## GEOLOGY BARE MOUNTAIN QUADRANGLE, NEVADA

H. R. Cornwall and F. J. Kleinhampl

of Death Valley, Calif., and about quartzite, 10 to 40 feet thick, marks member and the upper member, extends to about 1,050 feet above layers near its top, and with apha-100 miles northwest of Las Vegas. the top of the Stirling(?) and is over-respectively. A third unit, a lime-the base. It was mapped in cooperation with lain by alternating thin units of stone up to 150 feet thick overlying EUREKA QUARTZITE (Oe) the Nevada Bureau of Mines. Published studies on the Berg Mountain and shale of the Carrara formation. has a sharp lower contact and grades in the lower unit. The upper unit the Nevada Bureau of Mines. Published studies on the Bare Mountain
lished studies on the Bare Mountain lished studies on the Bare Mounta lished studies on the Bare Mountain area consist of an areal reconnaissance by Ball (1907), and the abstract of a dissertation by Brown (1954).
Thurston (1949) studied the Daisy fluorspar mine, and Bailey and the state of the Carrara formation is here fluorspar mine, and Bailey and the state of the Carrara formation.

Fossils have not been found in the up into the upper member, with which it is included on the map.

Lower shale member.—The lower member consists of approximately 100 feet of brownish gray to black shale with a few thin, lenticular the graves of feet thick overlying the Pogonip group is correlated with the Eureka quartize of Middle and Upper(?) Ordovician age on the basis of stratigraphic position and lithology. The Carrara formation is here defined and named for Carrara, an defined and named for Carrara, and the up into the

consist dominantly of carbonate next overlying unit consists mostly with the limestone. The unit is Middle and Upper (?) Ordovician age FLUORSPAR CANYON FORMATION (Dic) rocks with Lower Cambrian and of limestone alternating with shale conspicuously laminated, platy to is presumed. Worm trails indicate An incomplete section of Devo-Upper Mississippian clastic rocks. and siltstone. A conspicuous dark-Basin and range normal faults places.

thickest (4,800 feet) formation ex- broken cliffs, visible from a distance sandy layers occur commonly in the even more abundant. The base of by C. W. Merriam as: Favosites sp., thickest (4,800 feet) formation exposed in the quadrangle. Its base is not exposed, and the contact with the overlying Stirling(?) quartzite appears to be conformable, unlike that between these two units at the the discernible and the Carrara formation explosed in the quadrangle. Its base as a broad band of alternating white, orange, pink, and brown limestone overlain by dark-gray imestone, which within a few tens of feet grades upward into the cherty dolomite. Extensive patches of dark gray limestone occur at a discernible and the Carrara formation is a sandy dolomite or limestone, which within a few tens of feet grades upward into the cherty dolomite. Extensive patches of dark gray limestone occur at a discernible and the Carrara formation is a sandy dolomite or limestone, which within a few tens of feet grades upward into the cherty dolomite. Extensive patches of dark gray limestone occur at a few places. The upper member characteristically contains some that the promotion is a sandy dolomite or limestone, which within a few tens of feet grades upward into the cherty dolomite. Extensive patches of dark gray limestone occur at a few places. type locality in the Spring Mountains discernible and the Carrara formastubby thin lenses, and also many few places. The uppermost beds of the formation. (Nolan, 1929, p. 466-468) and in the tion appears to be transitional into zones in which the dolomite has have less chert than those below. A second incomplete section of Nopah Range (Hazzard, 1937, p. 305).

The Johnnie?) formation consists of zones several hundred feet thick of zones in which the dolomite and contain some limy dolomite and contain some limy dolomite and contain some limy dolomite which appears as lighter gray bands in contrast to the prevalent dark gray hands of dolomitized limestone with dolomite and contain some limy dolomite.

A second incomplete section of the Fluorspar Canyon formation which appears as lighter gray bands in contrast to the prevalent dark gray hands of dolomitized limestone with dolomite and contain some limy dolomite. zones several hundred feet thick of interstratified sandstone, siltstone, micaceous shale, and less commonly, carbonate rock; in any one zone either one rock type is dominant or olenellid type, collected from a bed either one rock type is dominant or olenellid type, collected from a bed on the control of phyllitic shale, schistose siltstone, Cambrian age. The age of the aphelaspid trilobite forms, have

abundant in the upper part. Two 238), and with the Bonanza King prominent quartzite units, each formation in the Nopah Range,

ish brown. The shale has a wayy, of the formation the alternating cherty limestone at the top. siltstone except where the latter is

The topography of areas underlain by Johnnie(?) formation, with its easily eroded shale and siltstone, is relatively subdued, and the slopes are ledges and low cliffs of quartzite, dolomite, and limestone.

STIRLING (?) QUARTZITE (Cs) to top, black, white, and gray, form and dolomitized. In a thin zone 200 formation and conformably under- Similar thick bands also occur in the glomeratic. tance. The unit is slabby to massive, to and oblique to stratification.

locally gritty and conglomeratic.

