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STRATOTYPES FROM THE MALMANI SUBGROUP NORTH-WEST OF JOHANNESBURG, SOUTH AFRICA

by

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ABSTRACT

Eight formations are defined in the former Transvaal Dolomite from an area north-west of Johannesburg. With the underlying Black Reef Formation these form the Malmani Subgroup as defined here. Simple properties such as colour, and the presence or absence of chert were used as the primary basis for the mapping of these units. In more detail this mapping also involves the distinction of stromatolitic assemblages and other primary structures. Much fine detail within the formations has lateral persistence and numerous marker-horizons, often dominated by differing large domical stromatolitic structures, can be traced over distances of at least 40 km. Stratotypes are established for the formations.

The Subgroup is cut across by the Fountains Formation, a chert breccia of basin-wide distribution in relation to the former Transvaal Dolomite. Uplift and subaerial exposure resulted in the formation of this unit, and there is evidence of greater localised uplift in the area studied. At least five other significant chert breccias and related rocks can be traced through the area, and there is a third group of chert breccias of more local significance.

I. INTRODUCTION

An area of some 40 square kilometres was mapped in rocks ascribed until now to the Black Reef and the Dolomite Series. This area lies west of Swartkops hill, and is some 40 kilometres north-west of Johannesburg (Fig. 1).

The rocks under discussion rest unconformably on the north-western rim of the Halfway House Granite Dome, and are overlain by strata of the Pretoria Series. The Ongeluk lavas in this series have yielded a Rb/Sr whole-rock age of 2 224 ± 21 million years (Crampton, D., personal communication) thus providing a minimum age for the Dolomites.

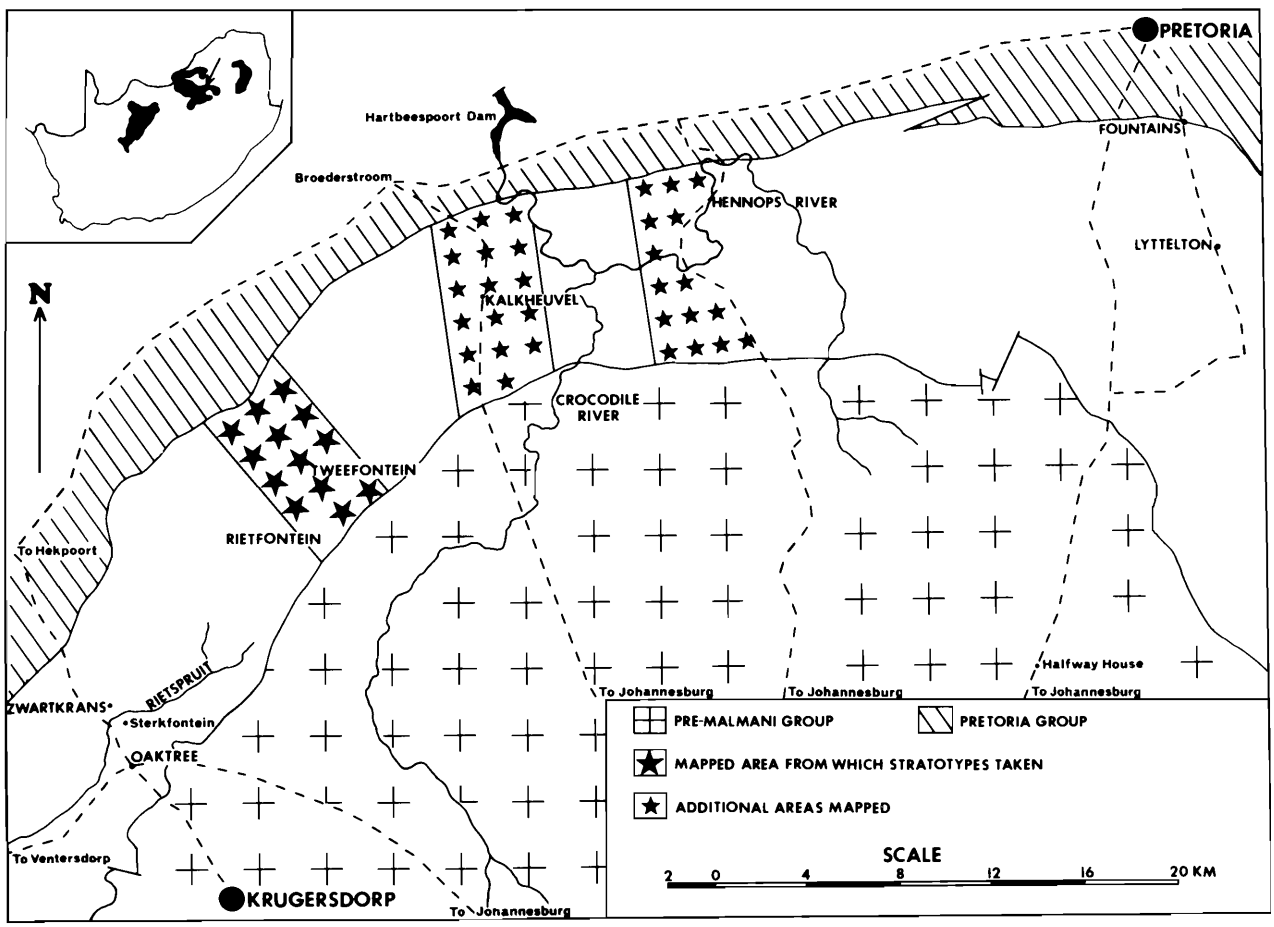


Figure 1
Locality-map. Inset: distribution of the Transvaal Supergroup in South Africa.

