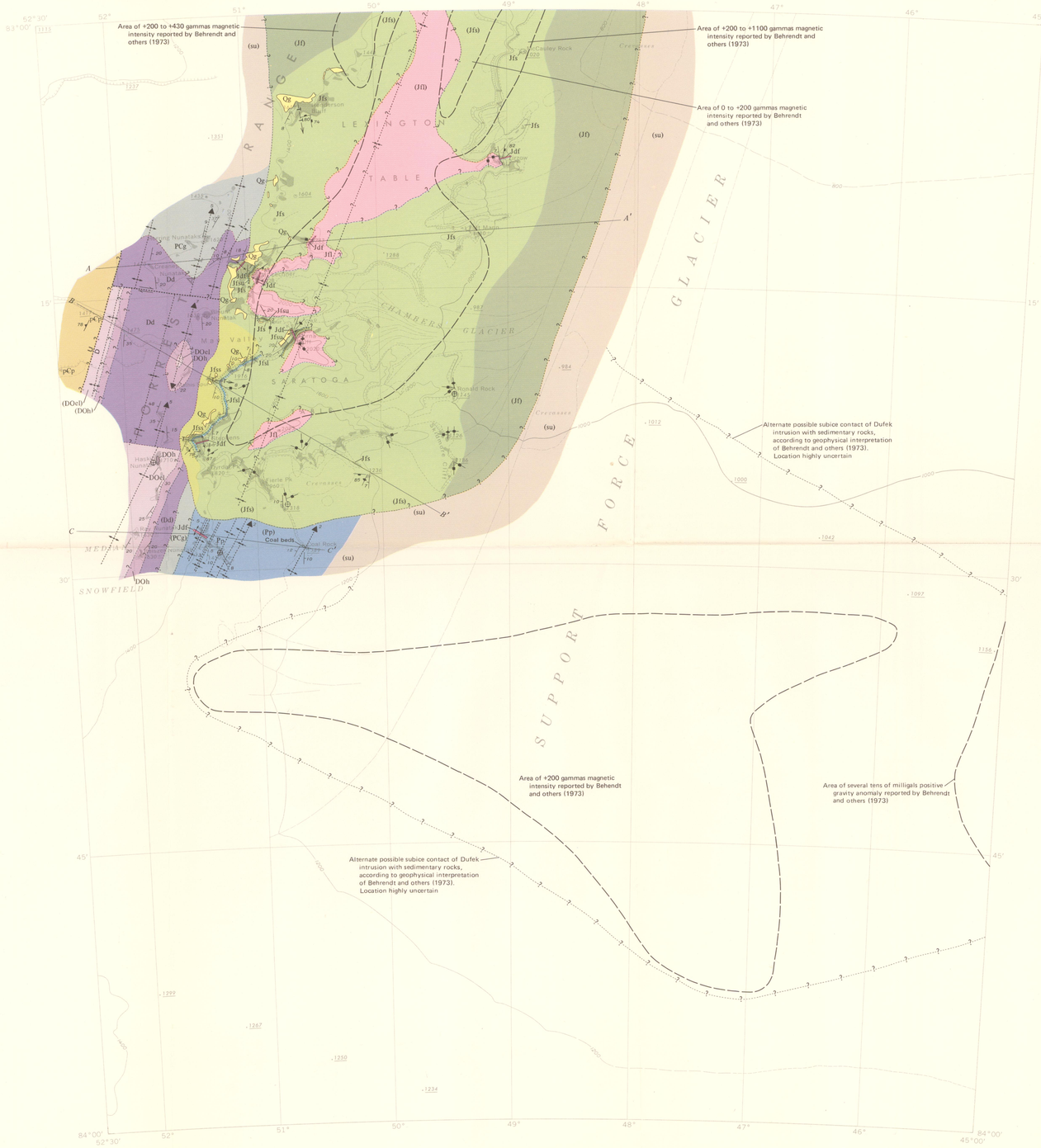
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

Prepared by the
U.S. GEOLOGICAL SURVEY
under the auspices of the
NATIONAL SCIENCE FOUNDATION

