Ferrar and uppermost Beacon rocks, Beardmore Glacier region

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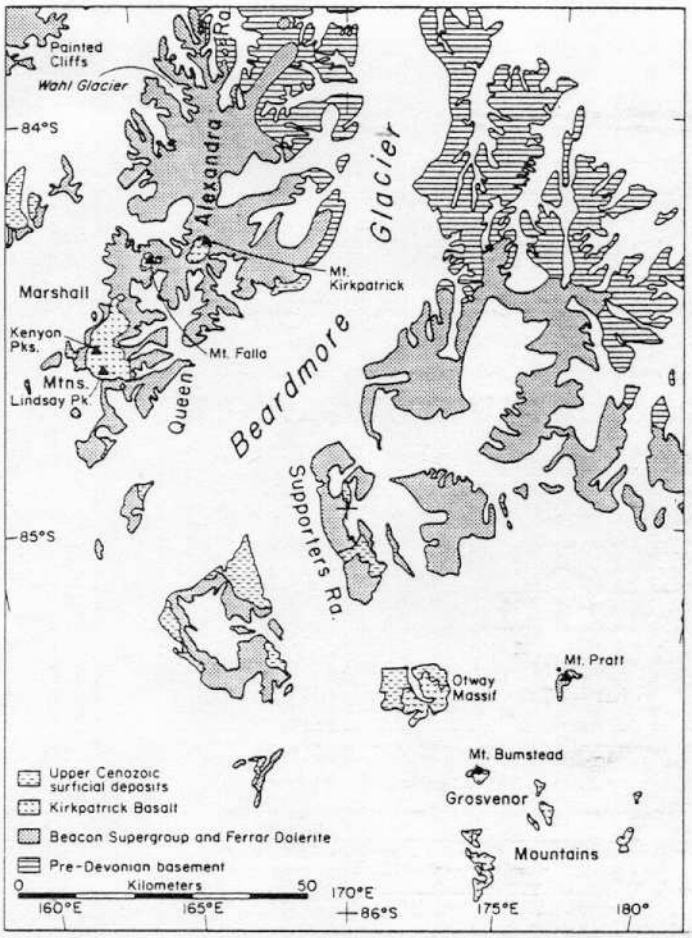
As part of the Beardmore project, we examined the volcanogenic rocks of the Beacon Supergroup that form the upper part of the Falla Formation (Barrett 1969) and the Prebble Formation (Barrett and Elliot 1972), and the overlying Kirkpatrick Basalt (Elliot 1970) of the Ferrar Group. These rocks crop out in the southern Queen Alexandra Range and south of the Beardmore Glacier in the Grosvenor Mountains and Otway Massif (figure).

Airfall debris has been found in beds as low in the section as the middle Fremouw Formation, but it is not until the middle of the overlying Falla Formation that the volcanic component becomes dominant. The upper part of the Falla at the type section is 259 meters thick and consists of a quartzose sandstone, tuff, and tuffaceous sandstone alternation (150 meters thick) overlain by a tuff unit (109 meters thick). The Falla is succeeded by the Prebble Formation which consists of coarse pyroclastic debris, tuff, and tuffaceous sandstone. The upper Falla and Prebble rocks were measured, examined for features from which the mode of deposition could be inferred, and sampled for geochemical analysis. The upper Falla, which is best exposed in the Mount Falla and Mount Kirkpatrick massifs, thins southward mainly by loss of the sandstone-tuff alternation, and the thickness diminishes to 90.5 meters or less. The base of the Prebble is defined by the incoming of coarse pyroclastic debris. The thickness of the Prebble ranges between less than 1–2 meters to at least 360 meters and possibly 440 meters. On the Otway Massif, where the thicker sections are exposed, the Prebble consists of unstratified coarse breccia with finer grained beds present only immediately beneath the Kirkpatrick Basalt lavas. Elsewhere, at Mount Pratt and the southern Queen Alexandra Range, the lithology is more varied. The mode of deposition of the finer beds includes both airfall and reworking of volcanic debris; the lapilli tuffs also include airfall deposits, as shown by "bomb" sags. Beds with accretionary lapilli are not uncommon. Surge deposits may be present but the exposure and secondary alternation preclude positive identification. The breccias represent mass flow deposits and probably include a range of mechanisms depending on water content, temperature of volcanic components, and surface slope.



Location and geologic sketch map for the Beardmore Glacier region.

On the Otway Massif, the breccias are largely unstratified even over hundreds of meters, though in a few places gradual changes in clast type or size suggest a crude layering. Locally the finer grained clasts (5–20 centimeters) show orientation suggestive of flow in a viscous medium. At other localities the breccias exhibit a rather poor stratification picked out by changes in clast concentration and type. The coarse clasts (greater than 20 centimeters) are dominated by tuff, sandstone, and diabase, whereas the finer clasts (1–20 centimeters) consist mainly of tuffaceous fragments though sandstone, shale, and coaly shale are also present. The coarseness of the debris suggests proximal sources, and the presence of intrusive breccias at Kenyon Peaks and Lindsay Peak also argues for local volcanism. The intrusive breccias, which cut the Prebble Formation or upper part of the Falla, consist of volcanic rock types that can be matched with those in the Prebble Formation itself. The thick breccias on the Otway Massif must represent some type of topographic fill, which has important implications for the geologic history. Both constructional landforms and significant valleys must have existed during Prebble time; the early phases of basaltic volcanism may also have influenced the topography. Tholeiitic magmatism clearly occurred before or during the explosive volcanism of the Prebble and prior to flood basalt eruption, because diabase clasts occur in the breccias. Likewise, the silicic volcanism continued after onset of plateau lava build up, as shown by tuff interbeds in the basalt sequence.

Kirkpatrick Basalt lava were examined in the Marshall Mountains, Otway Massif, and Grosvenor Mountains. The field relations of the lavas at Mount Bumstead were studied in detail, and from that work and subsequent work at other localities, it is now clear that there are two components to the basalt sequence. One consists of the large-volume, areally extensive, and commonly very thick lava flows which could have been derived from feeder dikes located at some considerable distance. The other consists of sequences of thin, laterally restricted, overlapping flows that give complex lava piles in which the stratigraphic order is difficult to establish except in restricted outcrop areas. These lava piles must have been erupted locally. These contrasting lavas and lava sequences fit Walker's (1972) description of simple and compound lava flows. During the course of fieldwork, well-developed weathering profiles were observed at the tops of some flows, and some of these profiles have the characteristics of paleosoils. The lava flows, weathering profiles, and the tuffaceous interbeds were extensively sampled for petrographic and geochemical study. On reexamination of Mount Pratt, no lava was observed and that group of nunataks was found to consist entirely of diabase sills except for the one small outcrop of Prebble previously reported. Diabase sills were also sampled at the Painted Cliffs and near the mouth of the Wahl Glacier, and diabase dikes were collected in the Supporters Range.

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