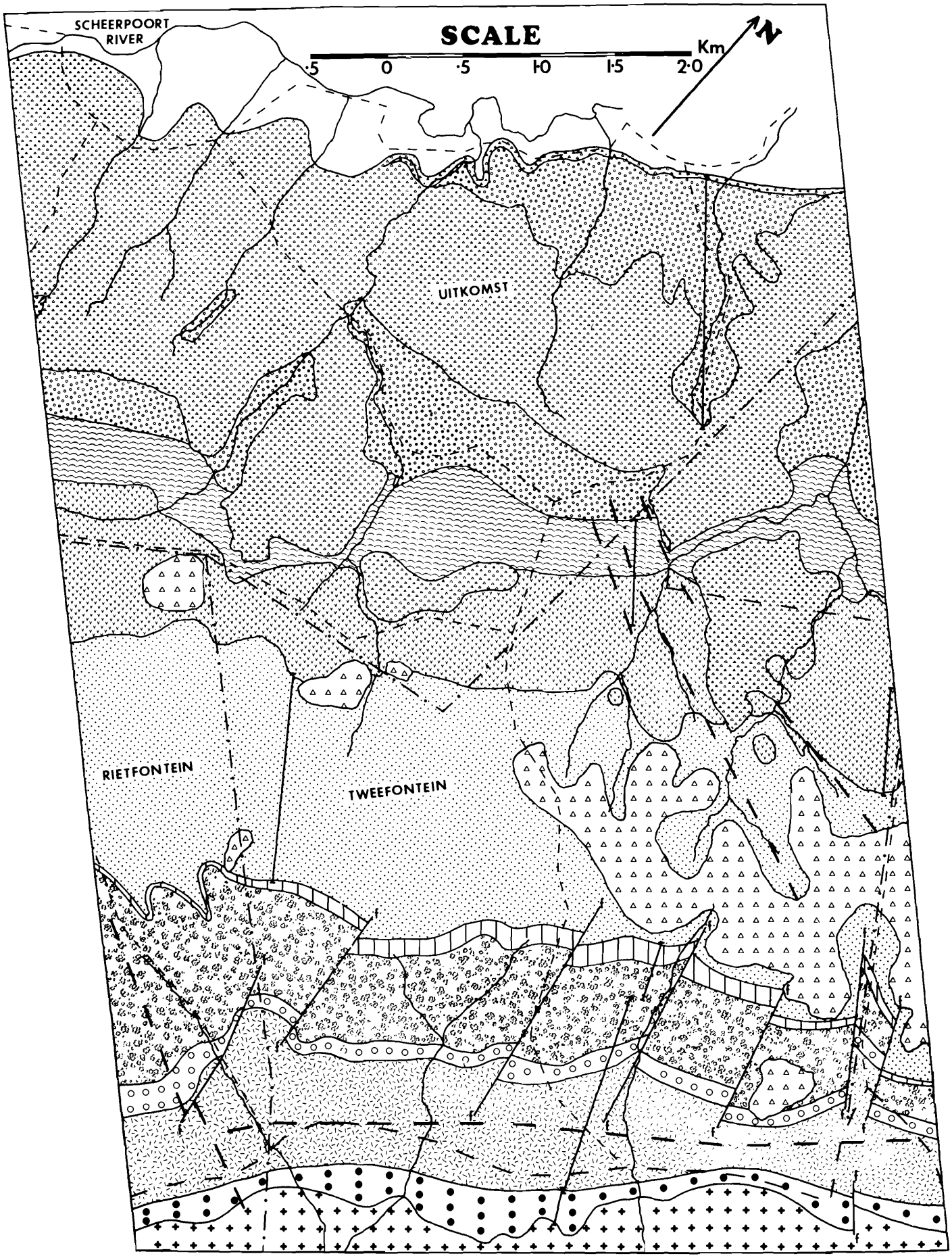
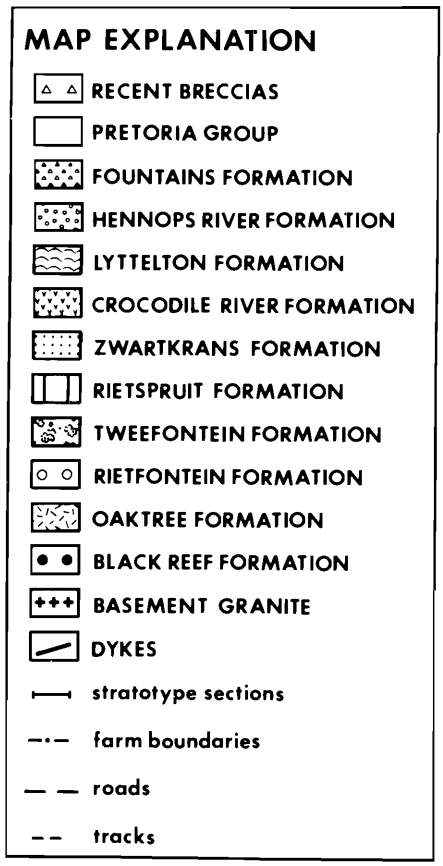


Figure 2
Mapped area west of Swartkops.

A ninefold lithostratigraphic subdivision encompassing the Black Reef and the Transvaal Dolomite has now been recognised. Complementary mapping in the Hennops River and Broederstroom areas carried out as B.Sc. Honours projects by Murray McGregor and Mark Kubler respectively (Fig. 1), and directed by the authors, has shown the same subdivision. Elsewhere in a wider area around the north and north-west of the Halfway House Granite Dome, between Lyttelton and the Sterkfontein Caves, reconnaissance work in portions of the sequence has indicated a further lateral persistence for those units examined.

It is now proposed to establish formal nomenclature for these nine subdivisions. Each is given formational status, and described here in accordance with the requirements both of the South African Stratigraphic Code (1971) and of a recent unpublished document of the South African Committee for Stratigraphy indicating what information is required in proposing any new lithostratigraphic name. Reference was also made to a preliminary report on stratotypes (International Subcommission on Stratigraphic Classification, 1970).

The full succession of the unit known until the present as the Dolomite Series is only developed in the north-eastern Transvaal. There it has now been proposed that the Main Dolomite, the Banded Ironstone and the Upper Dolomite Stages be styled the Malmani Dolomite, the Penge and the Duitschland Formations respectively, and that they be referred to collectively as the Olifants River Group (Button, 1973). This Group is underlain by the Black Reef Quartzite, the former Black Reef Series (Button, op. cit.). The succession mapped in this study is considered to be equivalent to the lower two-thirds of Button's Malmani Dolomite, and the Black Reef Quartzite. At Swartkops the latter is very much thinner, and as it is heterogeneous the term Black Reef Formation is preferred. The formations recognised make it necessary to raise the status of the Malmani Dolomite, as proposed by Button, in this area to that of the Malmani Subgroup. The name Malmani was first used by Draper (1894). Two points should be stressed at the outset: firstly that at Swartkops the Black Reef Formation is placed within the Malmani Subgroup; and secondly that the thick chert breccia named the Fountains Formation from the locality south of Pretoria (Fig. 1 and Button, 1968), representing the uppermost unit of this study cuts across the underlying formations and is not regarded as part of the Malmani Subgroup but rather as a separate formation. This latter interpretation differs from that of some earlier workers. Several of the points made in this paragraph are necessary to an understanding of this paper at the outset, but they will be discussed more comprehensively later.



Stratotypes have been measured across the area studied which lies on 1 : 50 000 topocadastral sheet 2527 DD Pelindaba, and on aerial photographs of Job 603, Strips 12, 13 and 14. Poor exposure of one stratotype necessitated the establishment of a composite stratotype. A paucity of suitable names has resulted in most of those selected being taken from the wider area shown on Fig. 1.

