Preliminary Geologic Report on the 1961 U.S. Expedition to Bellingshausen Sea, Antarctica

Abstract. Five areas of outcrop were examined along 120 miles of the coast of the Bellingshausen Sea east of the Thurston Peninsula. Hornblende quartz diorite is the principal rock in the area and occurs in a body of batholithic dimensions. The quartz diorite contains inclusions of older granulitic rock and is cut by mafic dikes. An island in Paradise Harbor on the Palmer Peninsula was also examined briefly.

New geologic data were gained from the little-known Eights Coast when the U.S. Navy icebreakers Glacier and Staten Island penetrated the Bellingshausen Sea between 6 February and 8 March 1961. Landings were made by helicopter at five areas of outcrop, the most easterly of which was an isolated nunatak at about lat. 73°04′S, long. 90°08′W. The coordinates of the other stations are shown in Fig. 1. The coast was seen by air to a point at lat. 72°30′S, long. 88°W. In addition, a brief examination was made of a small island in Paradise Harbor near Gonzalez Videla, the Chilean Base on the Palmer Peninsula.

The part of the Eights Coast visited this year consists of several islands surrounded by shelf ice, much of which is afloat. Ice rises, however, clearly indicate that the ice is aground at several places. Rock exposures are few, and are largely restricted to the nunatak and to cliffs on the seaward sides of the islands.

The principal rock exposed is quartz diorite. It is a light-gray to light medium gray, chalky white to buff-weathering, medium- to medium-coarse-grained rock with very poor to good foliation. Plagioclase, quartz, and hornblende (field identification only) are its major constituents, although some phases contain biotite and others are almost devoid of mafic minerals. In most specimens the hornblende is erratically distributed. Some specimens have ghostlike streaks of hornblende, which suggests that inclusions of amphibolite have been incompletely digested. This rock most probably comes from a border zone of the quartz diorite body. Foliation trends northeast to east-northeast and dips steeply to the southeast. Several sets of joints are present, the most prominent of which is a set of cross joints.

Float specimens of a more granitic character were collected from the nunatak. These specimens have either seriate porphyroid or aplitic textures. Rocks of both textures appear to contain considerable amounts of potassic feldspar and may be either quartz monzonite or true granite. The relation of these rocks to the quartz diorite is not known, but it is likely that they are more felsic phases of the major unit.

The quartz diorite is the same unit found by Craddock and Hubbard on the Thurston Peninsula in 1960 (*1*). The rock has been found over a distance of greater than 300 miles diagonal to the strike, and its most northerly and southerly exposures are about 135 miles apart (Fig. 1). Thus the body has batholithic dimensions and is certainly the predominant rock of this part of Antarctica. It is apparently overlain unconformably by basaltic volcanic rocks in the Jones Mountains. A University of Minnesota geological party worked in these mountains this year and will be able to describe this relation in more detail. The age and correlation of the quartz diorite are unknown at present, but it is hoped that biotite from it will be suitable for K-Ar absolute age determination.

At lat. 72°35′27″S, long. 95°07′W, the quartz diorite has intruded a peculiar feldspathic rock. This rock is medium gray, medium grained, and has a slight greasy luster. It is composed principally of plagioclase and black, shotlike grains of pyroxene, and has a distinct granulitic texture. A very rapid check in oils shows that the plagioclase is highly calcic, probably labradorite, and that the pyroxene is orthorhombic, probably hypersthene. The rock has a gabbroic composition, but its texture and general appearance suggest that it may be a mafic charnockite. The contact of the two units is essentially conformable, and a minor zone of migmatite and veined gneiss is present. The granulitic rock is definitely the older, as inclusions of it are found within the quartz diorite. The granulitic unit may well be true basement, but data are too scanty to establish this. The extent of the granulitic unit is not known, but it appears to be exposed in cliffs east-northeast of this location. Severe crevassing of the ice and lack of time prevented the examination of these exposures.

Very fine grained mafic dikes of lamprophyric appearance cut the quartz diorite at several locations. These dikes range from a fraction of an inch to about 15 feet in width and show a marked preference for filling cross joints. In most exposures, the dikes are sheared and chloritized, and the surrounding rock is stained by hydrous iron oxide.

