COMMONWEALTH OF AUSTRALIA

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DEPARTMENT OF NATIONAL DEVELOPMENT

# BUREAU OF MINERAL RESOURCES GEOLOGY AND GEOPHYSICS

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**RECORDS:**

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1952/56



## PRELIMINARY REPORT ON THE GEOLOGY OF THE WILTON (BULMAN) RIVER- MT. MARUMBA AREA NORTHERN TERRITORY.



by

A.A. OPIK.

# PRELIMINARY NOTE ON THE GEOLOGY OF THE WILTON (BULMAN) RIVER - MT. MARUMBA AREA NORTHERN TERRITORY

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## INTRODUCTION

This report presents the observations collected by B. Walpole and A.A. Öpik during a five days journey in June, 1952. They were accompanied by A.D.M. Bell, resident geologist, Alice Springs. In addition a substantial amount of information on the geology of the area, collected by B. Walpole on his previous visit and communicated to the present writer, has been used in this report. The sequence of the rocks as represented here was originally outlined by B. Walpole. From the amount of information now available, it will be possible to produce a more detailed map on the basis of air photographs, which B. Walpole intends to do. The upper proterozoic age of the sediments and the presence of Collenia was first recognized in the Mt. Marumba by Haddon F. King on a recent visit. On H.T. Jensen's map (1915) the banks of the Wilton River are coloured as "Cambrian limestones and quartzite". On the map of the Commonwealth of Australia by E. David the same rocks are referred to upper Proterozoic and in the text (1950) as undifferentiated Cambrian and upper Proterozoic.

## OUTLINE OF STRUCTURE

A wide nearly regional anticline, perhaps a dome with gently dipping flanks, shows a core of the oldest outcropping sediments (A, Mt. Marumba beds). A fault as a straight linear disjunctive structure but with apparently a small vertical throw accentuates the contrast between the oldest (A) rocks in the N.E. part of the area against the younger beds in S.W. and S. The dips are low, mostly less than 5 degrees, and large areas seem to consist of nearly horizontal beds. Steeper dips and dragging are present near the main fault. The northern and southern flanks of the anticline are formed of the conglomerates and sandstones of the Wilton River beds (B). The dolerite (or diabase) sills are involved in the structures described which shows that the disturbance took place after the emplacement of the sills.

### Mt. Marumba beds

The Mt. Marumba beds have the rank of a formation consisting of stratified and laminated limestones and dolomites, Collenia bioherms, sandstones and silicified oolithic limestones deposited in marine but very shallow conditions. A section through Mt. Marumba totalling perhaps no more than 200 feet is given in Figure I.

Before the deposition of the next unit (B, Wilton River conglomerates and sandstones) part of the Mt. Marumba beds was removed by erosion. In some other outcrops different aspects of the beds are observed with different thicknesses of the members suggesting, perhaps, originally a recurrent repetition of the Collenia bioherms and repetition of the sandstones and oolites, but direct proof for it could not be obtained. The maximum thickness of Mt. Marumba beds is perhaps of the order of 500 feet.

Mt. Marumba beds are sandwiched between two diabase sills (No. 1 and No. 2, as shown in the section).

The ore (galena and sphalerite) occurs in the dolomitic limestone, in the Collenia bioherms, and in the silicified oolitic limestones. It seems that the ore is connected with certain beds and laminae, which because of their composition, have been more suitable for replacement. In rocks of uniform composition (e.g. silicified oolitic limestone) the ore is more dispersed and does not form solid seams as in the laminated limestone. In the hills west of the Wilton River dolomitic layers in the limestone are transformed into steatite or serpentine. These magnesium-minerals seem to indicate the areas of more intense mineralization.

No ore has been observed in the sandstones, perhaps, because having a central position in the sequence /in they are/the greatest possible distance from the sills.

Some interformational slumping of the laminated limestones is present and it was observed in one case that a seam of solid galena, nearly 4 inches thick and replacing a single bed, follows the same bed in all its folds in a "slump pillow" which represents a richer pocket of the ore. The slumping is, of course, an event of unconsolidated sediments, but the occurrence illustrates the selective nature of the later replacement by galena. The galena is said to be argentiferous, indicating that the ore has been introduced from outside most probably in connection with the diabase sills. It might be possible for native silver to occur at the contacts with the sills as the environment has some features of similarity with the native silver deposits at Kongsberg, Norway.

North of Mt. Marumba another type of mineralization is present. A prominent jointing of the limestones is developed here in some places and the rocks along the joints are silicified completely, or only on one side of the joint plane, whereas on the other side the silicification follows certain beds only. A displacement (faulting) seems to be present along some of the joints. The ore in such conditions seems to be more disperse being introduced in uniformly silicified rocks not possessing beds of "preference" any more.

