

NOTES ON GEOLOGICAL STRUCTURE

Half a century after its recognition, the age of the Roberts Mountains overthrust, its relationship to particular stratigraphic units, its distribution, and even its geometry remain matters of great controversy. The thrust is a major component of the Anlier orogeny. In the Sulphur Springs and Pine Ranges, it is accompanied by an earlier, relatively local(?) episode of thrusting along a separate fault surface and, at Mineral Hill, by unusual large-scale overfolding.

The Two Episodes of Thrusting

The upper thrust, interpreted here as the regional or "main" Roberts Mountains thrust, truncates the lower thrust and places Ordovician-Virginian (western assemblage) rocks upon both Devonian-Mississippian carbonates and the Mississippian-Chaiman-Dale Canyon Formations (upon the Woodruff Formation alone in the Pine Valley Quadrangle). The lower thrust in the Mineral Hill Quadrangle places the Devonian Woodruff Formation, with the unconformably overlying Mississippian-Chaiman-Dale Canyon Formations, upon the Devonian Telegraph Canyon Formation. Strong contraction, fracturing, and silicification through some 30 feet or more of overlying Woodruff Formation mark this

lower thrust surface. An analogous lower thrust in the Pine Valley Quadrangle places the Woodruff Formation directly upon the Mississippian Dale Canyon Formation (Smith and Ketter, 1968, 1978; Johnson and Pandergast, 1981; Visconti, 1982; Whitaker, 1985) and is considered by many to mark the base of the Roberts Mountains allochthon. Identification of Upper Devonian shale, siltstone, and chert in the Mineral Hill Quadrangle as allochthonous Woodruff Formation rather than autochthonous Pilot Shale is based upon the invariable presence of bedded chert, a characteristic of the type Woodruff but not of the Pilot, less so upon the abundant occurrence of *Angustionotus* sp., and upon proximity to, if not structural continuity with, allochthonous Woodruff Formation in the Pine Valley Quadrangle. Allochthonous *Angustionotus* shale occurs also in the Roberts Mountains (Murphy and others, 1984). Geometry of the two thrusts in the Union Summit area is based in part upon drill data provided by the Cordex Exploration Company.

Major Overturned Folding of the Roberts Mountains Thrust

The gently sinuous trend of the Sulphur Springs Range closely parallels large-scale folds in the Roberts

Mountains thrust. One of these folds, an eastward verging overfold along the westerly side of the range, is an uncommon, if not unique, feature of the thrust. Evidence for the fold, best exposed along a 5-mile belt north and south of Mineral Hill (across sections C-C' to F-F'), includes:

- 1) Dip of the thrust surface itself—from 30° easterly north of Mineral Hill, near-vertical on the east side of the hill, steeply to the west but overturned in underground workings, to 20° westerly and overturned south of Mineral Hill, and in an inverted kille and faner at Mineral Hill camp.
- 2) The inverted stratigraphic sequence from Devonian Telegraph Canyon Formation to Mississippian Camp Creek sequence as well as numerous inverted geopotential structures on Mineral Hill and Cave Hill.
- 3) Intense folding of the Vini Formation immediately to the east of the overfold, a geometry which is in keeping with expected deformation of more ductile rocks in a structure of this type. Similar deformation occurs at the south end of the Mineral Hill quadrangle (across section H-H') where the same overfold is inferred to extend southerly into the Garden Pass Quadrangle. Analogous deformation in the Vini Formation and the overlying Vaino(?) Formation and the Bruffey sequence immediately east of

the Bruffey Ranch may reflect strong, though apparently not overturned, folding of the thrust in that area (cross sections A-A', B-B'). It is unclear whether the overfold at Mineral Hill is contemporaneous or postcontemporaneous with Roberts Mountains thrusting, as the vergence might suggest, or entirely post thrust.

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STRATIGRAPHIC NOTES

Devonian lower plate stratigraphy is modified from Carlisle and others (1983). Recognition of the Camp Creek sequence (Mc-d) of Ketter (1980) and separation of Telegraph Canyon (D) from originally mapped Dale-Gard (Dd) south of Mineral Hill are from Thomas (1985).