The geology of the area is shown on Fig. 2. Three stratigraphic columns are given in Fig. 3. In Fig. 3A the named lithostratigraphic units and their thicknesses are shown. The dolomite types recorded, which are fundamental to the mapping, are shown in Fig. 3B. These are dark chert-free dolomite, dark chert-free dolomite with large domes, colour-banded dolomite, recrystallized chert-free dolomite and recrystallized chert-rich dolomite, plus oolites. In Fig. 3C the following information is recorded: chert and dolomite fragments in a dolomite matrix, dolomitic breccia, chert breccia, and shale; which may or may not be associated with breccia.

Prior to this mapping, information on stromatolite morphology (Truswell and Eriksson, 1972), and on an assemblage of tidal flat structures (Eriksson and Truswell, 1974) was presented; much of the data for these communications came from this area.

II. STRATOTYPES IN THE MALMANI SUBGROUP

Black Reef Formation

Historically the name Black Reef, first used by Penning (1891) is retained for the lower, largely clastic, unit of the Malmani Subgroup. The stratotype has a thickness of 24 metres (Fig. 4). A basal pebbly layer is overlain by five metres of quartzite displaying abundant cross-bedding and ripple marks. The overlying carbonaceous shales contain two intercalated non-stromatolitic dolomite horizons which weather to a chocolate colour, the lower of which is overlain by a two metre thickness of wad (Fig. 5). The latter is considered to represent a residue of a greater thickness of dolomite, i.e. to indicate a greater original volume of carbonate in the Black Reef Formation.

The resistant quartzite results in the development of a characteristic scarp and dip-slope above the underlying Halfway House Granite. The granite is highly sheared along the contact with this formation. An arbitrary upper boundary has been taken at the disappearance of clastic sediments.

Oaktree Formation

This formation is named after the hamlet at the intersection of the Johannesburg-Ventersdorp and Krugersdorp-Hekpoort roads (Fig. 1). The measured section is 176 metres thick. A structureless dolomite weathering to a chocolate colour is succeeded upwards by dark dolomite containing elongate domical stromatolites, with sizes of up to 10 x 4 metres in plan and a relief of at least a metre. The zone of large domes is overlain by a thin shale, above which light-coloured dolomite contains sporadically developed domes up to 90 x 60 cm. in plan. Within this

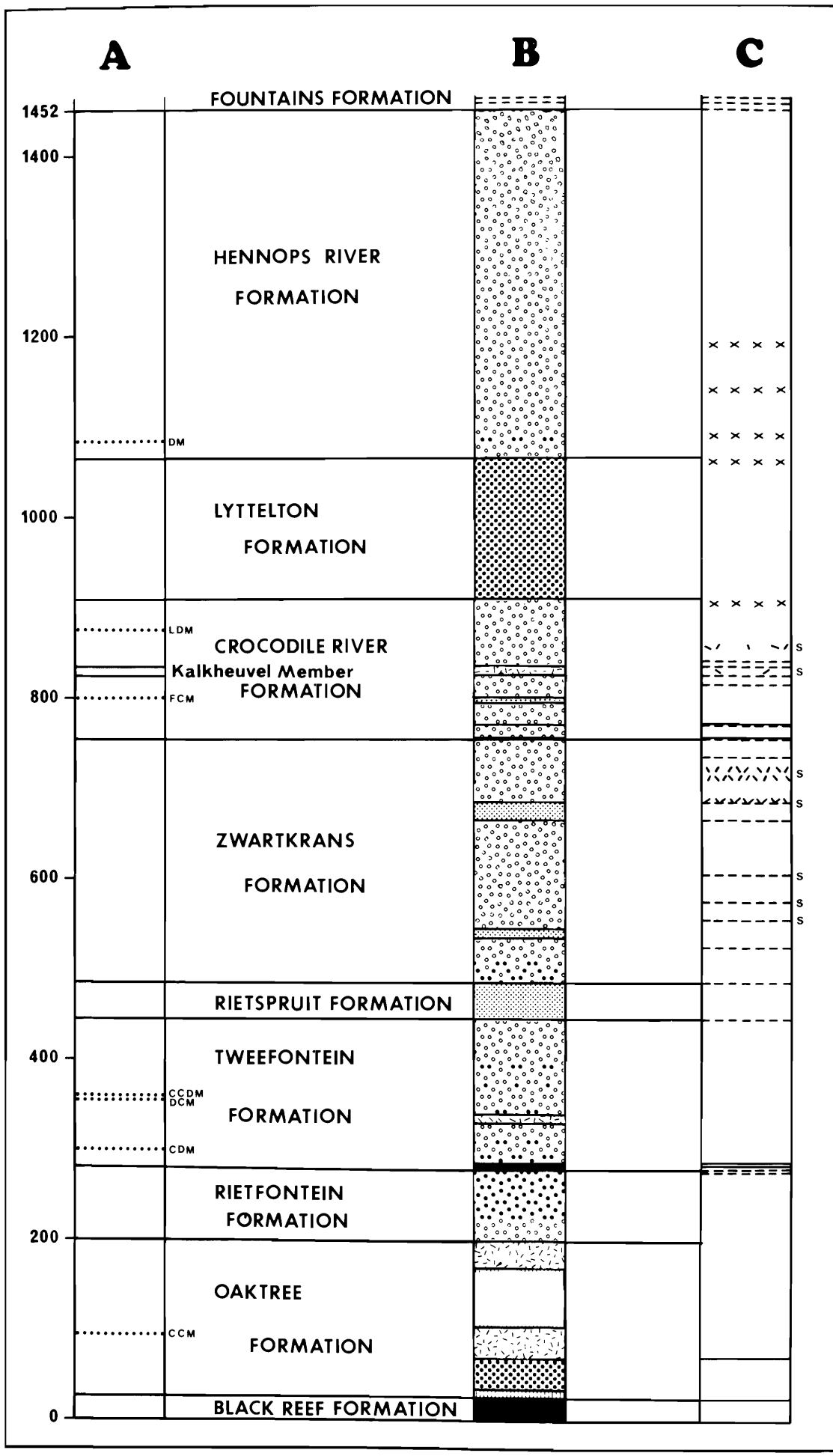


Figure 3
Composite stratigraphic columns.

A	B	C
D M - Dome Marker	Recrystallized Chert-rich Dolomite ···Oolite Development	××× Chert and Dolomite Fragments in a Dolomite Matrix
L D M - Linked Dome Marker	Recrystallized Chert-free Dolomite	Dolomitic Breccias
F C M - Fretted Chert Marker	Colour-banded Dolomite	--- Chert Breccias
C C D M - Chert Carapace Dome Marker	Dark Chert-free Dolomite with Large Domes	— Carbonaceous Shales
D C M - Domical Columnar Marker	Dark Chert-free Dolomite	ss Shales Associated with Breccia
C D M - Concretionary Dome Marker	Clastic Sediments	
C C M - Convoluted Chert Marker		

Figure 3
Composite stratigraphic columns.