U.S. ANTARCTIC RESEARCH PROGRAM
SARATOGA TABLE QUADRANGLE
ANTARCTIC GEOLOGIC MAP A-9



Base from U.S. Geological Survey, 1967

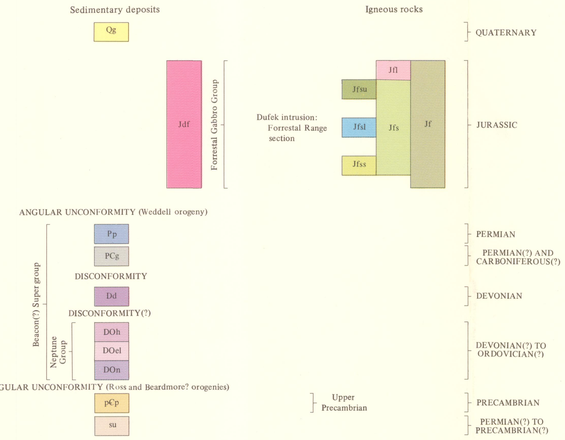
SCALE 1:250,000

Polar Stereographic Projection—Standard Parallel 80°14′
CONTOUR INTERVAL 200 METERS—DATUM IS MEAN SEA LEVEL
Elevations and ice thickness in meters

Geology by A. B. Ford, W. W. Boyd, Jr., D. L. Schmidt, and W. H. Nelson, 1965-66; Mount Lechner area by A. B. Ford, 1974

CORRELATION OF MAP UNITS

Units shown in parentheses where inferred to lie beneath ice



DESCRIPTION OF MAP UNITS

Qg GLACIAL AND TALUS DEPOSITS, UNDIVIDED (Quaternary) – Chiefly non-weathered, nonsorted, unconsolidated talus and morainal materials of apparent local derivation, in many places lying on ice. May locally include older deposits

Jdf FELSIC DIKE ROCK (Jurassic) – Felsite, aplite, pegmatite, alaskite, leucogabbro, and granophyre of dikes apparently related to the Jurassic Dufek intrusion. Locally zoned. Some may be coeval with Lexington Granophyre; others possibly coeval with local host cumulates. Except for a single occurrence on Grob Ridge, all occur within boundaries of the Dufek intrusion

FORRESTAL GABBRO GROUP (Jurassic) – Includes, in descending order, Lexington Granophyre, Saratoga Gabbro, Aughenbaugh Gabbro, and Walker Anorthosite. Layered rocks of the Dufek intrusion; chiefly well-laminated mafic cumulates of general gabbroic composition. Modal proportions of settled plagioclase, two pyroxenes, and opaque oxides highly variable. Group includes pyroxene cumulate, plagioclase cumulate, and magnetite cumulate in interlayers a few millimeters to several meters thick, and a capping layer of granophyre. Pyroxenes belong to two coexisting series, augite-ferroaugite and bronzite-inverted pigeonite. The opaque oxides are chiefly composite grains of titaniferous magnetite and ferrian ilmenite. Stratigraphy and rock-stratigraphic nomenclature of group discussed in Ford (1976). Jurassic age assignment based on K-Ar analyses that average 168±3.4 m.y. (R. W. Kistler, unpub. data). Extent of group under cover of ice inferred from geophysical data of Behrendt and others (1973). Group estimated to be 8-9 km thick, of which about 1.8 km is exposed in Dufek Massif and 1.7 km in the Forrestal Range. Lower units of group exposed to north in Davis Valley quadrangle (Ford and others, 1978)

Jf FORRESTAL GABBRO GROUP, UNDIVIDED – Undivided gabbroic and related rock of the Dufek intrusion. Where shown under cover of ice, inferred from geophysical surveys

Jfl LEXINGTON GRANOPHYRE – Cream to light-gray granophyre concordantly overlying layered mafic cumulates. Commonly microporphyritic, containing microphenocrysts of zoned andesine and pale-green augite or ferroaugite in mesostasis of alkali feldspar and quartz. A late-stage differentiate of the tholeiitic Dufek magma. Composition approximates that of an iron-rich granodiorite. Sharp basal contact; top not exposed. At least 240 m thick, and probably about 300 m thick

Jfs SARATOGA GABBRO – Generally well layered and laminated, medium- to dark-gray, iron-rich gabbroic cumulates of upper part of the Dufek intrusion. Weathers dark brownish gray. Includes numerous layers of leucocratic plagioclase-rich cumulate (anorthosite and leucogabbro) and common thin dark-gray to black layers of magnetite-rich cumulate. Mineral-graded layering common. Mafic rock is chiefly two pyroxene-plagioclase-magnetite cumulate. Scour channels (trough layering) observed mainly in lowest member. Upper contact with granophyre sharp; base not exposed. Exposed thickness about 1,400 m

Jfsu Upper inclusion member – Medium- to dark-gray gabbroic cumulate containing abundant small to large rounded and embayed inclusions of noncumulus anorthositic to leucogabbroic rock. Inclusions commonly 1-3 m across. Locally, where inclusions are abundant, has appearance of a breccia-conglomerate. Contacts of layer generally indistinct. Thickness ranges from about 64 m at Camp Spur to 100-107 m at Sorna Bluff and Mount Lechner