Fossils are rare and none of those sils, of Early and Middle Ordovician the dolomite appears as a thick overlying Carrara formation, are NOPAH FORMATION (Co)

POGONIP GROUP (Op) tubular structures. An oolitic lime-stone unit associated with silty and summer as the section of the type locality near contain intercalated silty and sandy Eureka, Nevada (Nolan and others.

Most of the formation

olive gray to brownish gray, the and secondary dolomite and in the thirds of the group consists of shaly Therefore, the lower contact is brown. They are fine to medium olive gray to brownish gray, the quartzite is gray to white, and the delemits and limestone are vellowish brown. The shale has a wavy, parallel, laminated to very thinand rather indistinct except at the distinctive zones ranging between and rather indistinct except at the distinctive zones ranging between distinctive zones ranging between the distinctive zon parallel, laminated to very thinand rather indistinct except at the distinctive zones, ranging between the underlying more cherty Ely pod, is present in the uppermost few very top. The middle third of the 90 and 400 feet in thickness, can be Springs dolomite. locally cross-stratified. The sandstones are poorly sorted, locally very distinct light- and dark-gray occur as partings and as thin, rather 3 feet thick, is present locally near section are the stromatoporoid, stones are poorly sorted, locally contain abundant dark minerals and contain abundant dark minerals and This prominently striped middle limestone. Chert occurs both as This prominently striped middle limestone. Chert occurs both as This prominently striped middle limestone. The persistent lenses interbedded with the base of the limy part of the formation. Fossils occur sporadically clated with a gastropod questionably carbonate cement, and are laminated to thin-bedded with parallel to low-unit no. 7G in the Cornfield Springs actively pure limestone is in shades of best collections were made from a construction of the confield springs actively pure limestone is in shades of the confield springs actively pure limestone is in shades of the confield springs actively pure limestone is in shades of the confield springs actively pure limestone is in shades of the confield springs. formation (Hazzard, 1937, p. 277, gray, whereas shaly parts are olive few dolomite layers near its top, feet thick, was measured 1½ miles 319) in the Nopah Range, which gray to olive brown; silty and cherty about 500 feet above the base of the northeast of Meiklejohn Peak. according to a revision of nomen-parts appear yellowish gray to formation. Collections yielded There, the dolomite contains chert clature (Palmer and Hazzard, 1956, brownish gray. Most of the lime-pentameroid brachiopods and corals, and a fauna similar to that at the p. 2498-2499) forms the upper part stone is aphanitic to medium grained, like faunas described from the type type locality, but lacks well-developof the Bonanza King formation. but a 300-foot zone near the top is section (Merriam and Anderson, ed quartz sand and limestone zones. Three distinct bands, each about commonly medium to very coarse 200 feet thick, that are from bottom grained and locally recrystallized tion as Middle Silurian in age.

Some of the fossiliferous dolomites yield either a hydrogen sulfide or a

The Carrara formation is here defined and named for Carrara, an abandoned mining camp 8 miles east-southeast of Beatty on Nevada in the fall of 1956 and completed in the spring of 1958.

Members of the U. S. Geological Survey identified Paleozoic fossils collected by the authors during field work. Cambrian faunas were iden-

Upper Mississippian clastic rocks.

The Paleozoic rocks are intensely

The Paleozoic rocks are intensely about 150 feet thick forms the top

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The Paleozoic rocks are intensely about 150 feet thick forms the top deformed, principally by flat thrust faults and right-lateral strike-slip for the unit. It is overlain by finefaults. The thrust faults occur grained clastic rocks of the third member is 1,600 to 1,800 feet thick thick, overlies the Eureka quartzite, type section on the north end of faults. The thrust faults occur mainly in the weak shaly parts of the section. Tuffs and welded tuffs of Tertiarry age are thrust over the Paleozoic rocks, but the deformation are a light of the formation are a light of Tertiarry age are thrust over the Paleozoic rocks, but the deformation are a light of the formation are a light of Paleozoic rocks, but the deformation was less intense than in the earlier thrust plates in Paleozoic rocks.

Basin and range normal faults

The basin places.

The basin place developed in late Tertiary and The lower half of the Carrara coarse grained and obscurely to At Bare Mountain most of the seformation is greenish-, yellowish-, and brownish-gray shale with 1 or parallel, and locally wavy, laminated very fine-grained, laminated to very mation exposed here is 300 feet thick PALEOZOIC ROCKS 2 bands of dark-gray limestone, to thin bedded and locally thick thin-bedded and blocky dolomite. and is dark-gray cherty dolomite JOHNNIE(?) FORMATION [C] which form ledges in the steep shaly
The Johnnie(?) formation of Early
Slope. The upper half of the forcation is prominent in a few zones.

