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EXPLANATION FOR

MAP OF BEDROCK GEOLOGY OF THE ORANGE AREA, MASSACHUSETTS AND NEW HAMPSHIRE

by

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DESCRIPTION OF ROCK UNITS

INTRUSIVE IGNEOUS ROCKS

Triassic?

Trd

Trd: Fine- to medium-grained augite-pigeonite diabase dikes.

Devonian?

hbd

hbd: Medium-grained weakly foliated hornblende-biotite diorite.

hkg

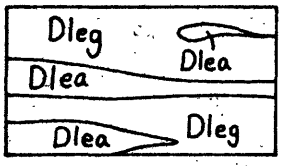
hkg: Hardwick granite (quartz diorite) of Emerson, 1917.

gn

gn: Well foliated two-mica granite gneiss.

METAMORPHIC ROCKS

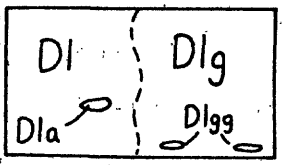
Lower Devonian



Erving Formation (formerly Erving Member of Littleton Formation of Robinson, 1963)

Dlea: Finely laminated to massive, fine- to coarse-grained hornblende-andesine-epidote amphibolite.

Dleg: Well bedded gray fine-grained quartz-plagioclase-biotite granulite with interbedded mica-garnet-staurolite-kyanite schist, thin layers of hornblende-garnet calc-silicate rock, and biotite granulite with thin layers of pink ultra-fine-grained garnet and euhedral magnetite.



Littleton Formation

Dl: Western facies, gray-weathering mica-garnet-staurolite schist (kyanite zone), mica-garnet-sillimanite schist with or without staurolite (sillimanite zone), and mica-chlorite-garnet phyllite with pseudomorphs after staurolite (retrograde zone). Dla: Hornblende-plagioclase amphibolite.

Dlg: Eastern facies, gray granulite and schist member. Gray weathering schists, gneisses, and granulites with quartz, plagioclase, mica, garnet, and sillimanite. A few layers and lenses of calc-silicate rock with hornblende, garnet, diopside, calcite, and rare calcite marble. Dlgg: Lenses of well bedded quartz-garnet-grunerite, garnet-fayalite-magnetite-grunerite-graphite, garnet-fayalite-pyroxmangite-grunerite, and quartz-pyroxmangite-grunerite-graphite granulite within gray schist (Huntington, 1975).

Silurian

Sf

Fitch Formation

Sf: Fine- to coarse-grained gray calc-silicate granulite, rare lenses of calcite-quartz marble, and sulfidic mica schist and calc-silicate granulite.

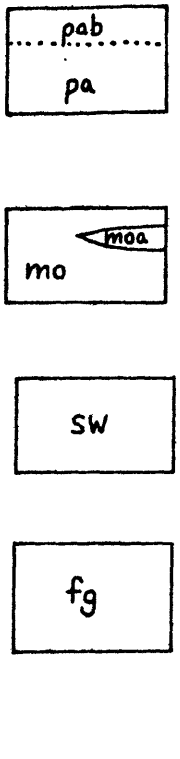
Sc

Clough Quartzite

Sc: Well bedded quartzite; quartz-pebble and quartz-cobble conglomerate; quartz-mica, quartz-muscovite-garnet, and quartz-mica-sillimanite schist. Thin layers of calc-silicate granulite and amphibolite at top of formation at a few localities.

Ordovician

Late Precambrian, Cambrian, or Ordovician



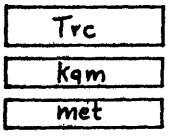
Coarse-grained Gneisses and Related Rocks

pa: Pauchaug Gneiss. Coarse-grained, non-layered, poorly foliated, microcline-plagioclase-quartz-biotite gneiss, locally with hornblende, epidote, and/or magnetite, and with rare inclusions of amphibolite. pab: Poorly defined finer-grained, more strongly foliated border zone. The Pauchaug Gneiss is interpreted as a massive plutonic rock of pre-Silurian, possibly pre-Middle Ordovician age.

mo: Monson Gneiss. Coarse-grained, layered to massive, well foliated plagioclase-quartz gneiss and plagioclase-microcline-quartz gneiss with or without biotite and hornblende with interbedded hornblende amphibolite. moa: Interbedded amphibolite and feldspar-quartz gneiss separately mapped. mon, moc: North Orange and Creamery Hill bands of finely-bedded feldspar-quartz gneiss and amphibolite. sw: Swanzey Gneiss, Monson-like gneiss exposed in southern part of Keene Gneiss dome, less massive than other parts of dome. Monson and Swanzey Gneiss are lithically correlated with the assemblage Monson, New London, Mamacoke as mapped by Lundgren (1966) and Goldsmith (1967) in southeastern Connecticut.

fg: Fourmile Gneiss of Ashenden, 1973. Gray plagioclase-biotite-quartz gneiss, commonly with minor hornblende and with interbedded hornblende-epidote amphibolite. In the Pelham dome and Kempfield anticline this is the only unit in contact with Paleozoic cover. It overlies other units deeper in the Pelham dome (Ashenden, 1973, Onasch, 1973, Robinson et al., 1973; Laird, 1974) including the Dry Hill Gneiss from which zircons have been dated at 575 m. y.

