LC–130 landed the British party of four men with three dog teams and supplies for 70 days on Stratton Glacier, at the western end of the Shackleton Range.

R. B. Wyeth, assisted by G. K. Wright with one dog team, carried out detailed field mapping around Blaiklock Glacier using the landing-site supply depot, while P. D. Clarkson, assisted by M. A. Warden with two dog teams, carried out reconnaissance and detailed field mapping in the Read and Herbert Mountains using both the landing-site depot and depots established in previous seasons.

At the western end of the range, Wyeth made a detailed study of the Turnpike metamorphics to the south and west of the head of Blaiklock Glacier. At the type locality (Turnpike Bluff), this is a sequence of quartzites and highly cleaved slates of unknown thickness, with the strike of cleavage and original bedding generally east–west and following the major structural trend of the range. This group is brought against the basement rocks of the Shackleton metamorphics by an east–west fault south of Mount Pivot.

The Shackleton metamorphics in this area form the dividing ridge system between Stratton and Blaiklock Glaciers and also extend westwards through Mount Homard and Mount Pivot. These rocks are primarily medium-grade gneisses and schists with some amphibolites and occasional marbles, which are in general similar to the basement rocks throughout the range.

In the northwestern part of the range, across the mouth of Blaiklock Glacier, are the sedimentary Blaiklock beds. In the area of Mount Provender, Pratt Peaks, and Mount Gass, the lower group of thinly bedded sandstones with grit, shale, and conglomerate bands lies unconformably on the Shackleton metamorphics. The upper group of grits with feldspathic and heavy mineral horizons occurs around Trey Peaks, Mount Haslop, and Mount Lowe, but the contact with the Shackleton metamorphics was not seen in this area. The intermediate group is not exposed, but it is presumed to lie beneath Blaiklock Glacier. The only evidence of this group is shale debris in moraine below Pratt Peaks. These shales contain inarticulate brachiopods, the only fossils found so far in the range. Throughout the Blaiklock beds sedimentary structures are common and, with other criteria, suggest a local source area, probably on the Shackleton metamorphics.

In the Read Mountains, work continued eastwards from Glen Glacier. The main rock types encountered were medium-grade gneisses, although a granite mass was found southwest of The Ark. Farther east is a small outcrop of flat-lying quartzite thrust over gneisses. A similar contact but dipping to the south was found about 8 km to the northeast. Here the quartzites are overlain by calcareous sediments and a sequence of slates of unknown thickness. This group presumably belongs to the Turnpike metamorphics, but the presence of grit and conglomeratic bands in this area suggests that it represents a different part of the succession to the rocks at Turnpike Bluff. It was not possible to follow the sequence through to the slates and quartzites immediately north of the Read Mountains escarpment, but they appear to belong to a similar level in the succession. Further work in this area was curtailed by bad weather.

The main objective in the Herbert Mountains was to extend previous reconnaissance mapping. It now appears that the mountains can be divided into three groups. The central and northern group comprises mainly acidic gneisses, which become more basic southwards until a very thick sequence of amphibolites is reached. The eastern ridges are essentially basic garnet-gneisses, with amphibolites and calcareous paragneisses to the south. South and west of Mount Absalom is a variety of gneisses and schists with a prominent outcrop of marble, and most of these rocks are well folded.

Dolerite dykes were found in the central Herbert Mountains and at Pratt Peaks. Hopefully, these dykes will provide useful paleomagnetic and age data, particularly the dyke at Pratt Peaks because it intrudes the Blaiklock beds.

Despite the initial delay and long periods of poor weather in the Read and Herbert Mountains, the season was successful, although some areas were not examined in as much detail as was originally intended. Thanks are due to the National Science Foundation and USARP for their assistance, and especially to Commander D. B. Eldridge and the officers and men of VXE–6 who flew the missions.

Structural studies in the Scotia Arc: Canal Beagle, Tierra del Fuego

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Through the courtesy of Juan Pedrals G., administrator, and Eduardo Gonzáles P. of the Departamento de Exploraciones, Empresa Nacional del Petroleo (National Petroleum Company of Chile, ENAP), the author was able to undertake field work along the shores of Canal Beagle in southern Tierra del Fuego during July 1970. He accompanied two ENAP geologists, Raúl Cortés R. and Sergio Cespedes H.,

who were carrying out regional geologic studies of Magallanes Province, on board the chartered cutter *Ivan*. The weather was excellent for field work despite the season. Limited daylight (approximately 0800–1700 hours) imposed the only restriction. The author's work forms part of a continuing study of the tectonic history of the Scotia Arc region supported by the National Science Foundation (Dalziel, 1969, 1970, and 1971; Dalziel *et al.*, 1970).