Chert as anastomosing irregular with sandstone lenses and a little lenses comprises about 10 percent limestone. Fossils collected near Cambrian age is the oldest and mation forms a striking series of Brownish- to olive-gray silty and of the rock, and in some zones is the top of this unit were identified

sandstone, and siltstone. This sequence is similar to the basal part of the Johnnie (?) formation in the Nopah Range (Hazzard, 1937, p. 303).

The remainder of the formation is predominantly shale and siltstone redominantly shale and siltstone of the type locality in the Nopah formation together with several hundred feet of limestone and dolomite above and below the shale also correlate closely lithology with the Bonanza King formation of the type locality in Mountain (Merriam, 1940, p. 11-12).

A thin lower unit, about 150 feet thick, contains interstratified light-and dark-gray limy dolomite that locally contains sparse sand, small lithology with the Bonanza King formation of the type locality in Mountain (Merriam, 1940, p. 11-12).

A thin lower unit, about 150 feet thick, contains interstratified light-and dark-gray limy dolomite that locally contains sparse sand, small lithology with the Dunderberg shale and carbonate units adjacent to it with subordinate intercalated sandstone and a few thin beds of dolomite

with subordinate intercalated sandstone and a few thin beds of dolomite

for mation of the type locality in in the AEC Nevada Proving Grounds
the Providence Mountains, Calif.

(Johnson and Hithard 1977 2019) stone and a few thin beds of dolomite and limestone; siltstone is most (Hazzard and Mason, 1936, p. 234-238), and with the Ronausa King (Johnson and Hibbard, 1957, p. 340-238), and with the Ronausa King (April 238), and with the Ronausa King (Solution and Hibbard, 1957, p. 340-238), and with the Ronausa King (Solution and Hibbard, 1957, p. 340-238), and with the Ronausa King (Solution and Hibbard, 1957, p. 340-238), and with the Ronausa King (Solution and Hibbard, 1957, p. 340-238), and with the Ronausa King (Solution and Hibbard, 1957, p. 340-238). formation in the Nopah Range,
Calif., as revised by Palmer and
A limestone sequence 1,375 feet
Hazzard (1958 n. 2494-2499). The
thick measured at Bare Mountain about 300 feet thick, occur near the middle and top of the formation;

A limestone sequence 1,375 feet thick, consists of medium-gray thick, consists of aphanitic to fine-limy dolomite that grades upward grained limestone with intercalated the lower quartzite is conglomeratic formation is mostly thin- to thick- has been correlated with the Pogo- into light-gray partly recrystallized quartzose sandstone laminae and and locally the upper has vertical bedded dolomite with a few zones and locally the upper has vertical bedded dolomite with a few zones and locally the upper has vertical bedded dolomite with a few zones and locally the upper has vertical dolomite that commonly weathers to quartzite lenses up to 5 feet thick sandy dolomite crops out locally about 800 feet below the top of the sandy dolomite crops out locally about 800 feet below the top of the sand partings, and locally thin dackevett, 1958, p. 6). Units within MacKevett, 1958, p. 6). Units within bedded, platy, and slabby. Although medium gray with slightly different A complete section measured the group were not differentiated the lower part of the formation is shades in faint bands, thick bedded

A quartzite, 1,150 feet in thickness, the uppermost part of the Bonanza feet above the base of the measured LONE MOUNTAIN DOLOMITE (Sim) petroliferous odor when struck with A quartzite, 1,150 feet in thickness, the uppermost part of the Bonanza feet above the base of the measured conformably overlies the Johnnie(?)

King formation at Bare Mountain. section the limestone is locally conThe basal part of the Fluorspar lies the Carrara formation. It is Nopah Range (Hazzard, 1937, p. 319
The lower contact of the Pogonip overlying, gradationally, similar Merriam contains fossils of probcorrelated with the 3,700-foot thick
Stirling(?)quartziteof Early Cambrian

Stirling(?)quartziteof Early Cambrian Stirling(?) quartzite of Early Cambrian age, whose type section is about 35 miles to the southeast in the Spring miles to the southeast in the Spring miles to the southeast in the Spring miles (Nolan 1929 p. 463). In Manufacine (Nolan 1929 p. 463). In Manufacin mountains (Noian, 1929, p. 403). In general, the Stirling (?) consists of light gray, orange, and brown quartzite, that appears pale red from a distinguishment of the spots, and discrete and anastomosthat appears pale red from a distinguishment of the spots, and discrete and anastomosthat appears pale red from a distinguishment of the spots, and discrete and anastomosthat appears pale red from a distinguishment of the spots, and discrete and anastomosthat appears pale red from a distinguishment of the spots, and discrete and anastomosthat appears pale red from a distinguishment of the Nevada formation as part of the Nevada formati

unstratified to thinly laminated or found have been identifiable. The age, include the spongelike form very light gray unit with a thick, thin bedded, and commonly low-formation at Bare Mountain is Receptaculities elongatus Walcott, poorly defined darker gray zone in A thick sequence of rocks of of schistose siltstone and phyllitic shale, similar to those in the upper part of the underlying Johnnie?)