ROCK TYPES WEST OF CONNECTICUT VALLEY BORDER FAULT



Trc: Mesozoic conglomerate.

kqm: Kinsman Quartz Monzonite of Ashuelot pluton.

met: Metamorphic rocks undifferentiated.

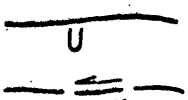
LITHOLOGIC CONTACTS

Location accurate

Location approximate

Location inferred

NORMAL OR VERTICAL FAULTS



Location accurate- U indicates relative vertical displacement, upthrown side.

Location approximate- arrows indicate relative horizontal displacement

Location inferred

STRUCTURE SYMBOLS

Strike and dip of inclined or overturned bedding.

Strike and dip of inclined foliation.

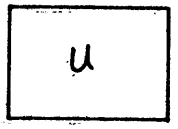
Strike of vertical foliation.

Trend and plunge of lineation or minor fold axis.

(Underlined readings are from Hadley, 1949, Balk, 1956.

Cross sections through lines 1-1' to 13-13' are omitted from this open-file map.

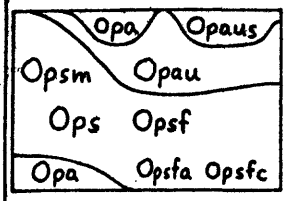
Ordovician



Ultramafic Rocks

u: Principally composed of hornblende with or wthout olivine, orthopyroxene, spinel, anthophyllite, cummingtonite, talc, ankerite, magnetite, serpentine, in a variety of associations. As isolated lenses and boudins in Monson Gneiss, Ammonoosuc Volcanics, Partridge Formation. Ultimately will be subdivided and probably assigned as units within these formations. Probably variable in age, but all pre-Silurian.

Middle Ordovician



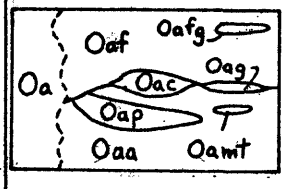
Partridge Formation

Opau: Augen gneiss member. Sulfidic to gray weathering mica-sillimanite schist with augen of sodic plagioclase and K-feldspar that are commonly strongly granulated. Predominantly massive but some well layered. Amphibolite rare. Opaus: sulfidic schist and amphibolite where separately mapped at top of member.

Opa: Amphibolite where separately mapped.

Ops: Sulfidic schist* member. Sulfidic mica schist with or without garnet, staurolite, kyanite, sillimanite, chlorite (retrograde zone), plagioclase; sulfidic feldspathic schist; calc-silicate rock; and amphibolites composed of various combinations of plagioclase, hornblende, garnet, epidote, anthophyllite, and cummingtonite. Opsm: predominantly sulfidic mica schist. Opsf: Predominantly sulfidic feldspathic schist. Opsfa: Portion of Opsf with about 50% amphibolite. Opsfc: Sulfidic feldspathic schist with gray well bedded calc-silicate granulite.

*Sulfide is usually pyrrhotite, less commonly pyrite.



Ammonoosuc Volcanics

Oa: Undifferentiated irregularly interstratified amphibolite and feldspar-quartz gneiss.

Oaf: Felsic upper unit, predominantly fine- to medium-grained feldspar-quartz gneiss with minor amphibolite. Felsic gneisses typically contain garnet, muscovite, less commonly kyanite, sillimanite, or hornblende. Oafg: Gedrite-cordierite gneiss in felsic unit (Robinson and Jaffe, 1969).

Oag: Well bedded quartz-garnet-amphibole granulite commonly containing cummingtonite or grunerite and magnetite, less commonly gedrite or hornblende. Discontinuous at contact between upper felsic and lower mafic units.

Oaa: Mafic lower unit, predominantly amphibolite with interbedded feldspar-quartz gneiss of variable amount. In addition to hornblende and hornblende-epidote amphibolite, is characterized by anthophyllite-hornblende and cummingtonite-hornblende amphibolite, with or without garnet, and gedrite and cummingtonite plagioclase-quartz gneisses. Local zones of marble and hornblende-calcite-diopside-epidote gneiss too thin to map.

Oap: Predominantly plagioclase-quartz-biotite gneiss within Oaa.

Oac: Conglomerate with calcite marble matrix. Oamt: Magnetite-garnet quartzite.

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