Little information was gained about the structure of the area visited. The major feature, of course, is the northeast-trending batholith of quartz diorite that is overlain to the south by basaltic volcanic rocks. Distinct evidence of faulting was found at lat. 72°36′S, long.

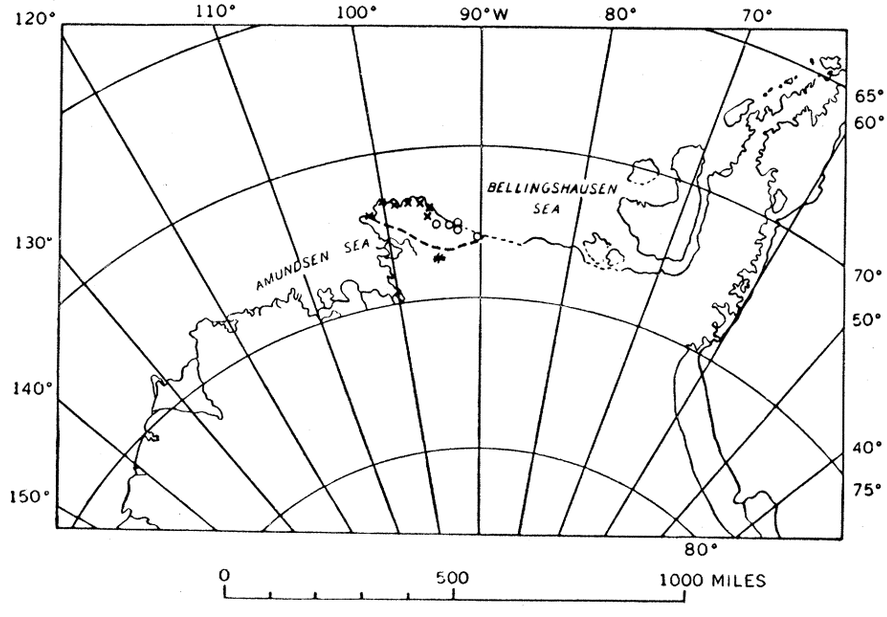

Fig. 1. Outline map of part of western Antarctica, showing location of quartz diorite exposures visited (O), those reported by Craddock and Hubbard (*1*) (X), and point at which quartz diorite is overlain by basaltic volcanic rocks (#). The dashed line indicates approximate area of exposure of the batholith.

93°24′W. Almost vertical, west-facing cliffs stand above the sea ice and form the shoreline of the island. The rock is cut by a large number of slickensided and grooved vertical slip planes and vertical cataclastic zones showing dip-slip movement. The slip planes and cataclastic zones strike north, parallel to the shoreline. This similar orientation suggests that the shoreline is fault controlled.

Rocks of two types were collected from the exposure in Paradise Harbor. The first of these is a medium-gray, medium-grained, sparsely mafic rock of dioritic composition that is not at all like the quartz diorite of the Eights Coast. The second type occurs as inclusions in the dioritic rock and is an odd, dark-gray, fine-grained to fine-medium-grained rock that is composed principally of calcic plagioclase—either calcic andesine or laboradorite. Epidote, sparse masses of chlorite, and magnetite-ilmenite are the only other minerals identified as yet. This rock may be an old andesite or crystal tuff, although it does not resemble Adie's descriptions of such rocks (*2*). A University of Wisconsin geological party did considerable work in this area last austral summer and will undoubtedly present much more geologic data (*3*).

AVERY ALA DRAKE, JR.
U.S. Geological Survey,
Washington, D.C.

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2. R. J. Adie, *Falkland Islands Dependencies Survey, Scientific Reports* (1954).
3. Publication of this report was authorized by the director, U.S. Geological Survey.

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Histochemical Distribution of Acid Phosphatase in Healing Wounds

Abstract. When wounds are inflicted in the palate, tongue and skin of Wistar rats and guinea pigs, acid phospatase activity in proliferating epithelium of these wounds is markedly decreased from that in normal epithelium; the enzyme reappears as soon as keratinization is evident. In connective tissue the enzyme is found especially in foreign body giant cells and in histiocytes in macrophagic function.