formation and the lower part of the overlying Carreer for the underlying Ca Pogonip group from other localities. of pitted light-gray dolomite that Meiklejohn Peak where the type is fine to medium grained and beintercalated in the quartzite in the Two distinct units with a total spicuous, occurring in part in comes coarser grained upward. It section, bounded top and bottom by basal and upper parts of the for- thickness of about 1,900 feet consti- relatively massive, locally dolo- is indistinctly stratified, massive, thrust faults, is 3,200 feet thick, mation. The lower contact of the tute the Nopah formation of Late mitized limestone. Palliseria first and contains fragments of crinoid and consists chiefly of silty clayformation is placed arbitrarily at Cambrian age at Bare Mountain; appears about 750 feet above the stems. The middle unit, about 500 stone with intercalated zones of a 10- to 30-foot glass zone at the but phenocrysts of the other min- of Bare Mountain. Such weak beds ride mine, was recorded as 72 flasks Prelim. Rept. 3-209.

Survey identified Paleozoic Tossils collected by the authors during field work. Cambrian faunas were identified by A. R. Palmer; Ordovician faunas were identified by A. R. Palmer; Ordovician faunas by J. M. Berdan, R. J. Ross, Jr., and E. L. Yochelson; Silurian and Devonian faunas, except the Devonian Stringocephalus?, by J. M. Berdan and C. W. Merriam, and Carboniferous faunas by W. H. Hass and L. G. Henbest.

SUMMARY OF GEOLOGY

Paleozoic rocks in the Bare Mountain quadrangle are typical of the eastern Nevada facies and consist dominantly of carbonate

Iimestone with minor amounts of quartzite, sandstone, and siltstone. A typical section 1,785 feet thick was sharp contact the Bonanza King formation and overlies with a sharp contact the Bonanza King formation and passes abruptly up into the upper member of the Nopah formation. Upper member of the Nopah formation. Upper member.—A limestone, and siltstone. A typical section 1,785 feet thick was sharp contact the Bonanza King formation and passes abruptly up into the upper member of the Nopah formation. Upper member of the Nopah formation. Upper member.—A limestone, and siltstone. Upper member of the Nopah formation and passes abruptly up into the upper member. A limestone in the canyon half a mile northwest of Carrara Canyon. Clastic rocks dominate the lower half of the formation whereas limestone dominates the upper half. The lower half commonly has three major subdivisions and the upper half. The lower half commonly has three major subdivisions and the upper member.—A limestone. Upper member of the Nopah formation and passes abruptly up into the upper member of the Nopah formation in the upper member of the Nopah formation in the blower contact of the formation is formation at the base of a limy sand-stone and the blower contact of the formation is formation of at the base of a limy sand-stone and the blower contact of the Nopah formation at the base of a limy sand-stone and the blower contact of the Devention at the blower contact of the Solice at the base of

several occur in about equal proportions. Low-grade metamorphism limestone in the lower part of the member.

\*\*Pseudoagnostus\*\*, a distinct Upper limestone in the lower part of the lower part of the member.

\*\*Pseudoagnostus\*\*, a distinct Upper limestone in the lower part of the Cambrian agnostid, as well as other limestone in the lower part of the member.

\*\*Pseudoagnostus\*\*, a distinct Upper limestone in the lower part of the lower part of the member.

\*\*Pseudoagnostus\*\*, a distinct Upper limestone in the lower part of the member.

\*\*Pseudoagnostus\*\*, a distinct Upper limestone in the lower part of the lower part of the limestone in the lower part of the limestone in the lower part of emmonly has produced phyllite, formation indicates a late Early poorly preserved agnostid and ROBERTS MOUNTAINS FORMATION to dark gray in faintly to sharply defined bands 1 to 40 feet thick; been identified from the lower shale A sequence of limestone and dolo- each band in turn commonly ha of the formation are locally more Middle Cambrian and it correlates member of the Nopah formation at mite beds, ranging from 650 to 850 alternating bands of nearly the same intensely metamorphosed in the roughly both in lithology and in Bare Mountain. These indicate the feet in thickness, is correlated with shade. Locally, the rock is irregvicinity of Conejo and Dry Canyons overall thickness with units of the equivalence of the member with the Roberts Mountains formation, ularly mottled light to dark gray. near the west-central margin of the same age overlying the Stirling(") and basal Nopah formation at its type which has its type section at Roberts Stratification ranges in thickness same age everying the Stringer, and quadrangle.

