Geology of the Northern Pensacola Mountains and Adjacent Areas

DWIGHT L. SCHMIDT *and* A. B. FORD

U. S. Geological Survey

The northern Pensacola Mountains are composed of folded sedimentary rocks and stratiform gabbroic rock. About half of the northern Pensacolas consists of folded, interbedded graywacke and slate (Patuxent Formation) of Precambrian age that is unconformably overlain by folded limestone (Nelson Limestone), volcanic rocks, and shale of Cambrian age. This, in turn, is unconformably overlain by folded sandstone of middle Paleozoic age (Schmidt *et al.*, 1965). A gentle regional plunge to the north results in prominent outcrops of pebbly mudstone (Gale Mudstone) of Permian (?) age and overlaying coal- and *Glossopteris*-bearing siltstone and shale of Permian age. The Permian rocks in the northern Pensacolas were broadly folded at the same time that the middle Paleozoic rocks were folded, but before the intrusion of stratiform gabbroic rock. The Gale Mudstone, a diamictite containing clasts of all the older sedimentary and igneous rocks of the area, is a tillite occurring within an area 50 by 100 kilometers (30 by 60 miles) (Frakes *et al.*, in press).

Stratiform gabbroic rock in the Dufek Massif and Forrestal Range of the northern Pensacola Mountains has been mapped and sampled in detail. If the mafic rock of these two ranges is part of a single intrusion, as seems likely, it forms one of the largest stratiform bodies in the world; its exposed part underlies a minimum area of 8,000 square kilometers (3,000 square miles) and is a minimum of 2,000 meters (6,600 feet) thick. Widespread feldspathic pyroxenite, in layers 1 to 3 meters (3 to 10 feet) thick, and less widespread magnetite layers and lenses lie with sharp contact on thick layers of anorthosite or leucogabbro. They grade upward into thick layers of gray gabbro. Centimeter-scale, rhythmic layering is characteristic. Numerous channel-like structures, tens of meters wide, are filled with layered pyroxenites, iron oxides, anorthosite, and leucogabbro, with sharp basal contacts. The rock which fills the channels grades across an upper contact into normally interlayered gabbroic rock. These channels may have been formed by currents of probably convective origin. Neither the base nor the top of the stratiform pile is exposed, but fine-grained, chilled phases border locally contact-metamorphosed Paleozoic quartz sandstone. The layers dip about 10°SE. The body has been uplifted along high-angle faults bordering the southeastern margin of the Filchner Ice Shelf. The age of the body is uncertain, but a post-Permian age is indicated by the metamorphic effects on nearby carbonaceous, *Glossopteris*-bearing, sedimentary rocks.

Three areas outside of the Pensacola Mountains, not previously visited by man, were mapped. A group of nunataks, 120 kilometers (75 miles) southwest of the Neptune Range, consists of intensely folded, rhythmically interbedded graywacke and slate (Patuxent Formation) of Precambrian age and folded quartz sandstone that unconformably overlies the graywacke. The Mount Ferrara area, 95 kilometers (60 miles) east of the Forrestal Range, consists of folded Nelson Limestone containing abundant archaeocyathids. The Mount Spann area, 120 kilometers (75 miles) northeast of the Forrestal Range, consists of interbedded, metasedimentary quartzite and siltstone that probably underlies the Cambrian Nelson Limestone and is probably much thicker than the estimated 1,000 meters (3,300 feet) of exposed section. This quartzitic formation is not exposed in the Pensacola Mountains, and its relation to the Patuxent Formation is not known.

References

Frakes, L. A., J. L. Matthews, I. R. Neder, *and* J. C. Crowell. (in press). Movement directions in Late Paleozoic glacial rocks of the Horlick and Pensacola Mountains, Antarctica. *Science*.

Schmidt, D. L., P. L. Williams, W. H. Nelson, *and* J. R. Ege. 1965. Upper Precambrian and Paleozoic stratigraphy and structure of the Neptune Range, Antarctica. *U.S. Geological Survey Prof. Paper* 525-D, p. 112-119.

Geophysical Reconnaissance in the Pensacola Mountains

JOHN C. BEHRENDT, JOHN R. HENDERSON *and* LAURENT J. MEISTER

Regional Geophysics Branch
U.S. Geological Survey
Denver, Colorado

A seismic reflection, gravity, and aeromagnetic reconnaissance was made in the Pensacola Mountains, Antarctica, during the 1965-1966 austral summer. Prominent ice streams between the Neptune and Patuxent Ranges and east of the Forrestal Range overlie channels, probably of glacial origin, in the rock surface 2,000 meters (6,600 feet) below sea level. Seismic reflections show the Filchner Ice Shelf to be 1,250 meters (4,100 feet) thick near its southern margin.

