

## THE AGE RELATIONSHIPS OF THE MATSAP, LOSKOP, WATERBERG AND NAMA SYSTEMS

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### ABSTRACT

The suggestion is made that the rocks of the Loskop system, as defined by F. C. Truter (1949), and those of the Matsap system in the Union are synchronous and equivalent in age to the "Lower Dordabis beds" and the Auborus series of South-West Africa. This essentially continental system was strongly compressed and eroded before the deposition of the Waterberg succession in the Union and the Nama succession in South-West Africa and the west of the Cape Province. The possibility of the Waterberg and the Nama being contemporaneous is suggested, the calcareous rocks of the Nama being a local possibly marine development of a widespread system whose members are predominantly red and arenaceous.

In his Presidential Address to the Geological Society of South Africa (*Proc. geol. Soc. S.Afr.*, LII, 1950, pp. lxvi-lxvii), F. C. Truter proposed the name of Loskop system for a succession of sediments typically developed in the vicinity of the Loskop dam in the Middelburg district of the Transvaal. In the type area the system comprises gray, reddish and purplish, rarely whitish, quartzites and grits, red shales, conglomerates and boulder beds. The conglomerates are composed chiefly of pebbles and boulders of Rooiberg felsites, some of which display hydrothermal alteration effected by the Bushveld granite while others are fresh; occasionally inclusions of white quartzite are found.

On the Transvaal Geological Survey map sheet No. 3 these beds were designated as part of the Lower half of the Waterberg system following conformably upon the felsites of that system which were subsequently separated to become part of the Rooiberg series. The Loskop beds rest mainly on the Rooiberg felsites; but between Witbank and Balmoral their base transgresses on to sediments of the Pretoria series. The Loskop beds are also overlain unconformably by the conglomerates and quartzites of the Waterberg system; west of the Loskop dam the latter lie with low southerly dips upon a truncated anticline (with a north-south axis) of Loskop beds and transgress on to Rooiberg volcanics which form the core of the anticline.

Truter goes on to cite several localities in the central Transvaal where rocks lithologically similar to those of the Loskop region lie between the Transvaal system and the Waterberg system, sometimes transgressing from Rooiberg felsites to lie on Bushveld granite and always being more highly folded than the Waterberg sediments where these overlie them. North of Rooiberg, in a belt running westwards towards Thabazimbi, they are highly folded and overfolded from the south and are thus contrasted with the lithologically somewhat similar rocks of the Waterberg which overlie them and which are gently inclined to the north.

In the north-western Transvaal, west of the Blouberg, Willemse observed conglomerates, grits and quartzites with subsidiary shales overlain by the Waterberg beds with a pronounced unconformity. Recent mapping by H. N.

Visser in the Zoutpansberg north-east of Louis Trichardt has disclosed large "windows" of older rocks beneath the gently dipping and faulted Waterberg beds. These older rocks include a succession of strata folded along east-west axes, which lithologically closely resemble the typical Loskop rocks.

The existence of a group of sediments in the Transvaal which was laid down upon a surface that post-dated the Bushveld granite intrusion and which was folded and denuded before the deposition of the Waterberg sediments appears, therefore, to be well established. Can this group be correlated with deposits elsewhere in the Union?

In an attempt to answer this question, attention is directed to the Matsap system of Griqualand West and Bechuanaland. This system has been subdivided into the Gamagara series (of somewhat local occurrence) and the Lower, Middle and Upper stages of the Matsap series, of which the last has the widest distribution. The middle stage is mainly volcanic; but it, too, thins out and disappears southwards from Olifantshoek. The sediments are mainly quartzitic, with basal conglomerates in the Gamagara and some conglomerates and grits at other horizons, and include shale and some limestones. The predominating colours of the sediments are pink, reddish, and purplish, paler colours appearing in the west. All the beds have been folded or even overfolded; shearing is common; and thrusting from the west is clearly in evidence. The strike of the fold axes is approximately north-south in the middle of the belt of outcrops; but at each end of the belt the axes turn to have a latitudinal trend. This trend to the east, resulting in a north-easterly strike, is well seen to the north of the Molopo river in Bechuanaland Protectorate at and near Tsabong. The Matsap system lies unconformably upon Transvaal, Ventersdorp and even Kheis rocks.

During recent years, a correlation of the Matsap with the Waterberg has been generally accepted, mainly on the grounds of lithological similarity and of a post-Transvaal age, although there is no counterpart in the history of the Waterberg beds to the strong folding and shearing which have affected the Matsap rocks. In the Loskop formation, however, there appears to be closer parallelism with the features of the Matsap than there is in the Waterberg. Both are mainly quartzitic with subordinate shales; both are predominantly reddish or purplish in colour; both lie unconformably upon Transvaal or older rocks; both are folded in contradistinction to the relatively flat-lying Waterberg. The axes of the folds of each appear to be related. The north-south axes of the main body of the Matsap begin to turn to the eastwards in the north; in Bechuanaland, just north of the Molopo, the direction is nearly north-east and it becomes progressively more easterly as the Transvaal border is approached; this swing culminates in an approximately east-west strike of the fold axes in the "windows" of the Zoutpansberg. In the central Transvaal, the axis of folding is nearly meridional, paralleling the direction displayed in the Langeberg of Griqualand West.

As far as is known at present, there are no contemporaneous lava flows in the Loskop similar to those of the Hartley Hill or Middle stage of the Matsap; but the latter are local in their occurrence and the volcanicity of which they were the product may not have been widespread.