In the Johnnie(?) formation at Bare Mountain the lower beds consist of 200 to 300 feet of dolomite and limestone that become increasingly sandy upwards and several hundred

same age everying the Stringer, and prospect Mountain quartzites in the Atomic Energy Commission Nevada Proving Grounds (Johnson and Hibbard, 1957, p. 336-342) and Groom district (Humphrey, 1945, p. 23-26) respectively.

basal Nopah formation at its type which has its type section at Roberts (Creek Mountain in central Nevada (Merriam, 1940, p. 11-12; Nolan and others, 1956, p. 36-37). The formation of Hazzard and Mason, 1937, in the Providence Mountains, California (Palmer and Hazzard, p. 23-26) respectively.

Straulication ranges in thickness (Creek Mountain in central Nevada (Merriam, 1940, p. 11-12; Nolan and others, 1956, p. 36-37). The formation of Hazzard and Mason, 1937, in the Providence Mountains, California (Palmer and Hazzard, p. 23-26) respectively. eet of quartzitic sandstone, silty BONANZA KING FORMATION (Cox) 1956). The lower shale member of the type locality and one at Lone where they consist chiefly of tiny

consisting chiefly of medium- to to dark gray, and the clastic rock is dark-gray limestone and limy dolo- brown and locally gray. Johnnie (7). It may be extensive at this horizon but is not readily recurrence this horizon but is not readily recurrence.

A complete section measured the group were not differentiated during mapping. The lower third cherty, the conspicuous chert unit and massive at the base, and lamithis horizon but is not readily recognizable, probably because of units that differ from one another cherty limestone with cherty dolo-

The shale and siltstone are light chiefly in content of clastics, chert, mite at the base; the upper two-everywhere at Bare Mountain. white to pink and weather pinkish feet of the section. The tiny rod-

mite about 1,600 feet thick, and Canyon formation according to

nitic to coarse-grained sequences in the upper hundred feet. Strati-

grains of black chert. indicating cyclic deposition.

have been named the Eleana formation by Johnson and Hibbard (1957, p. 357-360) and have been correlated in part with the Chainman shale and Diamond Peak for-

mation. feet, although accurate determina-

INTRODUCTION the base of the quartzite overlying these two units, a thin basal shale base of the formation in the meas- feet thick, is blotched light- and chert, shale, coarser clastics, and base. Some glass zones are locally erals may be scarse or absent in any are found in the Johnnie (?), Carrara, up to 1943 according to Bailey and The Bare Mountain quadrangle is located in Nye County, Nev, east

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The Bare Mountain quadrangle in 1943 according to Bailey and dark-gray dolomite, chiefly fine to carbonate rocks. Two other frag
and Meiklejohn formations. The proundmass about 1,000 feet above the base and medium grained with a few sandy in 1956, but the located in Nye County, Nev, east

The Bare Mountain quadrangle in 1943 according to Bailey and dark-gray dolomite, chiefly fine to carbonate rocks. Two other frag
and Meiklejohn formations. The proundmass and Meiklejohn formations in the South Nye County, Nev, east

The Bare Mountain quadrangle in 1943 according to 1943 according to 1943 according to 1944 according to formation, likewise bounded by intertongue with stony welded tuff with intergrown anhedral to sub- bricate in the area south of Fluors- amount of production is unknown thrust faults, crop out west and along the strike and presumably hedral crystals about 0.05 mm across par Canyon. Thrust plates of the and probably small. The mercury northeast of Meiklejohn Peak. The section west of Meiklejohn Peak is The welded tuff glass is brown, tered hematite grains.

of quartz and sanidine, and scatsection west of Meiklejohn formation virtually surround a stubby plate of Stirling(?) seminated in a lens of chalcedony predominantly shale, whereas the dark gray, or black, in part perlitic, Some intrusive rhyolite is partly quartzite and Carrara formation at and opal along a steeply dipping section northeast of the peak con- and contains abundant glass shards glassy, particularly along margins. Crescent Cliff. The Meiklejohn fissure in dolomite of the Fluorspar sists of shale, quartzite, chert, and and scattered fragments, mostly less Glassy rhyolite has a groundmass for mation has been sheared out Canyon formation of Devonian age.

The rocks in the measured section, and glassy rhyolite. The glass frag- mass of the stony facies, however, onip group and Fluorspar Canyon Tip Top mine is similar in occursoutheast of Meiklejohn Peak, can ments and shards are also commonly be divided into lower, middle, and perlitic. In some glass the shards devitrification. The rhyolites range Razorback Ridge. These thrusting located 600 feet north of it. Proupper units, 1,000, 800, and 1,400 feet tend to be oriented with their long in color from white to gray and thick, respectively. The lower part of the lower unit consists of very the glass zone, or molded around of the lower unit consists of very the glass zone, or molded around of the lower unit consists of very the glass zone, or molded around of the lower unit consists of very tend to be oriented with their long in color from white to gray and relations attest both to the intensity of the deformation to which the phenocrysts may be either prominent or coks were subjected, and also to thin bedded, platy to flaggy, tuff- crystal and rock fragments. Broken or inconspicuous. The spherulitie the efficacy of shaly units as the Small amounts of mercury have accous silty claystone that is light crystals, up to 2 mm across, of rhyolites commonly have a planar loci of planes of rupture. gray with brown laminae, except quartz, sanidine, biotite, and albite structure due to alternations of The age of the intense thrust and plored Thompson mine in the northfor 50 feet of pinkish gray claystone or oligoclase, are scattered through layers up to 1 mm thick of spheruli- tear faulting on Bare Mountain west end of Yucca Mountain (sec. 29, feet are several lenses of shale and dark gray fossiliferous dolomite.