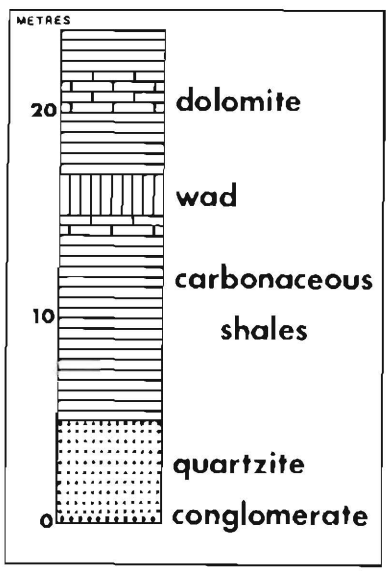


Figure 4
Stratigraphic column of the Black Reef Formation.

zone lies the *convoluted chert marker* (CCM). This marker contains the only appreciable chert in the formation and is also distinguished by the convoluted, sometimes overturned, attitude of the domes that it contains. Above the light-coloured dolomite is a substantial thickness of finely laminated dolomite which weathers to a chocolate colour (Fig. 3B) containing an horizon of siliceous concretions. The overlying dolomite becomes lighter in colour, a crinkled lamination is prevalent, and occasional chert partings appear at the top of the formation.

This formation does not have a distinctive geomorphic expression. The upper boundary is gradational and is

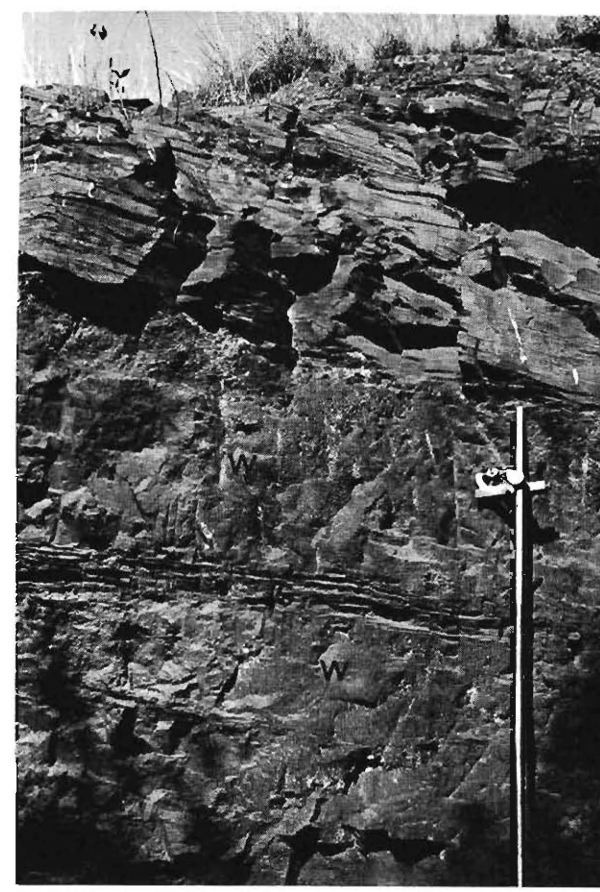


Figure 5
Wad (W) and Shale (S) in the Black Reef. Dolomite underlies the Wad.

taken at the appearance of chert in highly recrystallized dolomite.

Rietfontein Formation

On the farm Rietfontein this formation is particularly well exposed (Fig. 1). The unit is 82 metres thick and contains light-coloured dolomite and chert throughout. In the lower third of the formation structures are uncommon as a result of recrystallization, but where seen these were predominantly domes up to one metre in diameter. The succeeding 50 metres is almost entirely oolitic, rarely pisolitic. The oolites are most obvious in the chert but are also present in the carbonate. The oolites are frequently deformed and characteristically display reversed grading. Examples of small-scale cross-bedding were recorded in the oolitic rocks, and ripple marks are common towards the top of this zone. The chert is often lensoid, tabular or thin platy in appearance. The uppermost five metres of the formation consists of partly, more commonly wholly, silicified chert breccia with which some shaly matrix is developed.

The chert breccia is a readily mappable boundary, and is overlain by shale. The oolitic rocks are often well exposed below the resistant chert breccia on the farms Rietfontein and Tweefontein.

Tweefontein Formation

The farm Tweefontein is shown in Figures 1 and 2. A thickness of 163 metres was measured in light-coloured dolomite with which chert is almost universally associated. The formation contains varied structures with small domes being the most common and also including indistinct tabular finger-shaped columnar stromatolites, thin oolitic bands and lenses and both linear and interference ripple marks. At least three marker-horizons are developed in it (Fig. 6). The *concretionary dome marker* (CDM) is made up of linked elongate domes which reach sizes of 1½ metres in width, five metres in length, and have a relief that may exceed one metre. The domes have steep sides parallel to their elongation. Individual domes can contain disc-, oval- or cylindrically-shaped concretions (Fig. 7). In the *domical columnar marker* (DCM) stout columns 15 cm in diameter and up to 40 cm high overlie linked domes, and are in turn overlapped by large domes (Fig. 8) of uncertain size but with relief greater than 1 metre. The chert developed in this marker has a distinctive fretted appearance. Immediately above this lies the *chert carapace dome marker* (CCDM). This is composed of flat-topped, but steep-sided, large elongate domes of up to 5 x 3 metres in plan, and with a relief of at least 1,2 metres. A thick chert carapace encloses dolomite within these domes. Higher up in the succession a potential fourth marker occurs. It consists of large contiguous steep-sided domes at least 2,5 metres wide and relief greater than 1 metre. However, the upper part of the formation is poorly exposed and this horizon could not be traced laterally. In contrast the formation is well exposed as high as the third marker. The outcrop of the CDM and DCM markers are often clearly visible on aerial photographs. A brecciated chert defines the top of the formation.

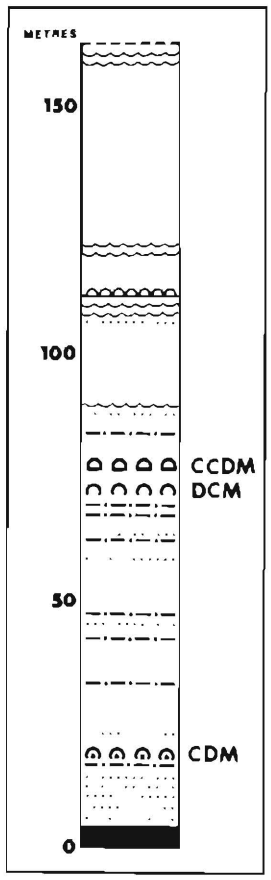


Figure 6
Stratigraphic column of the Tweefontein Formation.