Bouguer anomalies decrease from +60 to —80 mgal. across the boundary from West to East Antarctica. An abrupt change in crustal structure across this boundary is required to explain the 2 mgal./km. gradient. Aeromagnetic profiles delineate anomalies up to 1,800 gammas associated with the basic stratiform intrusion comprising the Dufek Massif and Forrestal Range. A probable minimum areal extent of 9,500 square kilometers (3,700 square miles) is calculated for the intrusive on the basis of the magnetic anomalies, making it one of the largest bodies of its type in the world. The extent of this magnetic anomaly across a fault forming the north border of the Pensacola Mountains probably precludes transcurrent movement.

Topographic Field Operations

PETER F. BERMEL

Topographic Division
U. S. Geological Survey

Topographic mapping in Antarctica was continued in 1965-1966. Five topographic engineers were assigned to obtain geodetic control for the topographic mapping program and to execute surveys in support of projects in geology, seismology, geophysics, and glaciology.

Eight hundred twenty-five kilometers (512 miles) of electronic traverse were completed in the Pensacola Mountains, expanding the work begun in 1962 and completing ground survey control for topographic mapping of the Pensacola Mountains area. This traverse was begun in the Neptune Range and extended north through the Forrestal Range to Mt. Spann and Mt. Ferrara, thence to the nunataks to the far south. At the beginning, midpoint, and end of the main traverse, control lines were run 160 kilometers (100 miles) to either side to determine the positions of seismic stations. As part of this project, an evaluation of the Airborne Control (ABC) system was made in which a hovering helicopter is used as a survey platform. The future value of this system in Antarctica is doubtful with existing equipment.

A 1:25,000-scale topographic map of the Dufek Massif was prepared at the request of the geological team. After laying out a base line using electronic distance-measuring instruments and altimeters, the Massif area was mapped using standard plane-table procedures and terrestrial photographs.

USCGC *Eastwind* Oceanographic Cruise

GEORGE A. LLANO[1]

Office of Antarctic Programs
National Science Foundation

The cruise of USCGC *Eastwind* supported marine biological and oceanographic studies which constituted the major 1965-1966 summer scientific effort of the U. S. Antarctic Research Program in the Antarctic Peninsula. The cruise began at Valparaíso, Chile, December 25, 1965, and terminated on February 26, 1966, at Punta Arenas, Chile. Of the 57 days aboard ship, 35 were applied to scientific work, 7 to port calls, and 15 to the resupply of Palmer Station. The area of study included Marguerite Bay, Anvers Island, Gerlache and Bransfield Straits, the Weddell Sea, the South Orkney Islands, and the Drake Passage. During the major effort from January 1 to February 26, *Eastwind* steamed 6,877 nautical miles (fig. 1). Fifty-nine ocean stations were made. Twenty-one land sorties were completed, primarily by helicopters which flew 65 hours in support of the terrestrial and related scientific work. The ship's complement consisted of 21 officers, including 4 aviators, 182 enlisted men, and 15 scientists.

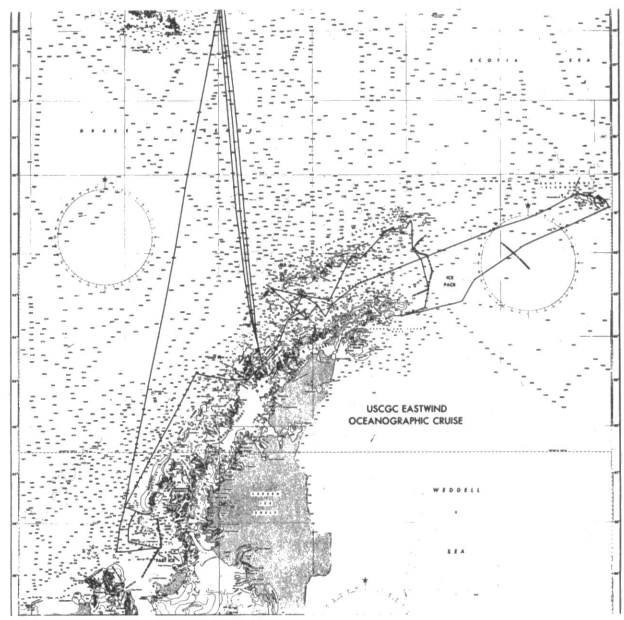

Fig. 1.

[1] U.S. Antarctic Research Program Representative, Antarctic Peninsula, 1965-1966.