The middle part of the lower unit is silty elevent that the lower unit is silty elevent that the lower unit is silty elevent that the same overall exists as the welded is same overall exists and crystals as the welded to the same overall exists and crystals as the well exists and crystals as the wel is silty claystone that includes thin tuff glass, but the glass is partly Older gravels, probably for the welded tuff of probable Miocene has been very small (Bailey and to thick layers of black chert; the to almost completely devitrified. most part Pleistocene in age and age that crop out in the same area Phoenix, 1944, p. 143). upper part of the lower unit includes In addition, the stony rock contains characterized by the variable sort- but were not involved in this intense The Silicon mine, located at the several sandstone and conglomerate scattered to abundant pumics frag- ing of the detritus occur in the orogeny. Northwest of Bare northwest end of Yucca Mountain layers that weather brownish gray ments flattened parallel to the bed-central and northern parts of the Mountain in the Hawthorne and (sec. 19, T. 11 S., R. 48 E., unsurand contain prominent pebbles and ding planes of the welded tuff. Bare Mountain quadrangle. These Tonopah quadrangles intense thrust veyed), has produced an unknown The middle unit of the measured reddish brown and commonly con- lower ends of the fans consist of (Ferguson and Muller, 1949, p. 7-13) silica that runs about 99.7 percent section, roughly 800 feet thick, tains conspicuous white feldspar relatively fine detritus and cobbles, with thrusting from the north fol-

unit of the section, and in part others, 1910, p. 39), crops out near cyclically arranged.

Cretaceous.

3. The Tertia

from the limestone beds indicate a vugs in the rock.

Late Mississippian age. One bed

Alteration.—The tuff, and to a of smooth desert pavement broken by the gullies of ephemeral streams.

The fault surface caused secondary faulting and tilting due to jostling the fault surface caused secondary faulting and tilting due to jostling the fault surface caused secondary faulting and tilting due to jostling the fault surface caused secondary faulting and tilting due to jostling the fault surface caused secondary faulting and tilting due to jostling the fault surface caused secondary faulting and tilting due to jostling the fault surface caused secondary faulting and tilting due to jostling the fault surface caused secondary faulting and tilting due to jostling the fault surface caused secondary faulting and tilting due to jostling the fault surface caused secondary faulting and tilting due to jostling the fault surface caused secondary faulting and tilting due to jostling the fault surface caused secondary faulting and tilting due to jostling the fault surface caused secondary faulting and tilting due to jostling the fault surface caused secondary fault surface caus contains the conodonts Cavus- lesser extent the welded tuff, is STRUCTURE of blocks as the plate moved. De- Spec. Rept. 51. contains the conodonts Cavasgrathus sp., Gnathodus bilineatus,
Ligonodina sp., and fragments of
other bladelike and barlike conodonts. Another bed contains the
foraminifera Monotaxis sp., Endothyra sp., and a fusulinide genus
with affinities to Pseudoendothyra
sp.

STRUCTURE

STRUCTURE

STRUCTURE

The structural history of the Bare
Mountain area is complex and of
long duration. The principal deformation of this type was great
mountain area is complex and of
long duration. The principal deformation of this type was great
est near the thrust plane. The
youngest tuff and welded tuff were
not involved in this deformation and
unconformably overlie older deformed tuff and welded tuff in
Tates Wash, north of Meiklejohn
grathus sp., California Jour. Mines
and Geology, v. 33, p. 273-339.
Ligonodina sp., and fragments of
other bladelike and barlike conodonts. Another bed contains the
formation of this type was great
est near the thrust plane. The
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Tates Wash, north of Meiklejohn
peak.

STRUCTURE

The structural history of the Bare
dountain area is complex and of
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unconformably overlie older deformed tuff and welded tuff in
Tates Wash, north of Meiklejohn
peak. mines at the west end of Yucca The Meiklejohn formation is Mountain. The alteration was probsimilar in part to the Chainman ably caused by solutions from ther-

are considered to be Late Mississip- EXTRUSIVE BASALT

able range in age of the tuff and and a little hypersthene and augite. strike approximately north, and dip rangle. quadrangle to the west, which are interstitial glass. The tops of the indicate generally the relative 1923, p. 167) when gold was disyounger than early Oligocene and are probably Miocene in age (Stock and cinders in the cinder con's, are northeast to southwest.