Jfsl Lower inclusion member – Lithology and contacts similar to those of upper inclusion member. About 46 m thick at Mount Stephens

Jfss Stephens Anorthosite Member – A conspicuously layered sequence consisting of four prominent light-colored mineral-graded layers, 7-15 m thick, of plagioclase-rich cumulate interlayered with medium- to dark-gray mafic cumulates. Scour channels (trough-layered structure), filled with plagioclase cumulate, locally present. Upper contact at top of highest leucocratic layer is gradational into overlying mafic cumulates; basal contact not exposed. Exposed thickness about 300 m

AUGHENBAUGH GABBRO – A generally well-layered sequence of mostly mafic cumulates, at least 1,600 m thick, of the lower part of the Dufek intrusion. Differs from Saratoga Gabbro chiefly by absence or, near top, by scarcity of cumulus iron and titanium oxides, and by presence of pyroxene cumulate layers. Not exposed but may occur at depth below the cumulate sequence of the Saratoga in the Forrestal Range

WALKER ANORTHOSITE – The lowest known unit of the Dufek intrusion. Generally a poorly layered plagioclase cumulate, at least 230 m thick. Not exposed but may occur at depth below the cumulate sequence of the Saratoga in the Forrestal Range

BEACON(?) SUPERGROUP (Permian to Ordovician?) – Includes, in descending order, Pecora Formation, Gale Mudstone, Dover Sandstone, and Neptune Group

Pp PECORA FORMATION (Permian) – Gray tan-weathering thin-bedded fine-grained quartz- and feldspar-bearing sandstone with many thin interbeds of carbonaceous pyritic siltstone and shale. Sandstone commonly thinly crossbedded; forms ledges. Two graphitic coaly beds, about 1 m thick, on Coal Rock contain plant debris including a glossopterid flora of Permian age; nonfossiliferous rocks of Grob Ridge may be younger. Rocks commonly altered to hornfels by the Dufek intrusion. Base and top not exposed in Pensacola Mountains. Overlies Gale Mudstone with apparent concordance. Maximum thickness of about 200 m exposed on Coal Rock

PCg GALE MUDSTONE (Permian? and Carboniferous?) – Massive dark-gray diamictite (tillite) containing abundant dispersed pebbles, cobbles, and boulders of diverse lithology generally similar to those in pre-Gale terrane of the Pensacola Mountains. Coarse clasts mainly granite and gneiss and include schist, phyllite, quartzite, limestone, and siltstone. Bedding generally indistinct to absent. Nonfossiliferous. Strongly folded and locally well cleaved. Thermally indurated in contact aureole of the Dufek intrusion. Base and top not exposed. Exposed mainly in Schmidt Hills quadrangle where probably disconformable on Dover Sandstone above striated boulder pavements, and where thickness probably is several times a measured 315 m

Dd DOVER SANDSTONE (Devonian) – White, tan-weathering, thick and evenly bedded, well-sorted, medium- to coarse-grained quartz sandstone containing conspicuous, widely scattered quartz pebbles. Coarsely crossbedded in places. Quartzite beds common. Nonfossiliferous in the mapped area but elsewhere contains flora of Middle Devonian age. Moderately to strongly recrystallized in thermal aureole of Dufek intrusion. Base and top not exposed. Mainly exposed in Schmidt Hills quadrangle where about 1,200 m thick

NEPTUNE GROUP (Devonian? to Ordovician?) – Includes, in descending order, Heiser Sandstone, Elbow Formation, Elliott Sandstone, and Neith Conglomerate. Poorly exposed sequence more than 1,500 m thick; well exposed to west in Schmidt Hills quadrangle (Schmidt and others, 1978; Schmidt and Ford, 1969). Lower two units not exposed. Fossils rare, nondiagnostic of age, and known only in the Heiser Sandstone, which is believed to be correlative with a Devonian part of the Beacon Supergroup elsewhere in Antarctica. Separated from Cambrian and older rocks by angular unconformity

DOh HEISER SANDSTONE – Well-bedded light-green brown-weathering quartz sandstone. Slightly more silty than the Dover Sandstone. Characterized by abundant tubular burrows 1 cm or less in diameter oriented normal to bedding. Base and top not exposed. Thickness of about 320 m measured in Schmidt Hills quadrangle

DOel ELBOW FORMATION – Light-gray argillaceous siltstone interbedded with light-gray fine-grained quartz-rich sandstone, commonly in well-bedded cyclic pairs 0.3-2 m thick. Well laminated and commonly crossbedded. Red coloration of this unit in the adjacent Schmidt Hills quadrangle probably destroyed by thermal effects from the Dufek intrusion. About 300 m thick to west in the Schmidt Hills quadrangle

