

## CORRESPONDENCE

### SUPPOSED UNCONFORMITIES IN THE OLD RED SANDSTONE OF WESTERN MORAY

SIR,—In western Moray the Middle Old Red Sandstone is reported to rest unconformably on gneisses of the Moine Series and to be itself unconformably covered by Upper Old Red Sandstone (Macgregor, 1948, p. 62). To the south of Forres the Upper Old Red Sandstone is believed to transgress the underlying Middle Old Red Sandstone and thereby to come into direct contact with the Moine Gneisses (Horne, 1923, p. 16). Recent re-investigation of the critical exposures, however, has yielded evidence which does not accord with the existing interpretation.

To the authors' knowledge the unconformity at the base of the Middle Old Red Sandstone is exposed in the district only at Scurrypool Bridge on the Altyre Burn some three miles south of Forres. In the most recent description of the stream section, Horne (1923, p. 75) states that the basal breccia of the Middle Old Red Sandstone lies on Moine gneisses, no mention being made of the attitude of the unconformity. The writers observed that the surface of unconformity is irregular and has a general dip of at least  $50^{\circ}$  to  $10^{\circ}$  N. Ten yards downstream the Middle Old Red Sandstone dips at  $20^{\circ}$  to  $355^{\circ}$  N., the discordance in the dips showing that the Middle Old Red Sandstone accumulated against a steep slope of Moine Gneiss.

The base of the Upper Old Red Sandstone is reputed to be exposed in the Muckle Burn,  $5\frac{1}{2}$  miles south-west of Forres. From this locality Horne (1923, p. 80) described a "band of brecciated conglomerate [fine conglomerate with sub-angular pebbles], 15 feet thick . . . inclined to the north-west at an angle of  $7^{\circ}$ . Its relations to the Orcadian Series [Middle Old Red Sandstone] are not exposed". Horne regarded this conglomerate as the basal member of the Upper Old Red Sandstone succession.

On re-examination, it was found that conglomerate only is exposed in the Muckle Burn at this locality, where neither its upper nor its lower contact is visible. There is thus no direct evidence that the conglomerate marks an unconformity or is in fact the basal bed of the Upper Old Red Sandstone. On the unpublished Geological Survey 6-in. maps (Elgin 10, 11, 15, and 16; Nairn 2 and 5) no evidence is recorded which would suggest that there is any discordance between the Middle and Upper Old Red Sandstone. The Upper transgresses no recognizable stratigraphic horizon in the Middle Old Red Sandstone; the strikes of bedding in the two divisions are parallel; and, where dips are given, the lower series dips normally beneath the upper. The unconformable relationship of the Middle to the Upper Old Red Sandstone in western Moray (and eastern Nairn) must therefore be regarded as not proven.

Horne (1923, p. 78) also described the contact relationships between the Upper Old Red Sandstone and the rocks of the Moine Series at Sluie, on the River Findhorn  $4\frac{1}{2}$  miles south-south-west of Forres, the only locality in western Moray where these two formations are seen in contact. He notes that "the basal [sedimentary] breccia, containing angular fragments of crystalline schists, embedded in a reddish matrix, is let down by a small fault against the old floor, but is to be seen resting on the gneiss in the walls of the gorge [to the south of the fault]".

The writers have found that, as Horne maintained, the contact between the Upper Old Red Sandstone and the Moine gneisses at Sluie is a fault. It trends  $80^{\circ}$  N., dips to the north at angles between  $70^{\circ}$  and  $80^{\circ}$ , truncates an acid pegmatite in the Upper Old Red Sandstone, and is marked by a zone of highly crushed rocks between 8 feet and 25 feet in width. The Moine gneisses close to the fault are strongly jointed, the dominant planes being parallel to the fault. The joint surfaces are smoothed and striated by

numerous slickensides which plunge steeply to the north. In thin section the gneisses show brecciation, displacement along joints, intense secondary alteration of some of the original mineral constituents, and many veins filled either by quartz or by calcite.

The effects of the fault, particularly on the tough, crystalline Moine gneisses, are of such severity that they indicate the presence of a major dislocation. Horne, however, considered that the Sluie fault was of small throw (probably of the order of 100 feet) since he claimed to have observed patches of basal Upper Old Red Sandstone in the walls of the Findhorn gorge immediately to the south of the fault. Careful re-examination of the gorge for more than a mile to the south of the fault at a period of unusually low water failed to reveal any such outlying patches. Locally, however, the Moine gneiss is heavily red-stained by solutions percolating downwards from the drift and a specimen of red-stained rock, superficially similar in aspect to Old Red Sandstone, was collected from the lip of the gorge upstream from Sluie; on close examination the patch was seen to be typical Moine gneiss, a conclusion later confirmed by microscopic inspection of a thin section.

There is thus no evidence to support Horne's contention that the Upper Old Red Sandstone occurs immediately to the south of the Sluie fault, and his inference as to the small throw of the fault is consequently unjustified. Further, what evidence there is strongly suggests that the Sluie fault is likely to be a dislocation of some magnitude.

As the only known exposure of the Upper Old Red Sandstone-Moine junction within the area is the fault junction at Sluie, it is conjectured that on its entire southern boundary, to the south of Forres, the Upper Old Red Sandstone is faulted against the Moine Series. The trend of the junction over its entire length of three miles is, on the available evidence, consistent with this interpretation.

There is thus no evidence for the southwards transgression of the Upper Old Red Sandstone on to the Moine gneisses nor is there any direct evidence for the existence of an unconformity separating the Middle and Upper Old Red Sandstone in western Moray, nor indeed anywhere south of the Moray Firth.

#### REFERENCES

- HORNE, J., 1923. *In The Geology of the Lower Findhorn and Lower Strath Nairn. Mem. Geol. Surv. Scot.*  
 MACGREGOR, A. G., 1948. *British Regional Geology: The Grampian Highlands. Second Edition. Geol. Surv. and Museum.*

G. P. BLACK.  
 D. H. MACKENZIE.

GRANT INSTITUTE OF GEOLOGY,  
 WEST MAINS ROAD,  
 EDINBURGH, 9.

19th November, 1956.

#### EROSION SURFACES IN UGANDA

SIR,—I have read with great interest the paper on "Slope Form and Erosion Surfaces in Uganda" by J. W. Pallister which appeared in your issue of November-December, 1956. In this he refers to the short published summary of the work I did on the erosion surfaces of Uganda (McConnell, 1955) and argues that I was wrong in separating the Koki Surface from the Buganda Surface as two separate cycles. This is a question which I