Mountain. Significant amounts of Paper no. 25. and Bode, 1935). The youngest tuff vesicular, and brown or red me to The close genetic relationship fluorspar have been mined since Merriam, C. W., and Anderson, C. A.

tain quadrangle are horizontal and ferric iron in the rocks. unconformably overlie the older tuff INTRUSEVE ROCKS and welded tuff, as for example on the north side of Tates Wash. Tuff. - Most of the tuff is moderately to well lithified, but parts to rhyodacite and rhyolits. The become thrust faults. of the youngest tuff are loosely consolidated. The tuff contains

basalt, dacite, and rayodacis occur

consolidated. The tuff contains

only in steep-dipping dikes less than

of thrusting of the rocks on Bare

The Daisy wine in Fluorspar angular fragments, commonly less
50 feet thick, whereas the myolite
Mountain was toward the southwest,

NW1/ con 22 T 12 S than 2 inches in diameter, of pumice.

occurs both in dikes and in arger drag folds in weak shally units in Canyon (NW1/4 sec. 23, T. 12 S., stony rhyolite, and rhyolitic glass, as well as glass shards. It also contains scarce to rather abundant broken crystals, commonly less than 2 mm in the longest dimension, of quartz, sanidine, albite or oligoclase, and biotite. The groundmass is porous and consists largely of glass, minute glass shards, and local Pleistocene age. aggregates of tridymite. Tiny vugs in some of the tuff. The glass, both in the groundmass and in the fragments, is partly devitrified, and devitrified areas are spherulitic. The tuff is white, gray, or yellow-

consolidated tuff of probable the underlying rocks. ish brown, and locally orange or pink. The pink tuff occurs just below some of the welded tuffs and pink deepens upward toward the welded tuff and probably was caused by heat from the welded tuff. The tuff is mostly massive, but beds of fine- and coarse-grained tuffaceous material up to 10 feet little zircon.

than I inch in diameter, of stony of clear perlitic glass. The ground- from between thrust plates of Pog- Another small deposit known as the The stony welded tuff is gray to gravels are old dissected fans. The faulting occurred in the Jurassic but moderate amount of ceramic

beds up to 5 feet in thickness of reddish brown. The light brown is, with a few as much as 6 feet in Mountain. brown-weathering sandstone, grit, chert-pebble conglomerate, black

The color barding of Restrict Work black and street in thickness of the time as feet in Mountain.

Longwell (1949, p. 965-966, and originally darker reddish frown.

West of Oasis Valley and north oral communication) has dated

Restrict Work black and the second diameter.

The color barding is the second diameter of Restrict Work black and north oral communication) has dated chert, and fine to coarse grained gray to black limestone. These interbeds form regularly spaced plane of bedding of the welded tuff mostly of tuff and welded tuff, but middle to Late Cretaceous with blocks according to Kral (1951, sequences which grade successively except for local contortions, south of Beatty Wash and northeast thrusting from the northwest. Noble p. 68). upward from conglomerate to sand- Crystals of biotite and feldspar, as of Meiklejohn Peak the boulders (1941, p. 958) and Wright (Noble and upward from conglomerate to sand-stone, siltstone, and limestone, indicating cyclic deposition. well as platy pumice fragments, indicating cyclic deposition. strewn on the dissected surfaces of the older fans are mostly of Paleo-major thrusting in the Virgin The upper 1,400 feet of the the plane of the welded tuff. zoic limestone, dolomite, and quart- Springs area of southern Death Ball, S. H., 1907, A geologic reconmeasured section is predominantly In several of the welded tuffs in zite. These boulders are, in part, Valley to have taken place in the naissance in southwestern Nevada varicolored pink, olive, brown, and the Bare Mountain quadrangle the arranged in linear trains along middle or late Tertiary. The major and eastern California: U. S. Geol. dark gray silty claystone and siltstone, with interbeds of conglom
dark gray silty claystone and siltstone, with interbeds of conglom
dark gray silty claystone and siltstone, with interbeds of conglom
ridge crests; these boulder trains
probably represent channels of old

could not have occurred as late as

Bailey, E. H., and Phoenix, D. A., erate, sandstone, chert, and lime- tuff showing this structure, noted streams that flowed out from the middle Tertiary, and probably 1944, Quicksilver deposits in Nestone, similar to those in the middle first by Emmons (Ransome, and north part of Bare Mountain. happened in the Jurassic or vada: Nevada Univ. Bull., v. 38,

Mesozoic. 3. Moderate thrusting 4. Normal faulting probably has Mountains, California: Geol. Soc.

and have been tilted and faulted Meiklejohn formation (Upper Misprobably bounds the east side of of Nye County, Nevada: Nevada with the tuff and welded tuff. sissippian); thus, folding could have Bare Mountain. Here Paleozoic Univ. Bull., v. 45, no. 3. These basalt flows are of probable occurred as early as middle Paleo-rocks are cut off abruptly along a Lincoln, F. C., 1923, Mining districts ion.

late Tertiary or early Quaternary

CENOZOIC ROCKS

late Tertiary or early Quaternary

zoic time.