As noted by Kranck (1932, p. 116), sediments belonging to the Yahgan Formation of Isla Navarino, Isla Hoste, and Isla Gordon can be traced across Brazo Noroeste of Canal Beagle (north of Isla Gordon) into Cordillera Darwin in the vicinity of Seno Garibaldi (see map). Here the sediments were found to be structurally overlain by acidic and basic igneous rocks and by metasediments of unknown affinities. All have been involved in complex polyphase deformation. The metasediments have been involved in high grade regional metamorphism and syntectonic regional migmatization. The deformed rocks are cut by acidic plutons. Hence, pretectonic, syntectonic, and posttectonic granitic rocks can be recognized.

The structure is dominated by a mylonitic foliation that is parallel to the compositional layering and the axial surface of isoclinal folds, and by an associated mineral elongation lineation. The folds, foliation, and lineation are deformed by typical secondary structures such as asymmetric folds with an accompanying crenulation or strain-slip axial surface foliation.

Thus the present work confirms the suggestions in Kranck's classic study of the Fuegian Andes (Kranck, 1932), recently supported by Katz (1964), that Yahgan sediments were involved in the deformation of the so-called Cordillera Darwin (or Central Cordillera) "high-metamorphic" schists. Therefore, the major stratigraphic problem of the cordillera is to separate the late Mesozoic metamorphic rocks from the older "basement" schists that can be recognized along its northern margin in Seno Agostini and the fiords south of Seno del Almirantazgo.

Previous work by the author (Cortés and Dalziel, 1970; Dalziel, 1970 and in press; Dalziel and Elliot, in press) indicates that elsewhere in the Patagonian and Fuegian Andes the effects of the late Mesozoic-earliest Tertiary Andean orogeny were restricted to a single important deformation phase, low grade regional metamorphism, and posttectonic granitic intrusions. Deformation and metamorphism comparable to that of the orthotectonic belts of the Appalachian-Caledonian and Alpine orogens seem to have been confined to Cordillera Darwin (cf. Katz, 1964).

Material was collected for microscopic studies of deformation/metamorphism relationships, paleomagnetic analysis, and geochronologic analysis.

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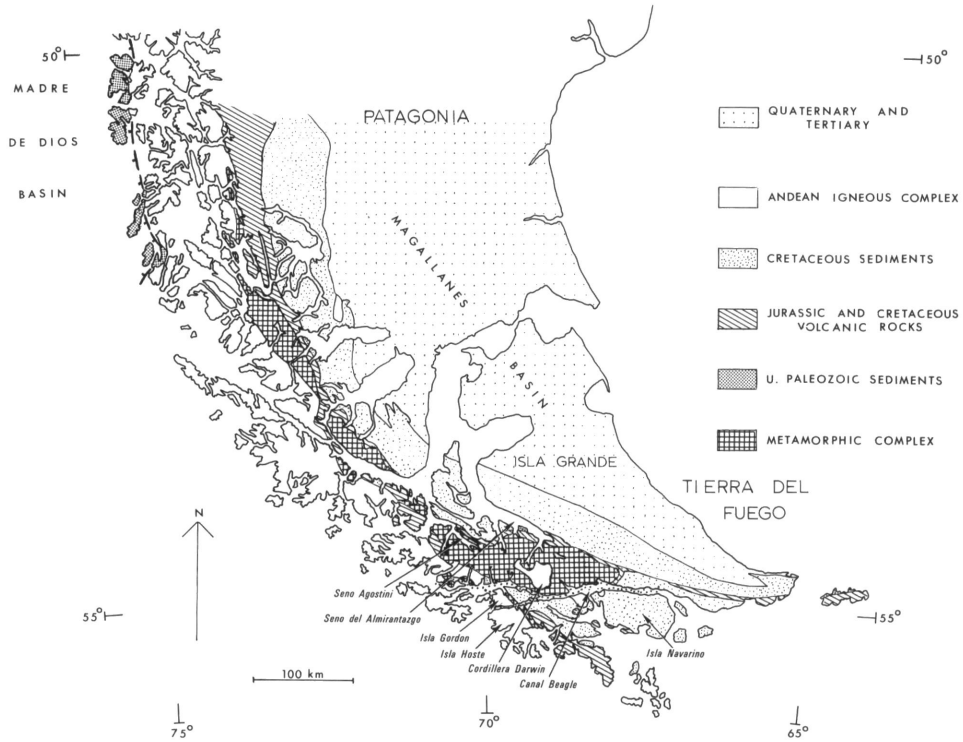