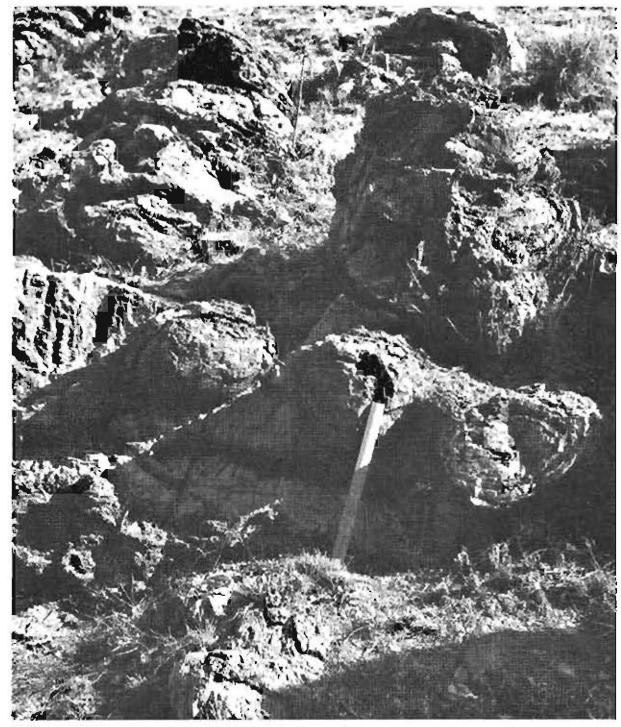


Figure 7
The concretionary dome marker (CDM) (Tweefontein Formation).

Rietspruit Formation

This formation is named from the Rietspruit flowing between Zwartkrans and the Sterkfontein. Colour-banded dolomite occurs throughout the 41 metre thick formation. Linked columnar stromatolites are the predominant structure, their morphology being defined by alternating thin, more carbonaceous dark and thicker light-coloured laminae. These forms have diameters of up to 10 cm and heights of up to 15 cm. At the top and the bottom of the formation unlinked columnar stromatolites occur reaching sizes of up to 20 cm in height. Small quartz crystals and occasional calcite crystals are scattered through the formation. The upper boundary is a silicified chert breccia, which has porous upper and lower surfaces. Exposures are adequate, but the formation usually occupies valleys.

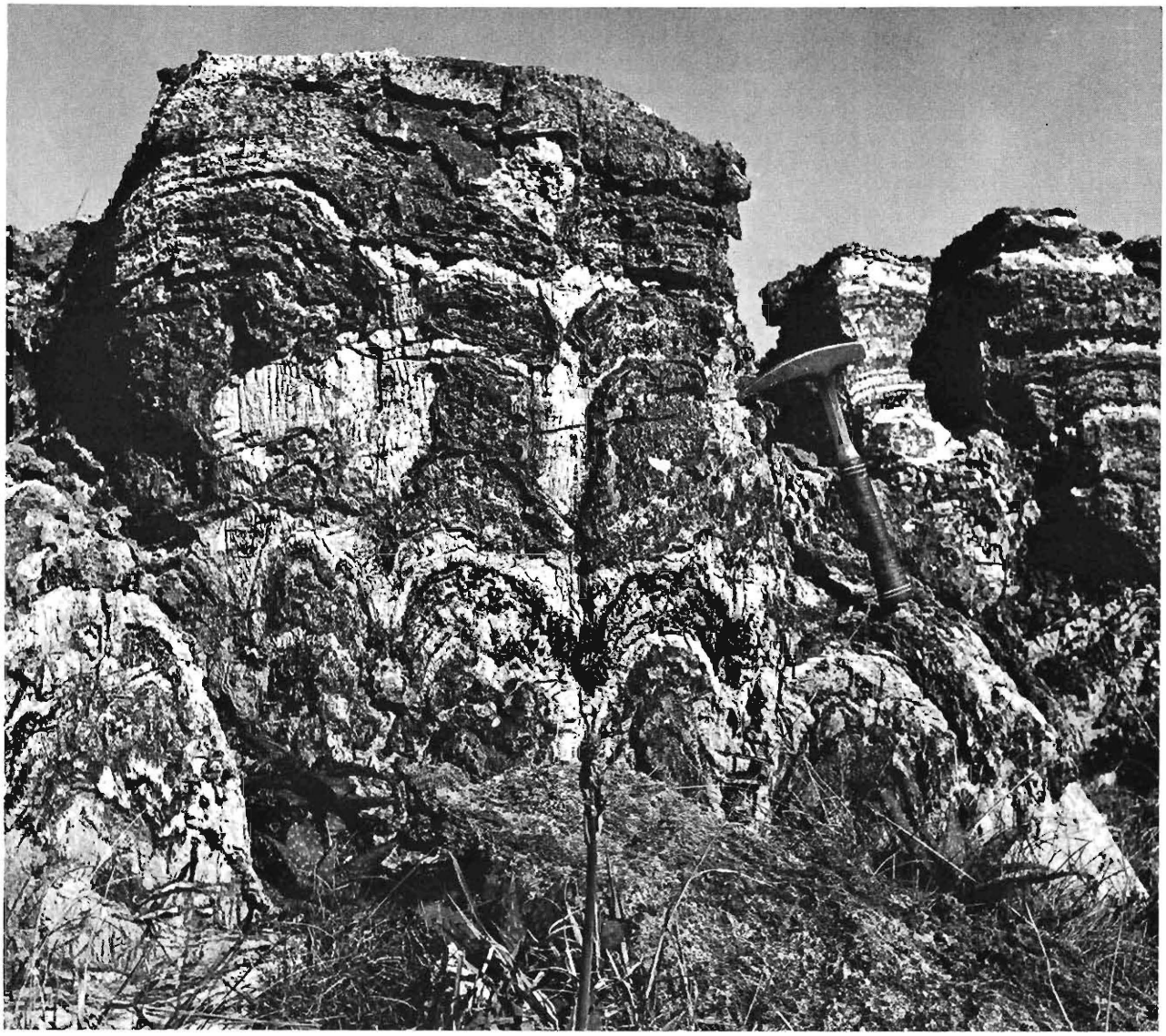


Figure 8
The domical columnar marker (DCM) (Tweefontein Formation)*
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Zwartkrans Formation

This formation is named after the locality on the farm Zwartkrans, better known for the early hominid remains recovered from cave-breccia deposits. The measured thickness of 269 metres contains a predominance of coarse recrystallized dolomite with discontinuous layers of chert. Two zones of chert-poor colour-banded dolomite occur (Fig. 3B). Thin oolite bands appear near the base of the formation and were occasionally recorded higher up. Other structures encountered include small stromatolitic domes, ripple-marked surfaces and, near the base, ill-defined columnar stromatolite horizons. This formation is characterized by the development of numerous chert breccias. Eight are shown on Figure 3C with the second from the top being in fact a composite of 3 chert breccia horizons. Several of the chert breccias contain and/or are overlain by shale. In addition, laterally impersistent dolomitic breccias are developed towards the top of the formation. Most of these occur in a zone in association with shale. Two distinctive concretionary horizons occur at a height of near 645 metres in the over-all succession. Lumpy chert concretions have a maximum diameter of 20 cm and cut across the bedding of the host-dolomite (Fig. 9). These horizons were unexposed other than in the stratotype but it seems likely that they might constitute markers in areas of good outcrop. In the area mapped, this formation lies on a watershed, and especially towards the north-east, is covered by surface breccia (Fig. 2). The upper boundary of the formation is a regionally persistent 1 metre thick chert breccia.