ELLIOTT SANDSTONE – Quartz-rich, locally conglomeratic sandstone about 1,400 m in maximum thickness in southern part of Schmidt Hills quadrangle. Not exposed and possibly not present owing to northward thinning from type area

DOn NEITH CONGLOMERATE – Shown only in cross sections. Exposed mainly in Schmidt Hills quadrangle, where it is a poorly sorted, poorly bedded to massive, reddish-brown conglomerate interlayered with moderately well bedded coarse sandstone. Thickness not known but locally may be as much as 1,000 m

pЄp PATUXENT FORMATION (upper Precambrian) – Well-bedded, medium- to dark-grayish-green, medium-grained argillaceous metasandstone (metasubgraywacke), generally rhythmically interlayered with dark-gray slate and minor amounts of graywacke. Locally conglomeratic. Poorly exposed. Mainly exposed in Schmidt Hills quadrangle, where felsic and mafic volcanic units also occur. Regionally metamorphosed to greenschist facies. Intensely folded and generally well cleaved. Fossils rare and nondiagnostic of age. Unconformably underlies Cambrian limestone in Schmidt Hills quadrangle. Thickness estimated to exceed 10,000 m

su SEDIMENTARY ROCKS, UNDIVIDED (Permian? to Precambrian?) – Sedimentary rocks of unknown correlation that are inferred to lie beneath cover of ice

Contact – Dotted where concealed; queried where highly uncertain

High-angle fault – U, upthrown side, D, downthrown side. Arrows indicate relative horizontal movement. Dotted where concealed; queried where highly uncertain

Anticline – Showing plunge. Dotted where concealed; queried where highly uncertain

Syncline – Showning plunge. Dotted where concealed; queried where highly uncertain

Strike and dip of beds in sedimentary rocks and of layers and lamination in igneous cumulates

Inclined

Horizontal

Strike and dip of cleavage in sedimentary rocks and of microshear joints in igneous rocks

Inclined

Vertical

Strike and dip of joints

Inclined

Horizontal

Vertical

Dike – Showing dip

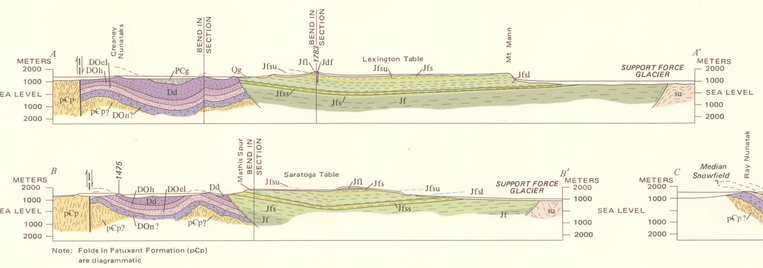
Inclined

Vertical

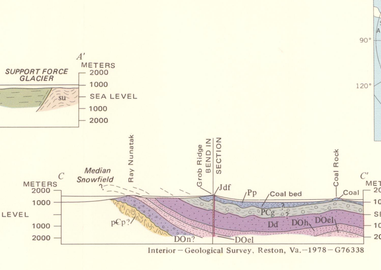
Trough-layered structure (scour channel) in cumulates, showing plunge

Area of geophysical anomaly

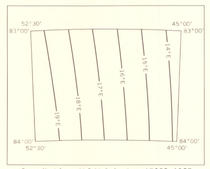
Bedrock outcrop



Note: Folds in Patuxent Formation (pЄp) are diagrammatic



Interior—Geological Survey, Reston, Va.—1978—G76338



Compiled from U.S.N.O.O. chart 17065, 1965
ISOGONIC LINE DIAGRAM

SELECTED REFERENCES

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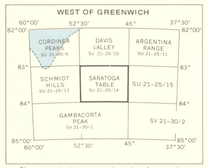

Sheet numbering system based on International Map of the World
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GEOLOGIC MAP OF THE SARATOGA TABLE QUADRANGLE, PENSACOLA MOUNTAINS, ANTARCTICA

By
Arthur B. Ford, Dwight L. Schmidt, Walter W. Boyd, Jr., and Willis H. Nelson

1978

For sale by Branch of Distribution, U.S. Geological Survey, 1200 South Eads Street, Arlington, VA 22202 and Branch of Distribution, U.S. Geological Survey, Box 25286, Federal Center, Denver, CO 80225

Explanatory pamphlet accompanies map