The histochemical distribution of acid phosphatase has been studied in wounds of the palate, tongue, and dorsal skin of 30 Wistar rats and 50 guinea pigs. The wounds were inflicted in such a way as to produce a loss of substance of convenient size, and the animals were killed after 3 days and 1, 2, and 3 weeks. The area of the wound, including a wide margin of normal tissue, was removed.

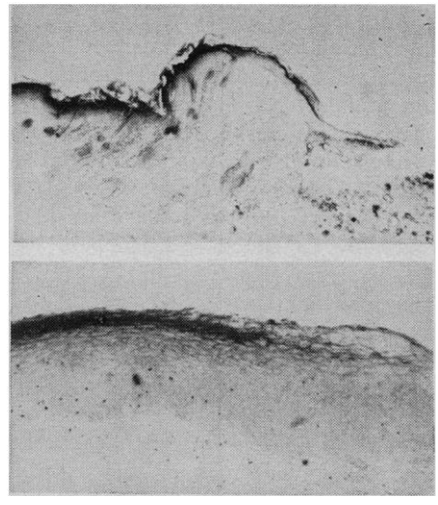

Fig. 1. (Top) Survey view of a 7-day-old wound in skin of guinea pig. Note the marked reduction in enzymic activity in the margins of the proliferated epithelium. Rutenburg and Seligman technique; incubation time 2 hours (about × 13). (Bottom) Part of margin of 7-day-old wound in guinea pig tongue. Note the abrupt decrease in the response of the upper epithelial layer. Rutenburg and Seligman technique (about × 60).

The demonstration of acid phosphatase was done with the methods of Burton (*1*), Gomori (*2*), and Rutenburg and Seligman (*3*) on unfixed sections and on sections fixed in formalin–chloral hydrate (*4*). Different incubation times ranging from 10 minutes to 24 hours were used. The most demonstrative slides were obtained after 1 to 3 hours of incubation. Similar results were obtained with the three techniques, but the two last mentioned produced better responses.

The epithelium of skin and oral mucosae of the rat show an intense reaction in the subcorneal layers and another less intense reaction in the basal cell layers; the latter reaction is especially evident in oral mucosa (*5*).

Similar histochemical behavior occurs in skin wounds and in wounds of the oral mucous membrane. During all the healing process and until epithelialization is complete, the epithelial margin of the wound shows a marked reduction in acid phosphatase activity with loss of the characteristic enzyme pattern, giving a weak diffuse reaction (Fig. 1). The same reduction in enzymic activity is seen in occasional acanthotic epithelium close to infected wounds.

Acid phosphatase appears in the superficial layers of proliferated epithelium as soon as histologic evidence of keratinization is detected.

Healing connective tissue contains isolated, intensely positive cells which are probably histiocytes in macrophagic function. Newly formed fibroblasts give a moderately positive reaction which is stronger than that of fibrocytes in normal corium. The fibrous tissue which occupies the area of the wound is also slightly positive, while normal connective tissue is almost negative. Foreign body giant cells occasionally found in wounds are strongly positive.

These results indicate that acid phosphatase is related to keratinization and not to epithelial proliferation. In connective tissue, acid phosphatase appears to be associated with macrophagic function and not with tissue formation (*6*).

F. A. CARRANZA, JR.
R. L. CABRINI
Laboratorio de Anatomía Patológica,
Hospital Ramos Mejía,
Buenos Aires, Argentina

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6. This investigation was supported by the U.S. Army Medical Research and Development Command, under research grant No. DA-MEDDH-60-4.

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Excessive Irrigation and the Soils and Ground Water of Oahu, Hawaii

Abstract. In the cultivation of sugar cane in Hawaii irrigation water is applied at very high rates. More than half of this water returns to the basalt aquifer by infiltrating through the highly permeable lateritic soils. The excessive rate of irrigation alters the composition of the ground water and accelerates the evolution of the low humic latosols to humic latosols.

About 30 square miles of the south central portion of the island of Oahu, Hawaii, is devoted to the cultivation of sugar cane, all of which is heavily irrigated. Of the total crop area, nearly 23 square miles directly overlies the basalt aquifer and is thus tributary to it;