If the correlation of the Loskop with the Matsap be accepted, there arises the question of the possible correlation of the Waterberg with one of the other described systems in the Union.

Geologists of the Belgian Congo have suggested the possible correlation of the Waterberg with the Table Mountain sandstone, mainly as a result of considering the Waterberg to be the equivalent of the upper part of the Kundelungu series of the Congo, which is fossiliferous. It would, however, seem preferable to consider a possible correlation in age between the Waterberg and the succession known as the Nama system which is developed in the western part of the Cape Province and which covers large areas in South-West Africa.

The Nama system is typically subdivided into (*a*) the Kuibis series at the base, followed by (*b*) the Schwarzkalk series and terminated by (*c*) the Fish River series. The top and bottom series are predominantly formed of red arenaceous deposits. The Schwarzkalk is composed mainly of dark coloured limestones. Eastward of their main area of development, however, the lower beds of these limestones interdigitate with and finally give place to the reddish and greenish shales of the upper part of the Zwartmodder beds of Gordonia; while to the north and west there appears a dark argillaceous facies of the series—the so-called Schwarzrand beds. The succession Kuibis-Schwarzkalk is seen south of the Orange river in Namaqualand; while in the Van Rhynsdorp area the succession, cut by step-faults, originally described by Rogers as Nieuwerust-Malmesbury-Ibiquas can now with tolerable certainty be considered as the Nama succession. It is in this area that the Nama beds are unconformably overlain by the Table Mountain sandstone.

Apart from the calcareous Schwarzkalk which has no known counterpart in the Waterberg of the Transvaal, the Nama and Waterberg sediments have lithological characteristics in common. Neither succession carried contemporaneous lavas, unless the lavas at the southern foot of the Zoutpansberg be considered as the base of the Waterberg. Save in the north—in the Naukluft mountains of South-West Africa, for example—both successions are essentially unfolded, although both have been subjected to step-faulting; the fault-planes strike northwards in the west (Nama system) but run east-west in the north (Waterberg system). The basal Kuibis quartzites in South-West Africa have yielded fossils whose identity is somewhat uncertain but whose presence argues either a late pre-Cambrian or a Cambrian age for the beds containing them. The Waterberg beds, continental in origin, have not been proved to be fossiliferous; but little or no attention has been paid to the infrequent shaly intercalations in the system.

A key area in which to determine the degree of accuracy of these suggested correlations between (*a*) Matsap and Loskop, and (*b*) Waterberg and Nama appears to be Bechuanaland Protectorate. From the Transvaal border to that of South-West Africa and south to the Molopo river, du Toit's map of the Protectorate shows a series of isolated outcrops of rock assigned by him to the Waterberg system. At and near Tsabong (north of the Molopo), east of Kooi, and west of Molepolole, these outcrops appear to lie along, or in the same direction as, the continuation of the arc-like strike of the main Matsap outcrops; but there

are no records known to me of the degree of folding displayed by the rocks outcropping in this mainly sand-covered area, nor of their detailed lithology.

Rogers (*Proc. geol. Soc. S.Afr.*, 1930, p. lvii) identified the rocks at Molepolole with the Rooiberg and stated that possibly Waterberg beds directly underlie the sand. He also considered that the Ghanzi beds of the western part of the Protectorate, which have an east-north-east strike, closely resembled the rocks of the Matsap system.

To the south-west along the strike, these Ghanzi beds are continued in isolated outcrops across the border of South-West Africa into the Gobabis and Dordabis areas. Several descriptions have been published of the outcrops in South-West Africa, but the elucidation of the succession has not been made quite clear. Gevers, in 1934, gave the name Dordabis to the succession and tentatively placed them in the Nama system. He distinguished, however, a Lower group and an Upper group.

The Lower group of Gevers' Dordabis series is composed of deep-red and even chocolate-coloured quartzites and sandstones with sedimentary breccias and conglomerates, cut by "sills and lenses of greenish epidotic diabase" which may be intercalated lava flows. Chocolate-brown sedimentary breccias locally occur near the base. Reddish clay-pellets are widely distributed in great abundance, and there are narrow intercalated layers of red shale. The beds are regularly folded, with steep dips, along north-east—south-west axes. Lithologically, the beds resemble rocks which occur to the south-west of Rehoboth and which appear to belong to the so-called Auborus series which is well-developed to the west of the Schwarzrand escarpment.

The Upper group of the Dordabis series consists of a succession of compact well-bedded quartzites, felspathic sandstones and massive conglomerates, pale reddish to whitish in colour, intercalated with calcareous shales, limestones and dolomites. The arenaceous rocks are reminiscent of parts of the Kuibis beds; the calcareous of the Schwarzkalk.

Examination of Gevers' maps and sections of the Dordabis area discloses that at no spot are the Upper beds in actual contact with the Lower, the two being separated from one another by surface sand below which a fault is presumed to run. The strike of the Lower beds is more complicated than that of the Upper, and the dips displayed by the Lower beds are, in general, much higher; in fact, Gevers considers the quartzites of the Lower beds to be isoclinally folded.

It would seem as if in this area we have two unconformable formations of which the younger is almost certainly the equivalent of the Nama beds to the south. If Rogers' suggestion that the Ghanzi beds are Matsap can be substantiated, it would appear that from Dordabis to Gobabis both Nama and Matsap are represented. If, further, there is justification for correlating the Matsap with the Loskop, *a priori* there seems a possibility that the Nama of South-West Africa (=Upper Dordabis of Gevers) and the Waterberg of the Transvaal are synchronous formations of different facies.