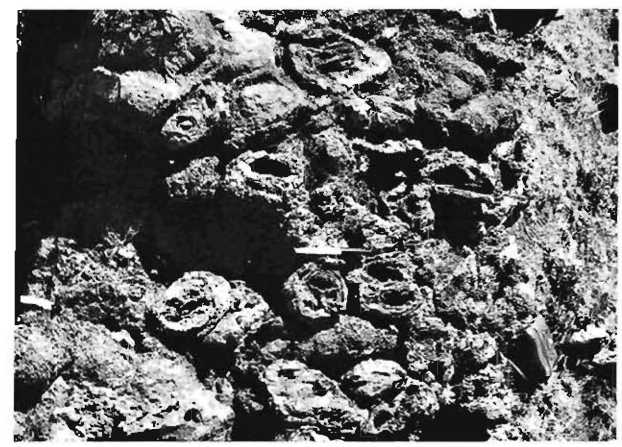

Figure 9
Concretionary horizon in the Zwartkrans Formation.

Crocodile River Formation

This formation is well exposed adjacent to the Crocodile River. A thickness of 154 metres was measured at the stratotype. Within the formation a member was established, and two markers recognized (Fig. 3A). A third horizon of linked columnar stromatolites was frequently useful in mapping and other dolomite-chert associations in the stratigraphy resulted in a detailed appreciation of this formation (Fig. 10). It will be recalled that this formation is

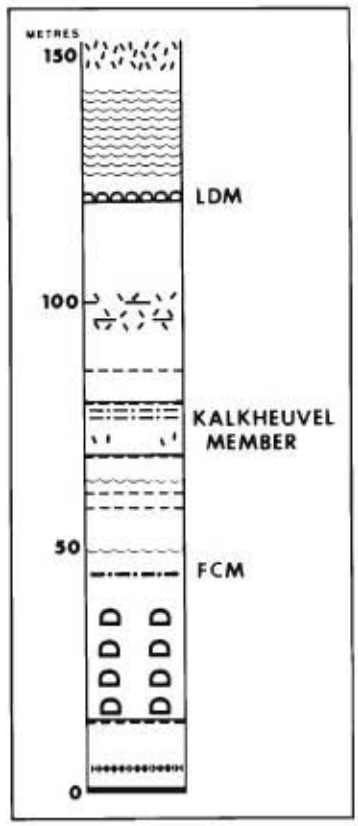

Figure 10
Stratigraphic column of the Crocodile River Formation.

underlain by a robust chert breccia. This is capped by shale (Fig. 11), and another similar chert breccia/shale is developed 15 metres higher in the succession. Immediately above the second shale a series of large elongate domes are developed through a 25 metre thickness. These are up to 2 x 5 metres in plan and have a relief which may exceed 1,2 metres (Fig. 12). Crinkled and flat lamination, the latter often displaying small parasitic domes, constitute the minor structure. This succession is capped by an horizon of colour-banded dolomite, and this in turn is overlain by the *fretted chert marker* (FCM) (Fig. 3A). This marker contains three separate horizons, each of which may be up to 25 cm thick, of ill-defined chertified columnar stromatolites which are probably developed on large flat elongate domes (Fig. 13). Between this marker and the Kalkheuvel Member an assemblage of structures includes ripple marks and chert breccias (Fig. 3C), as well as small elongate domes. The Kalkheuvel Member is 10 metres thick and consists of chert-free dolomite; it is characterised by the abundant development of quartz and calcite crystals and further by the presence of shale fragments, and also dolomitic blocks in a partly recrystallized dolomitic matrix. The shale fragments vary in size, and in attitude in relation to bedding. The largest fragments are up to 5 x 2 metres, the smallest are chips of only a few mm in size. Poorly preserved columns occur towards the top of the member. Chert breccias are developed at the top and bottom contacts, and that overlying the member is

Figure 11
Shale and chert breccia at the base of the Crocodile River Formation.

overlain by a shale band. The Kalkheuvel Member is named after the locality with this name adjacent to the Broederstroom road (Fig. 1). Above this small domical stromatolites are the predominant structure. A blocky dolomite breccia with some associated shale, and a chert breccia occur in this position of the stratigraphy. The *linked dome marker* (LDM) consists of a single layer of contiguous elongate domical stromatolites. The domes in it have a length, width and relief of up to 4, 2 and 1 metre respectively. The surface of these structures is marked by minor parasitic domes, while breccia fragments are oc-

Figure 12
Large dome below the fretted chert marker in the Crocodile River Formation.

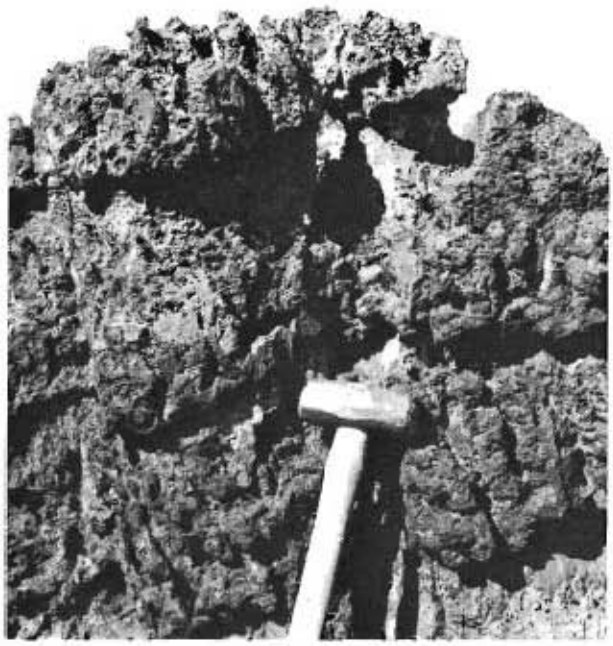

Figure 13
The fretted chert marker (FCM) in the Crocodile River Formation.

casionally preserved between the domes. In the next 23 metres (Fig. 10) small linked domes pass upwards into a thickness dominated by current and climbing ripple marks (Fig. 14) which may also contain possible crinkled stromatolites. In this part of the stratigraphy small elongate domical stromatolites are also developed sporadically. The top of the formation is defined either by a single sheet of breccia or a series of lenses of breccia distributed through a thickness of as much as 7 metres of dolomite. The breccia contains platy and block-like fragments of chert, and some dolomite, in a dolomitic matrix. Fragments reach 50 cm in length, and certain varied structures, including oolites, ripple marks and partially lined columns (Fig. 15) are present.