Younger rocks

Above the ore-bearing Mt. Marumba beds follow Wilton River conglomerates and sandstones (B). The pebbles of the conglomerates are quartzite and silicified oolitic limestone, chert fragments, and, more rarely, fragments of silicified Collenia doubtless originating from the eroded parts of Mt. Marumba beds. Obviously a nonconformity exists at the base of the conglomerates against the Mt. Marumba beds, as has been already mentioned above. The silicified pebbles in the conglomerate also indicate that the silicification of the oolitic limestone of Mt. Marumba beds is ancient and happened before the intrusion of the diabase, which conditions may be seen also on the top of Mt. Marumba itself. There the silicified limestone has been transformed into "billy" with diabase boulders still preserved - normal conditions at the base of a body of a basic igneous rock (billy produced by a basalt). Silicification in this area is therefore not necessarily an indicator for the presence of ore. Of course there is no evidence of all the sills having been injected simultaneously. Some or other of the older sills may be responsible for the silicification and perhaps only one of them for the ore. But no ore-bearing pebbles have been observed in the conglomerates which still suggests that silicification preceded the sills.

Sill No. 2 is injected at the base of the conglomerate though it is not present in every section.

South from Mt. Marumba area and about half way to Mainoru, at Emu Creek, flaggy and perhaps tuffaceous shales occur

with another (No. 3) sill at the base. The shales are metamorphized slightly at the contact. It seems that Emu Creek beds (C) are above the conglomerates and sandstones (B).

Above the Emu Creek beds (C) in a southerly direction to Mainoru, at Mainoru itself, west of Mainoru, and beyond Flying Fox River the country consists of an evenly laminated shale or siltstone., (Mainoru shale, D) which easily splits in plates up to 10 feet square and a fraction of an inch thick. The shale is light grey, or, at contacts with the diabase, yellow or reddish. Sill No. 4 is injected, into that shale and minor dykes occur, as at Mainoru Homestead itself. Perhaps over 1,000 square miles or more of country is occupied by this nearly horizontal Mainoru shale which represents the uppermost unit of the pre-Cretaceous rocks of the area.

Between Mainoru and Flying Fox Creek mesas of Cretaceous fossiliferous sandstones and calcareous sediments form a capping to the ancient Mainoru shale.

The age of the rocks and events.

The Mt. Marumba beds with their Collenia bioherms are definitely Upper Proterozoic in age. For the Wilton River conglomerates and sandstones (B) and the beds up to the Mainoru shale a Proterozoic or Lower Cambrian age may be considered, but the present writer is inclined to regard them all as upper Proterozoic. The Wilton River conglomerate and sandstone, Emu Creek beds and Mainoru shale are unfossiliferous and strikingly different from any cambrian rocks of Northern Australia. They also existed as consolidated rocks before the injection of the diabase sills, which most probably are not younger than Lower Cambrian or beginning of Middle Cambrian. Pre-Middle Cambrian basalts are known in the Kimberleys, and a volcanic basalt (Turkey Creek Volcanics) has been dated by B. Walpole as Cambrian (lowermost Middle Cambrian) from the Waterhouse River - Beswick St. area between Maranboy and Mainoru. Younger volcanics are unknown in the area. A late Proterozoic age for the intrusion of the sills is not impossible.

To sum up, two Upper Proterozoic groups of rocks are present, separated one from another by a nonconformity: 1) a lower one, with limestones, sandstones and oolites, and with Collenia, the top of which is represented by the Mt. Marumba beds, and 2) an upper group of conglomerate, quartzose sandstone and siltstones. The third youngest event (tentatively Lower Cambrian) was the injection of the sills and creation of the environment of mineralization.