Simplified geologic map of southern South America. The dotted line extending through Canal Beagle shows the location of the traverse made during the cruise of *Ivan*.

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Structural studies in the Scotia Arc: the South Orkney Islands. R/V *Hero* Cruise 71–1

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The South Orkney Islands phase of *Hero* Cruise 71–1 took place during February and March 1971. It started from Palmer Station and terminated at Punta Arenas, Chile. The purpose of the cruise was to study the geology of the South Orkneys as part of a continuing program supported by the National Science Foundation to elucidate the structure and tectonic history of the Scotia Arc (Dalziel, 1969, 1970, 1971, and in press; Dalziel *et al.,* 1970). The author was assisted by Stephan and Alice Brocoum and Mark Barsdell, all of Columbia University.

The South Orkney Islands are located on the South Scotia Ridge some 650 km east of the Antarctic Peninsula. Geologically they are composed (see map) of a metamorphic complex of unknown age, comparable to that of Elephant, Gibbs, and Clarence Islands in the South Shetlands group, a thick succession of graywackes and shales comparable to the probably late Paleozoic Trinity Peninsula Series of the Antarctic Peninsula, and late Mesozoic conglomerates. The metamorphic (and late Mesozoic) rocks are cut by a few undeformed diabase dikes. Earlier work in the group has been carried out by members of the Scottish National Antarctic Expedition (Pirie, 1905 and unpublished), and by the British Antarctic Survey (Adie, 1964).

Owing to the rugged nature of their terrain it proved most efficient to study Laurie, Powell, Fredriksen, and Coronation Islands (see map) using the ship as a base and making landings using an inflatable rubber boat. Over 150 landings were made on Laurie Island, 10 on Powell Island, eight on Fredriksen Island, and two on Coronation Island. Signy Island was studied for 3½ weeks from a base camp.

Preliminary scientific results

Laurie Island. The whole highly indented coastline was mapped in detail. The suggestion by Matthews and Maling (1967, p. 2) of the presence of late Mesozoic conglomerates is incorrect unless these rocks are confined to nunataks. Only rocks of the Graywacke-Shale Formation (formerly Graywacke-Shale Series) were seen.

In lithology and structural style the Graywacke-Shale Formation is virtually indistinguishable from the Trinity Peninsula Series, the Miers Bluff Formation in the South Shetland Islands, and some rocks of the Madre de Dios basin in Chile previously studied by the author (Dalziel, 1969, 1970, and in press; Dalziel *et al.,* 1970).

The rocks are highly deformed but essentially unmetamorphosed. The reported north-northwest to south-southwest trending strike and fold axis orientation (Pirie, 1905 and unpublished; Adie, 1964) is in fact confined to a narrow zone near the Argentine base Orcadas, built on the site of the Scottish Expedition's base. The dominant strike is east-west in the central part of the island and north-south at the east end. Large-scale recumbent and reclined folds involving over 1,500 m of strata are present, and their limbs are deformed by later structures.

Fredriksen Island. Although similar to the Graywacke-Shale Formation of Laurie Island, the sequence on Fredriksen Island contains more shale. The rocks are again highly deformed but unmetamorphosed. They generally dip at moderate angles to the south-southwest. British Antarctic Survey geologists report the presence of a "greenstone" sill at one locality.

Powell Island. The southern part of the island consists of flat-lying late Mesozoic conglomerates. The northern part is composed of medium grade metamorphic rocks like those of Signy and Coronation Islands, and not Graywacke-Shale Formation as previously mapped (Adie, 1964, p. 129; Matthews and Maling, 1967, fig. 1). The metamorphics have

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