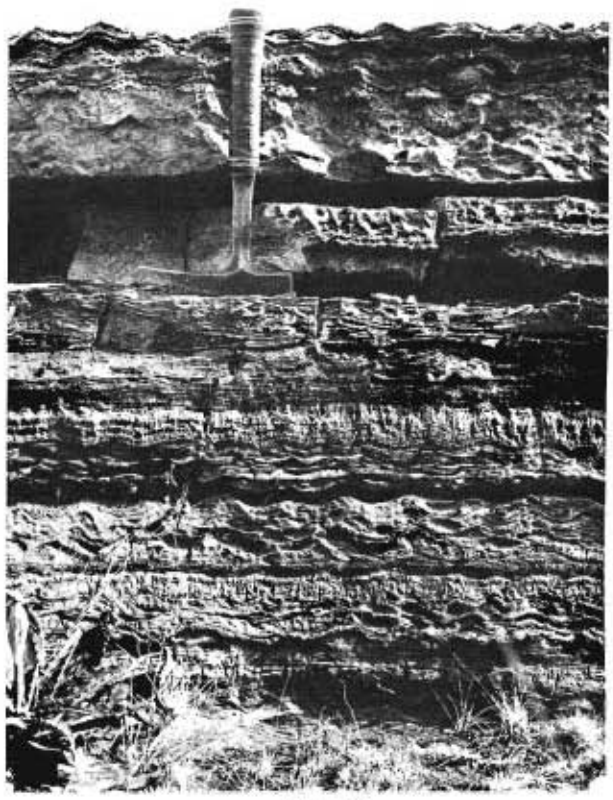

Figure 14
Ripple-marks and breccia in the Crocodile River Formation.

Figure 15
Breccia at the top of the Crocodile River Formation. Note fragment with linked columns.

Lyttelton Formation

This formation is named from the Lyttelton quarry south of Lyttelton. A thickness of 155 metres was measured at the stratotype. The formation lies between two brecciated horizons each of which has a similar dolomitic matrix. The lower of these breccias has already been described at the top of the Crocodile River Formation. The dark-coloured dolomite is essentially chert-free but there is a sporadic development of chert partings and stringers in the upper 20 metres of its development. In the uppermost four metres of the formation the dolomite becomes lighter in colour and the amount of chert increases. Large elongate stromatolitic mounds occur throughout the formation. The width of these structures ranges from less than five to over 30 metres, and the maximum length measured exceeded the latter figure (Fig. 16). It was not possible to record the full length of the larger structures. The relief, and also the inheritance, of these features was not apparent in the stratotype, but in the quarry at Lyttelton figures of three and 17 metres respectively were recorded for these parameters. Rare indistinct linked columnar stromatolite horizons were recorded in the formation as a type of minor structure in the domes. Flat lamination is however the commonest minor structure and usually displays crinkling towards the top of the formation. The dolomite commonly weathers into sharp pinnacles. It is usually well-exposed but has a varied geomorphic expression.

Hennops River Formation.

It proved necessary to construct a composite stratotype for this formation. In the area mapped much of the formation is covered by the transgressive Fountains Formation

Figure 16
Large elongate mounds from the Lyttelton Formation.

(see Fig. 2), and the only reasonably complete section that could be measured was in the Aapies, a tributary of the Skeerpoort River. In this section 68 metres of the succession was unexposed, and a further 157 metres consisted of recrystallized structureless dolomite. As a result a second section was measured west of the Hennops River. Here the lower 237 metres is well exposed on the scarp slope of the Schurveberg, but the remainder of the formation is poorly preserved and extensively leached immediately beneath the Fountains Formation. The composite stratotype is shown in Fig. 17, in which portions designated A are taken from the Aapies River section, those marked H from the section west of the Hennops River. The formation has been named for the section west of the Hennops River. However, thicknesses at the top of this section are uncertain, and as a result the figure of 388 metres given as the thickness for this unit is taken from the Aapies River.

The formation contains chert throughout. Apart from a darker zone at the top, the dolomite is light-coloured. In the lowermost 21 metres several distinctive structures occur; a 3-metre thick oolitic horizon displayed some cross-bedding and contained encapsulated breccia flakes. Well preserved columnar stromatolites, averaging 10 cm in height, 4 cm in diameter, overlie the oolites. These are overlain by a dome marker (DM) made up of large domes up to 4 m in diameter and with relief of 1,7 (Fig. 3A). This in turn is capped by a breccia with chert fragments in a dolomite matrix.

The next 116 metres form a broad zone in which, where recognisable, flat stromatolitic bedding and small domes predominate. Associated with the flat bedding, which may be very finely laminated, is a characteristic suite of structures. This includes flake-like dolomitic breccias and flat encapsulated forms (Fig. 18), and "palisade structures". The environmental significance of this assemblage, taken to suggest an upper intertidal-marginal supratidal depositional regime, has been analysed elsewhere (Eriksson and Truswell, 1974). Included in this zone are a number of horizons in which well-packed blocky chert fragments occur in a dolomite matrix.

Domical stromatolites, with occasional ripple-marks dominate the next 47 metres. The former are more than a metre in diameter at the base and become smaller upwards, approaching in size to those discussed in the underlying zone.

Abundant ripple-marks are developed in the following 171 metres of the succession. Where best seen, in the

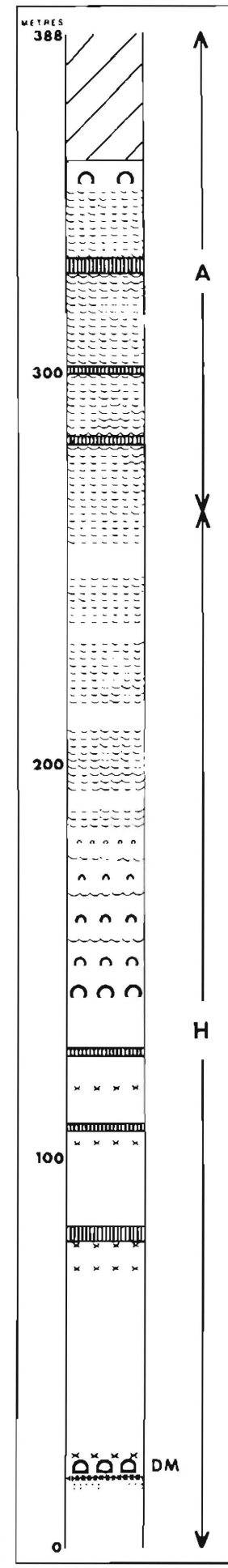

Figure 17
Composite stratigraphic column of the Hennops River Formation.