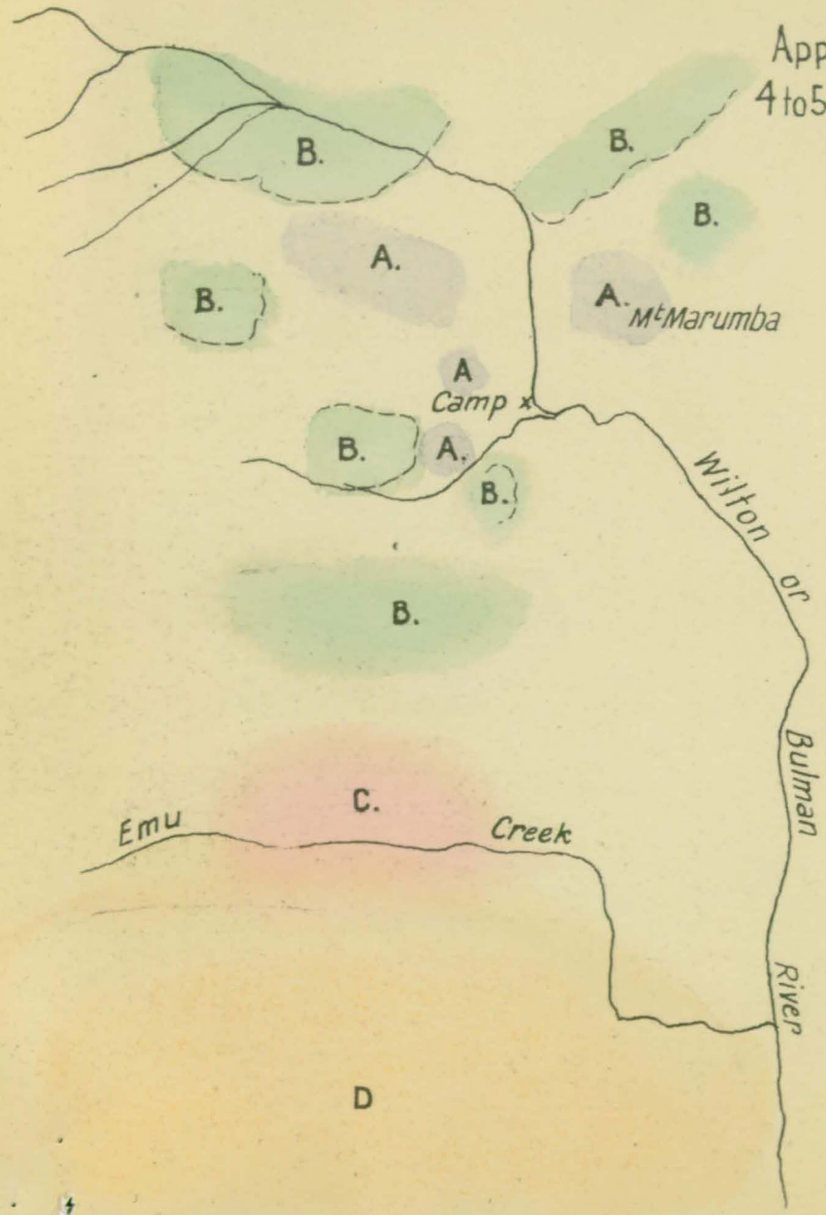
The problem of correlation

At the discussions in the field it has been assumed that the Buldiva Quartzite (Noakes 1949) is older than the Mt. Marumba beds though no direct evidence for it is present. In the main area of the Buldiva Quartzite it lies between the older Brook's Creek Group and the Daly River Group which is supposed to be all cambrian. There is still a chance that some of the Daly River rocks may be also Proterozoic in age and some of the limestones may be correlated with the Mt. Marumba beds. On the other hand the possibility of a correlation of the Wilton River conglomerate and sandstone with the Buldiva Quartzite has to be examined also, because both are older than the volcanics and sills.

The Collenia of the Mt. Marumba beds is most probably the same form as recently described by R.W. Fairbridge (Geol. Magazine, 1950) from Western Australia. It is quite possible that, as outlined by Fairbridge, a correlation all over Australia of deposits of that part of the Upper Proterozoic may be ventured.

Plan attached.
B 9/52

# DIAGRAMMATIC DISTRIBUTION OF SEDIMENTARY ROCKS IN THE WILTON RIVER - Mt MARUMBA AREA - N.T.

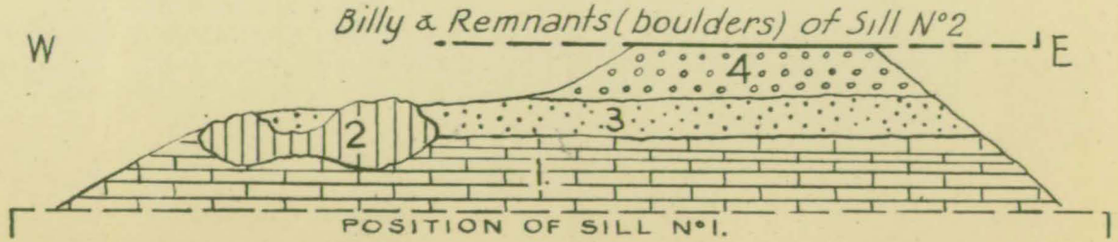



Compiled in the field by A.A.Öpik on observations by B.Walpole and A.A.Öpik - June 1952.

## SEQUENCE OF SEDIMENTS AND SILLS, ALSO LEGEND TO THE DIAGRAMMATIC MAP. THICKNESS ARBITRARY ONLY.

| | |
|---|---|
| D | *Mainoru flags* |
| SILL N°4 | |
| D | *Mainoru flags* |
| C | *Emu Creek shale (tuffaceous?)* |
| SILL N° 3 | |
| B | *Wilton River conglomerates & sandstones, with a disconformity at base.* |
| SILL N°2 | |
| A | *Mt Marumba beds with Collenia limestone, sandstone, silicified oolites and mineralization.* |
| SILL N°1 | |
| *BASE NOT SEEN* | |

## DIAGRAMMATIC SECTION THROUGH A HILL OF Mt MARUMBA TO ILLUSTRATE THE COMPOSITION OF Mt MARUMBA BEDS




1. *Flaggy dolomitic limestone, partly bituminous, with pyrite*
2. *Collenia reef*
3. *Current bedded, ripple marked sandstone*
4. *Current bedded, ripple marked silicified oolitic limestone, with sparsely disseminated galena.*