Geologic studies in the Prince Albert Mountains

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As part of a continuing program of investigations into the Jurassic magmatic rocks associated with Gondwanaland breakup, the Mawson Formation, Kirkpatrick Basalt, and Ferrar Dolerite were examined in the Prince Albert Mountains (figure) between 13 January and 4 February 1997. Put-in and pick-up were by LC-130, and the field investigations were aided by 2 days of helicopter support. This region was initially investigated by Skinner and Ricker (1968) and later more detailed observations and sample collections were made by Kyle (1979) and Wörner (1992).

The pyroclastic rocks of the Mawson Formation were examined at Ambalada Peak, at Thomas Rock and outcrops to its east and north, and at Sheppard Rocks. Although referred to as the "Exposure Hill Formation" by Wörner (1992), Kyle (1979) first noted the occurrence of these rocks and referred them to the "Mawson Formation"; his terminology is followed here. The pyroclastic rocks include breccias, lapilli tuffs, and tuffs. Armored lapilli, cored bombs, and fluidal basalt fragments are sparsely distributed in the breccias; outsize clasts are locally common, and in some outcrops, sedimentary rock fragments are an important component of the breccias. These and other features are indicative of hydrovolcanic processes having a role in the formation of these breccias, as has been documented for the correlative rocks in the central Transantarctic Mountains (Hanson and Elliot 1996). Thin sequences of lapilli tuff and tuff also occur and appear to include both airfall and base surge deposits. Two short sections consist of volcaniclastic strata with interbedded accretionary lapilli tuff: these rocks have similarities to the Carapace Sandstone (Ballance and Watters 1971). The upper and lower contacts of the formation are exposed at Thomas Rock, but the geologic relations are unclear because of apparent tilting of the Mawson Formation strata. Rocks similar to the lapilli tuffs and tuffs of the Mawson Formation are interbedded in the lower part of the basalt sequence at Thomas Rock. A short visit to Reckling Peak revealed the presence of Triassic strata cut by dolerite intrusions and intrusion breccias. The possible ignimbrite mentioned by Wörner (1992) was not located, and pumice fragments were not observed at Thomas Rock. The exposed and measured section at Ambalada Peak was only 70 meters thick, compared with the 200 meters reported by Kyle (1979); it is possible that additional unexamined or unexposed strata make up the difference.

The Kirkpatrick Basalt at Brimstone Peak was examined and collected in detail for geochemistry and radiometric age dating. Collections of secondary minerals were made at Brimstone Peak and Tent Rock to study the postmagmatic hydrothermal circulation systems. Sills at Thumb Point, The Mitten, Richards Nunatak, Beckett Nunatak, and Shultz Peak were also examined, and detailed collections were made for geochemical and isotopic study.

Inclement conditions curtailed the last week of fieldwork and prevented some objectives in the Ambalada Peak–Griffin Nunatak region from being met.

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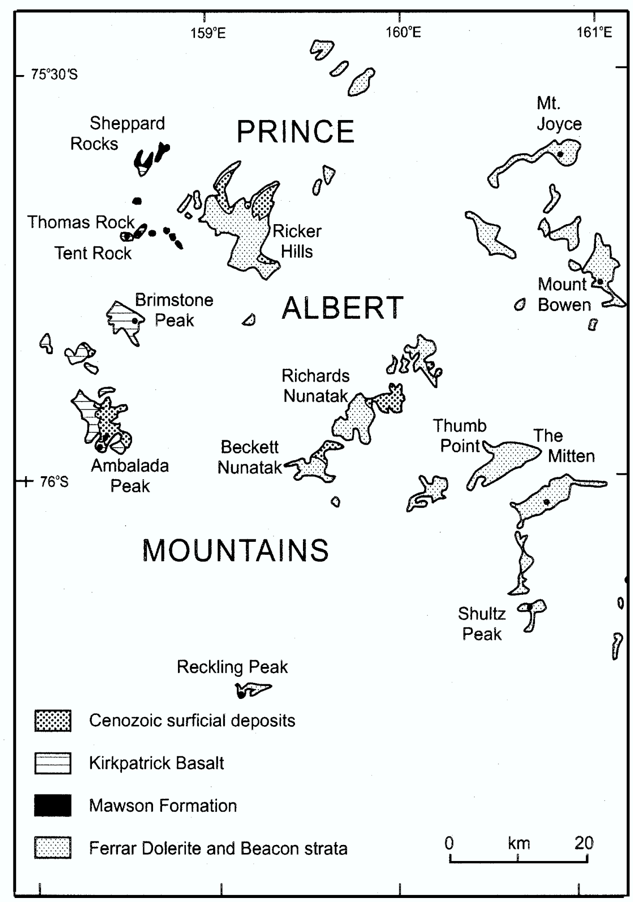

