition. Although this may be suitable for a global approach, certain disadvantages arise when viewed from the more localized aspects, for they do not consider the morphological manifestation of the ore-bodies. Fig. 79 is an attempt to include these features. If treated in the broader aspects, both the Langer Heinrich and Tumas Types would be typical duricrust deposits. There are, however, some essential differences, such as the magnetic anomalies associated with the Tumas Type. The common features are the mode of introduction into geochemical cycle, the mode of deposition and, partially, the mode of transport.

Ziegler (1974) differentiates the world uranium ore-bodies in terms of metallotectonics and therefore classifies the Yeelerrie and Namib Desert epigenetic calcrete deposits into different types. The Yeelerrie deposit is related to a stable continental crust, whereas those in the Namib Desert are associated with an ancient mobile belt. In the opinion of the author this part of his classification falls down, for it is essentially a problem of the availability of uranium and the type of host rock in which it is deposited.

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Fig 79 A genetic classification for the Langer Heinrich and Tumas Type uranium ore deposits in terms of the geochemical cycle and modes of transport and deposition.

Firstly, the uranium for both the Langer Heinrich and Yeelerrie deposits was basically derived from a low-grade granitic source. Secondly, the host rock is very similar when the Langer Heinrich deposit itself is considered, but dissimilar for the Langer Heinrich Type deposits in the gypcretæ of the Tumas River Valley.

This may be sufficient ground to further subdivide the deposits in terms of host rock and type, although possibly inadvisable with regard to (a) and (b) below:

- (a) Stratiform deposits in calcrete.
- (b) Stratiform deposits in gypcrete.
- (c) Dispersion halo in gypcrete.

Generally a metallotectonic classification is important in the broader sense, but it does not find application when considering the duricrust deposits of the Yeelerrie, Langer Heinrich and Tumas Types on a local scale.

The affiliations of the duricrust deposits to other types of uranium deposits in Southern Africa are illustrated in Fig. 80, which has been adapted from the genetic classification proposed by Barnes and Ruzicka (1972). This system is in fact a behavioural account of the crustal characteristics of uranium through the mechanical, chemical (at both high and low temperatures and pressures) and magmatic processes resulting in its ubiquitous distribution throughout time and space.

The relationships between ages of host rock and the mineralization found in them for the Southern African uranium deposits are given in Fig. 81.

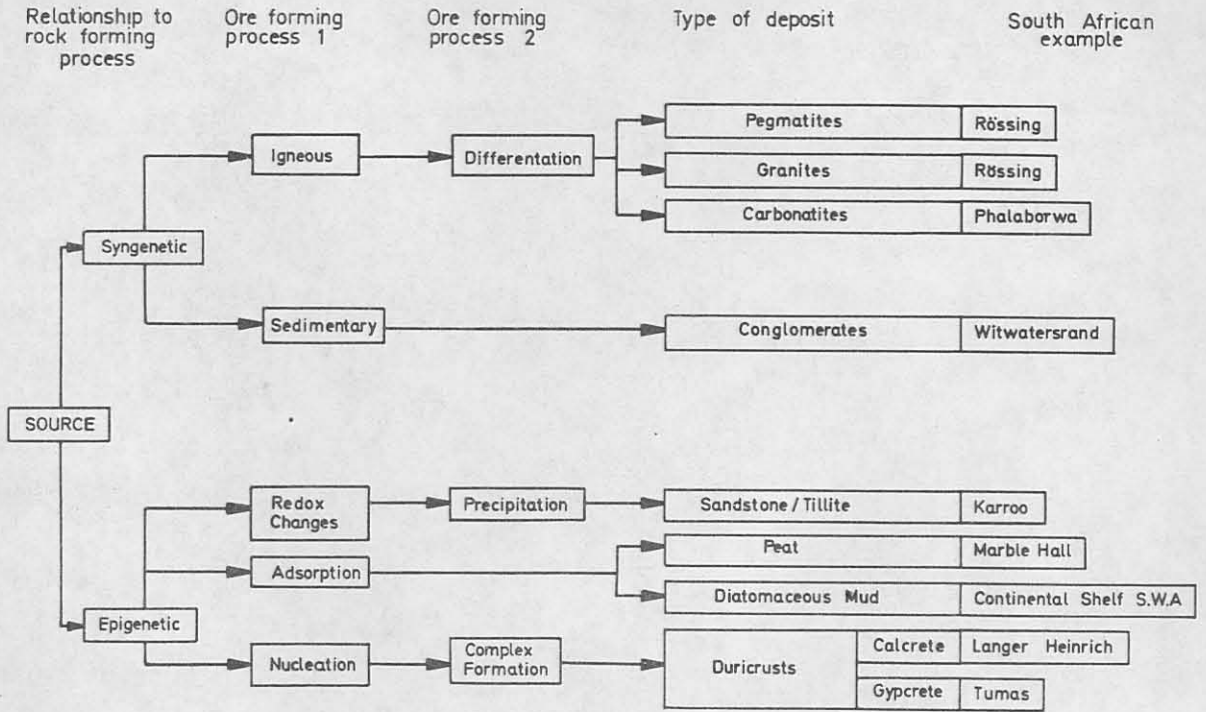


Fig. 80: The relationships of the duricrust deposits with respect to other types of uranium deposits in terms of ore-forming processes.

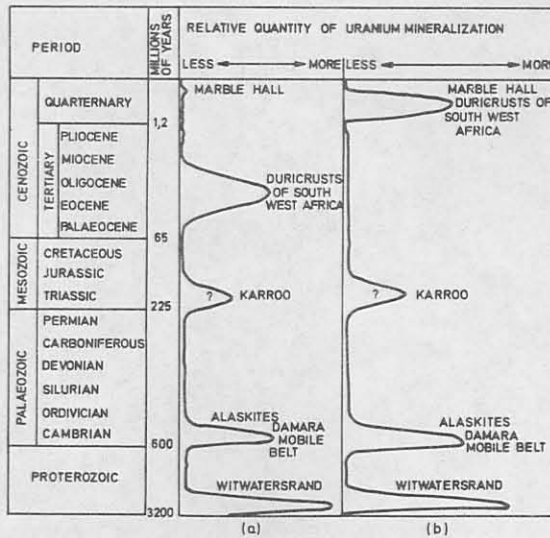


Fig 81: Relationships between ages of host rock and the associated uranium mineralization. (a) Age of host rock enclosing the uranium mineralization (b) Age of uranium mineralization.

A comparison between (a) and (b) of the Figure reveals that some uranium deposits are syngenetic, whereas the others are epigenetic. The age of the duricrust of the Namib Plain is mid-Tertiary, whereas the age of mineralization is Quaternary, which indicates their epigenetic character. The relative quantity of uranium in the Karoo is at this stage uncertain and therefore the peak height does not represent any magnitude of ore reserve.

A knowledge of the relationships given in Fig. 81 and the tectonic or petrogenetic processes that acted upon or formed the uranium deposits may yield fundamental information concerning classification and favourability criteria of the uranium mineralization and genetic history.