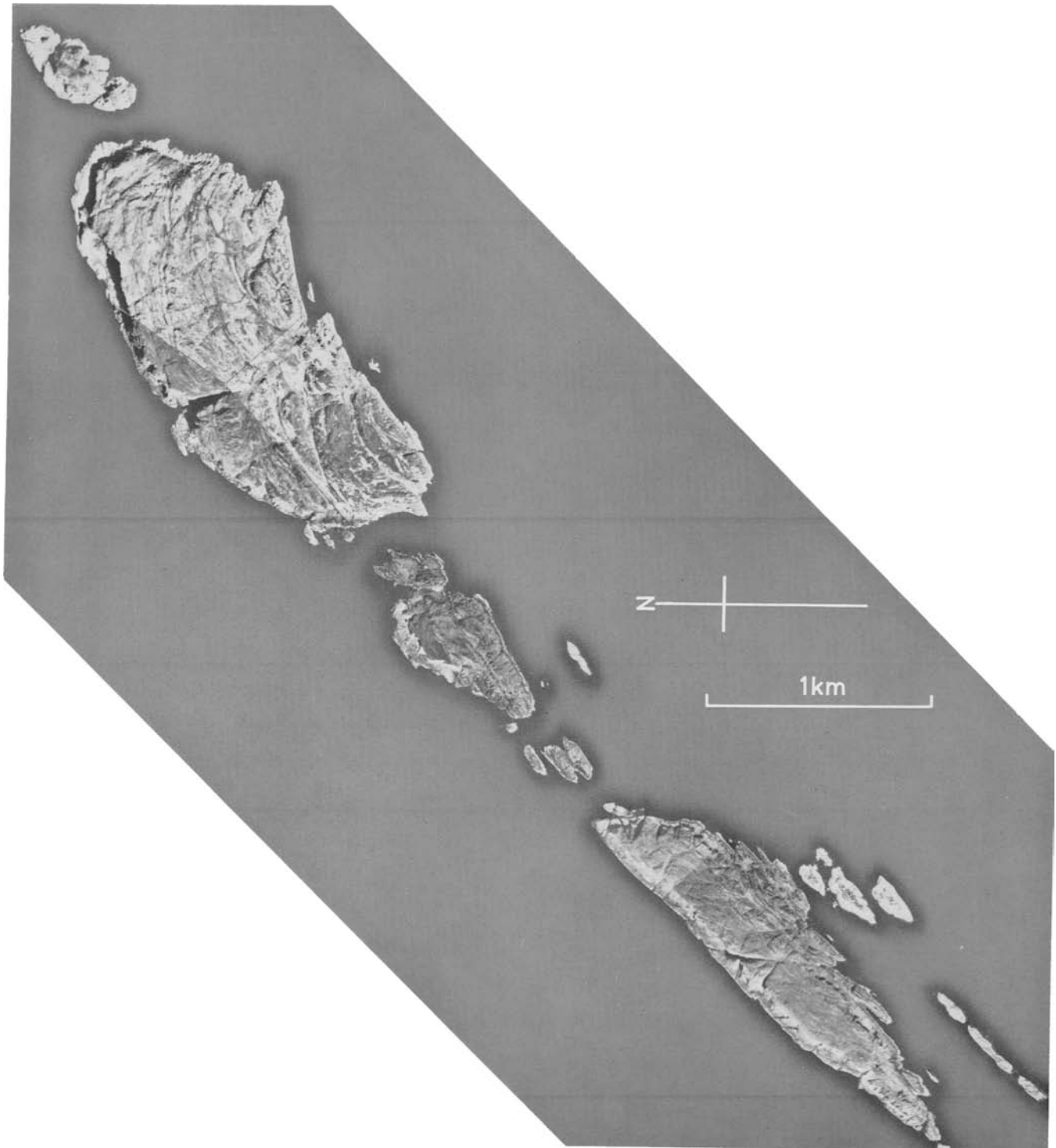


MEMOIRS OF THE GEOLOGICAL SOCIETY OF LONDON

no. 6

LATE PRE-CAMBRIAN GLACIATION
IN SCOTLAND



FRONTISPIECE

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LATE PRE-CAMBRIAN GLACIATION IN SCOTLAND

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ABSTRACT

This field study attempts to explain, in as much detail as possible, the depositional processes, environment and history of the Port Askaig Tillite in the Dalradian succession.

In the 750 m thick Tillite sequence, abundant and presumably far-travelled granite stones (up to 1.5 m in diameter) and sedimentary fragments (the largest of which measures 320 × 64 × 45 m) are contained in 47 mixtites (till-like beds with thicknesses from 50 cm to 65 m), which are separated by siltstone, sandstone, conglomerate and dolomite interbeds (ranging from a few centimetres to 200 m in thickness).

The Tillite lies at the same horizon, between formations which are rich in carbonates and contain stromatolites, for 700 km from north-east Scotland to western Ireland. Successions at five outcrops (Garvellachs, Port Askaig, Mull of Oa, Fanad, Schichallion) are described and a type section of the Tillite, containing five members, is erected in the area round Port Askaig. These members are correlated between the outcrops described and certain individual mixtites are correlated for 160 km between the Garvellachs, Islay and Fanad.

Several sedimentary features are described: (of the mixtites)

their sharp lower contacts, internal bedding, soft sediment folds, sandstone downfolds and the tectonic nature of the pebble fabric; (of the interbeds) their very variable palaeocurrents, the beach conglomerates, wave-cut erosion surfaces, varves and the outsize stones and drop-in structures produced by ice-rafting. Polygonal sandstone wedges—inferred to be of periglacial origin—are described for the first time in a pre-Pleistocene formation and are contrasted with post-compactional sandstone dykes.

After discussing and rejecting mass-flow (mudflow) and ice-rafting origins, evidence is presented that the mixtites were deposited by grounded ice sheets. Many interbeds and sandstone wedge horizons record ice-free conditions and at least 17 glacial advances and meltings are thus recognized. Many are recorded by the cycle: (base) marine (?) sediments deposited during a rise of sea-level, glacial mixtite, subaerial permafrost conditions (sandstone wedges), beach conditions (recording a transgression), marine sediments, etc. (top). Late Pre-Cambrian topography in the area was very flat and low-lying. This, plus continued subsidence, produced the thick, extensive tillite sequence.

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