Location and simplified geologic map of the Prince Albert Mountains region, southern Victoria Land. Ferrar Dolerite sills are co-extensive with the Beacon Supergroup strata; however, the Beacon rocks are much subordinate to the sills and form only thin sequences between the sills or occur as rafts within the sills.

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Stratigraphy and depositional environments of Permian postglacial rocks exposed between the Byrd and Nimrod Glaciers

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Permian postglacial rocks exposed in the area between the Nimrod and Byrd Glaciers (figure 1) were studied during the 1993–1994 austral summer. Prior to this field season, upper Paleozoic rocks in the central Transantarctic Mountains were known to occur only in the area from just north of the Nimrod Glacier to the Ohio Range (Laird, Mansergh, and Chappell 1971; Elliot 1975; Barrett 1991; Collinson et al. 1994; figure 1). Upper Paleozoic rocks, including the postglacial shales and sandstones, are now known to extend to at least the Byrd Glacier (Isbell et al. 1994). The purpose of this article is to provide a brief description of the postglacial rocks in this area and to interpret their environment of deposition. Laird et al. (1971) first correlated postglacial rocks just north of the Nimrod Glacier with rocks of the Mackellar Formation in the Beardmore Glacier region. Because these rocks can be traced as far as the Wallabies Nunataks (figure 1), we apply the name "the Mackellar Formation" to all postglacial shale and sandstone successions between the Nimrod and Byrd Glaciers. In this area, rocks of the Mackellar Formation include all shale and thin fine- to medium-grained sandstone beds that occur above a sharp contact with diamictites of the underlying Pagoda Formation and below the gradational contact with thick medium-grained sandstones of the overlying Fairchild Formation (Isbell et al. 1994). Rocks of the Mackellar Formation range from 16 to 52 meters (m) thick, and the thickest rocks occur in the central portion of the study area near Chappell Nunataks (figure 1). The postglacial rocks thin toward the Byrd Glacier as well as toward the Ross Ice Shelf and the polar plateau.

In the study area, rocks of the Mackellar Formation occur in multiple coarsening-upward successions (CUSs). A complete CUS contains, in ascending order, the following lithofacies:

- shale,
- shale and interbedded fine- to medium-grained sandstone, and
- medium-grained sandstone containing foreset beds (figure 2).

These lithofacies form one to three 16- to 30-m-thick CUSs.

The shale lithofacies at the base of the CUS is in sharp contact with either diamictite at the top of the Pagoda Formation or with medium-grained sandstone at the top of an underlying CUS (figure 2). These black to gray shales are 1 to 5 m thick and are laterally continuous across outcrop faces. Claystone occurs at the base of this lithofacies and grades progressively upward into alternating laminae of mudstone and siltstone and ultimately into alternating laminae of mudstone and very fine-grained sandstone.

The shale lithofacies grades upward into the 7.5- to 30-m-thick shale and interbedded very fine- to medium-grained sandstone lithofacies (figure 2). Sandstone layers in this lithofacies

- are 0.002 to 2 m thick;
- rest on sharp to erosional bases;
- display graded bedding; and
- are dominated by horizontal laminations with primary current lineations, trough cross-laminae, and climbing ripple laminations.

Small load structures and small-scale overturned and folded laminae are also common. Individual beds, which thin and fine laterally, display a slight downward dip in a direction parallel to paleocurrent orientations. These beds grade laterally into finer grained deposits. Rare symmetrical ripples occur on the updip portions of the dipping sandstone beds. A low-diversity ichnofacies containing *Isopodichnus* occurs on shale and sandstone bedding planes.