Figure 18
Flat-bedding, breccia lenses and overfolding from the upper intertidal-marginal supratidal facies, Hennops River Formation.

Aapies River section, cycles (described upwards) of ripple-marked cherts, ripple-marked dolomite, flat bedded dolomite, indistinct columnar stromatolites with quartz crystals are developed through thicknesses of 30—40 cm. Occurrences of the upper intertidal-marginal supratidal facies (see above), as well as thin oolitic lenses, were occasionally seen in association with these cycles. Large elongate domes with dimensions in plan of 3 x 2 m occur in the Aapies section near the top of this zone.

The uppermost 33 metres is composed of darker chert-poor dolomite. At both localities of the composite stratotype this zone is directly overlain by the Fountains Formation, is poorly exposed and difficult to characterise. However, some small domes and possible columnar stromatolites were seen.

III. ENVIRONMENTAL AND REGIONAL ASPECTS

The basal clastic sediments, here styled the Black Reef Formation of the Malmani Subgroup, have been studied over a wider area to the south-west of the region presently being described (Eriksson, 1972). There it was concluded that these rocks represented a marine sequence transgressing a series of confined fluvial channels. In the restricted area studied, the writers can contribute little to the study of this unit. But they do note that the nature of the coarse clastics suggests a re-working of the fluvial material, with the widespread quartzite indicating a beach and nearshore environment of deposition; while the dolomite and wad intercalations in the overlying shales relates these rocks firmly to a marine environment.

The remainder of the group is remarkable for the fact that it is composed almost exclusively of dolomite, frequently in association with chert. Non-chemical sediments are restricted to chert breccias and shale, often related to one another, but these account for less than 1 per cent of the sequence. Stromatolitic structures are developed sporadically throughout. In the Hennops River Formation an assemblage of small-scale structures has been recorded from several localities that is analogous to those from certain contemporary tidal embayments, and, as a result, an inner intertidal to marginal supratidal environment is indicated for these horizons (Eriksson and Truswell, 1974). In a part of the Oaktree Formation, and throughout the Lyttelton Formation, large elongate mounds are of comparable size to features recorded elsewhere for which a subtidal setting has been suggested (Truswell and Eriksson, 1973). Most of the stromatolites, in which overall the dome is the dominant form, are of a size indicative of formation within the intertidal zone. The nature of the sedimentation and of the primary structures present provides evidence that the sequence formed in an epeiric sea.

Reference has already been made to the complementary mapping from elsewhere around the north-west flank of the Halfway House Granite Dome, carried out near the Hennops River and at Broederstroom. This has revealed that the nine formations of the group are laterally persistent. With the exception of the Zwartkrans Formation, thicknesses are broadly comparable through this wider area. Numerous chert breccias are present in the stratotype of the Zwartkrans Formation, especially in the upper part; the variation in thickness of this unit may be related to the presence of these breccias, representing as they do manifestations of crustal instability.

At least four chert breccias with associated carbonaceous shales (chert-shales), and a carbonaceous shale horizon, can be traced through the areas mapped. The shale occurs in the Oaktree Formation, and the chert-shales at the top of the Rietfontein Formation, at the base of the Crocodile River Formation, 15 metres above this, and above the Kalkheuvel Member (Fig. 3C).

Sixty kilometres to the south, in the Potchefstroom synclinorium, 10 zones were distinguished from a study of bore-hole cores in the Malmani Dolomite (Eriksson, 1972). Correlations between these zones and the formations at Swartkops are given in Table I. Similar thicknesses are developed in the dark dolomite zones of both areas, but for the remainder there are significant variations in unit thicknessess.

In a regional study in the eastern Transvaal, Button (1974) recognised five zones in the Malmani Dolomite: namely the transition, lower dolomite and chert, chert-poor, upper dolomite and chert, and mixed zones. Based on the lack or abundance of chert he correlated four of these zones with Eriksson's succession in the Potchefstroom synclinorium. It should be noted, however, that the lower part of this chert-poor zone does contain significant amounts of chert in the central Transvaal.

In the eastern Transvaal the Fountains Formation, traced southwards, cuts down through the overlying Duitschland and Penge Formations into the Malmani Dolomite. Thus at Pilgrims Rest the preserved succession is broadly comparable with that mapped north-west of Johannesburg. The fountains Formation is a thick chert breccia, and like those which occur intraformationally, represents a residual concentration of chert rubble on an eroded surface following subaerial exposure (Button, 1968; Eriksson, 1971). The basin-wide distribution of this chert breccia is a response to regional uplift and defines a major unconformity. In the restricted area mapped, this chert cuts back for up to 400 metres through the stratigraphy (Figs. 2, 19), and this is considered to be

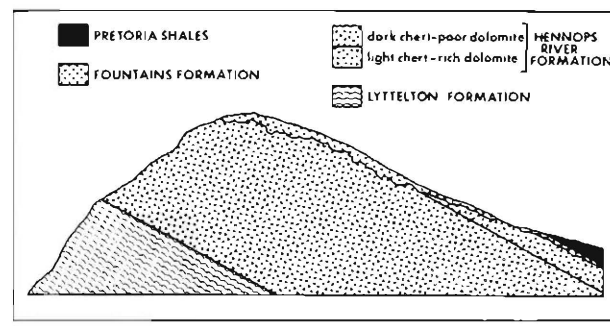

Figure 19
Stratigraphic relationships of the Fountains Formation.

related to greater localised uplift of the adjacent Halfway House Granite Dome. The intraformational brecciated cherts are of similar origin, but in all probability resulted from shorter lived, less widespread uplift. Other chert breccias, only recorded locally, are taken to reflect more local conditions. Where breaks in the record are developed in chert-poor dolomite, these are recorded by thin shale beds.

Table I
Correlation of the Zones in the Potchefstroom Synclinorium with the Formations at Swartkops

Potchefstroom Synclinorium		Swartkops	
Zone	Thickness (Metres)	Formation	Thickness (Metres)
Chert—Domical Stromatolite Zone	350	Hennops River	388
Upper Dark Dolomite Zone	160	Lyttelton	155
Finely-bedded Domical Stromatolite Zone	270	Crocodile River	154
Upper Mottled Zone			
Recrystallized Cherty Zone		Zwartkrans	269
Lower Mottled Zone			
Mixed Zone			
Columnar Stromatolite Zone	110	Rietspruit	41
Domical Stromatolite-Oolite Zone	160	Tweefontein	163
		Rietfontein	82
Lower Dark Zone	160	Oaktree	176
Kromdraai Member	2—30	Black Reef	24

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