- (1) Equivalence of the Camp Creek sequence and the Chaiman-Dale Canyon Formation is from Johnson and Pandergast (1981).
- (2) The Chaiman-Dale Canyon Formations predates the first thrust episode that places the Woodruff Formation upon eastern facies of the Roberts Mountains thrust subsequently placed the Vini and the Chaiman-Dale Canyon Formations upon the Roberts Mountains thrust.
- (3) The Telegraph Canyon Dolomite (Dd) is equivalent to the Santeuil Mountain Dolomite (Dd) of Murphy, A., and Pandergast (1981).
- (4) The Union Mountain Formation (Dd) is equivalent to part of the upper Basin and Range (Dd) of Johnson, Winterer, and Bonham (1984). The system of the Basin and Range (Dd) is from Johnson, Winterer, and Bonham (1984).
- (5) The Vaino(?) Formation (Dd) includes the Dolomite and the lower part of the Basin and Range (Dd) of Johnson, Winterer, and Bonham (1984).
- (6) Position of the eastern boundary is uncertain. The Basin-Devonian boundary probably lies within the lower Lons Mountain Dolomite. The Devonian-Basin boundary may be within the upper Lons Mountain Dolomite. The system of the Basin and Range (Dd) is from Johnson, Winterer, and Bonham (1984).
- (7) The "Bruffey sequence" is an informal term for rocks described by Smith and Ketter (1968, 1978) and Johnson and Pandergast (1981) and assigned to the stratigraphic sequence "Camp Creek sequence" by Johnson and Pandergast (1981).
- (8) Introduction of the term "Vaino(?) Formation" follows the usage of Smith and Ketter (1968) immediately north of the Mineral Hill Quadrangle.

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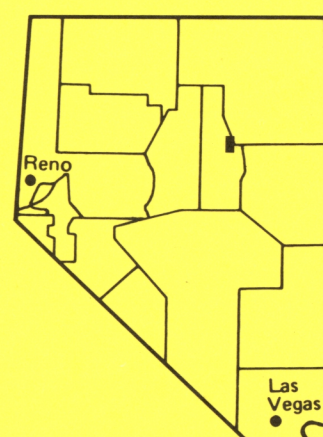
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GEOLOGIC MAP OF THE MINERAL HILL QUADRANGLE, NEVADA

NEVADA BUREAU OF MINES
AND GEOLOGY

MAP 97



A 1:48,000-scale geologic map of the Mineral Hill 15 Quadrangle with cross sections showing structural, stratigraphic, and thrust relationships.

Quaternary
Alluvium
Alluvial fans and stream sand and gravel; plays silt and clay in Diamond Valley.
Older alluvium
Dissected and dissected alluvial gravel and sand.

Pine Valley Formation
Lakeland in Pine Valley. Red-bedded light gray to buff siltstone, white rhyolite tuff, white clay-rich limestone, thin to coarse-grained sand and some pebble conglomerate.

Volcanic and sedimentary rocks in Pine Valley
Th. Olivine basalt, locally porphyritic and amygdaloidal and minor porphyritic rhyolite and rhyolite tuff.
Ts. Buff siltstone to siltstone conglomerate, white pumice and crystal lapilli tuff, and gray-brown fine to medium-grained poorly bedded sand.
Tv. Lavender porphyritic basalt, gray porphyritic rhyolite, rhyolite crystal tuff, light gray lapilli tuff, and minor rhyolite sandstone.

Volcanic rocks in the Sulphur Springs Range
Tr. Rhyolite crystal tuff.
Ts. Dark, fine-grained vesicular olivine basalt, locally porphyritic.
Tv. Buff to red brown, coarse-grained andesite tuff and breccia, andesite crystal tuff, light gray fine to medium-grained sand and brown siltstone of the Diamond Valley.

Garden Valley Formation
Red-brown siltstone to siltstone conglomerate, clay, conglomerate, quartzite and chert, coarse-grained chert, and medium to coarse-grained sandstone.

Lower Plate of Roberts Mountains Thrust
Camp Creek sequence¹
Chaiman-Dale Canyon Formations^{1,2}

Upper Plate of Roberts Mountains Thrust
Woodruff Formation
Devils Gate Limestone
Telegraph Canyon Dolomite³
Bruffey sequence⁴
Union Mountain Formation⁴
McClellan Canyon Formation⁵
Lone Mountain Dolomite⁶
Roberts Mountains Formation⁷
Vaino(?) Formation⁸
Vini Formation⁹

UNCONFORMITY
Camp Creek sequence¹
Chaiman-Dale Canyon Formations^{1,2}

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