2. The Paleozoic rocks in Bare

sharp, relatively straight line, and the alluvial fans are small and relatively straight line, and the alluvial TUFF AND WELDED TUFF associated flows in the southeastern Mountain later were subjected to tively undissected in comparison to lishing Co. The northern and eastern parts part of the quadrangle are of Recent an intense deformation that was those on the west side of Bare Longwell, C. R., 1949, Structure of

and welded tuff in the Bare Moun- a relatively high proporsion of between tear faults and thrust faults 1918, and a small production of 1942, Reconnaissance survey of is indicated not only by similar mercury, ceramic silica, and pumidirections of displacement but also cite has been recorded. Meager Geol. Soc. America Bull., v. 53, by the fact that some of north-showings of gold, silver, and tung-p. 1675-1728. Intrusive rocks in the Bare trending tear faults change their sten have been found in several Mountain quadrangle range in strike direction abruptly to the prospects, but no production has composition from basalt and dacite northwest or west, and themselves been recorded. Unsuccessful attempts have been made to quarry stocklike bodies up to 4,000 feet the Johnnie (?) and Carrara formations R. 47 E.) was discovered in 1918 and fornia: California Div. Mines Bull. wide and 2 miles long. The dikes in the northwest part of Bare has produced fluorspar continuoccur both in the Paleozoic rocks Mountain, south of Fluorspar ously since 1927. Total production Nolan, T. B., 1929, Notes on the and in Cenozoic wolcanic rocks. The Canyon, and in the Pogonip group has been nearly 100,000 tons of ore, stratigraphy and structure of the larger stocks occur only in volcanic on Meiklejohn Peak indicate that and substantial reserves remain. rocks, and one of the large intru- these thrust plates probably moved The ore as mined runs about 80 Mountain, Nevada: Am. Jour. sives cuts some of the young poorly south or southeast with respect to percent CaF, and less than 2 percent Sci., 5th ser., v. 17, p. 461-472. Several of the thrust faults have lenses along northeasterly trend-The basalt di kes are similar to wrinkles or troughs, discernible ing shear zones in dolomite of the

The intrusive rhyolite is porphy- warped faults, however, do not in- was being explored in 1958. Welded tuff.—The welded rhyoritic with phenocrysts up to about dicate that the faults were folded.

Mercury was discovered in 1908 at Natl. Acad. Sci. Proc., v. 21, p. 571,570 litic tuff is predominantly stony. 2 mm in their longest dimension. Thrust faulting, and particularly the north end of Meiklejohn Peak 571-579. Individual beds range from 20 to Phenocrysts, in order of decreasing imbrication of thrust plates, oc- (NW 1/4 sec. 18, T. 12 S., R. 48 E., Thurston, W. R., 1949, The Daisy 700 feet in thickness. Part of the abundance, are sanidine, quartz, curred mostly in weak shally units unsurveyed). Production from this fluorspar deposit near Beatty, welded tuff is glassy, and the stony welded tuff units commonly have oligoclase, and biotite. Sanidine that are interbedded with the preparation of the phenocrysts occur in all the rocks, dominantly massive carbonate rocks.

Nye County, Nevada: U.S. Geol. Harvey mine and also as the Tellusure of the phenocrysts occur in all the rocks, dominantly massive carbonate rocks.

consist of light gray to brown silty crystals and transparent quartz whereas the upper surfaces of the lowed by later thrusts from the is a thoroughly silicified rhyolitic claystone similar to that in the lower part, but with numerous inter-

the middle of sec. 8, T. 12 S., R. 47 E., and another spheroidal welded tuff formation exposed west of Meikle-john Peak consists of black siliceous shelp in its laws of the middle of sec. 8, T. 12 S., R. 47 E.

Alluvial fans flank Bare Mountains and hills in and adjacent to the Bare Mountain shelp in its laws of black siliceous shelp in its laws of the middle of sec. 8, T. 12 S., R. 47 E.

Alluvial fans flank Bare Mountain and hills in and adjacent to the Bare Mountain and tilting in the middle of sec. 8, T. 12 S., R. 47 E.

3. The Tertiary volcanic rocks, mainly tuff and welded tuff, were moderately deformed by faulting and tilting in the middle of sec. 8, T. 12 S., R. 47 E.

The northern and eastern parts of the Bare Mountain quadrangle are of keent age and have not been appreciably are underlain by tuff and welded tuff of rhyolitic composition. The tuff and welded tuff have a combined thickness of as much as 6,000 bined thickness of as much as 6,000 are underlained by erosion since their formation.

The basalt in the flows and in the flow and the first flows and the flows and in the flows and the flows and in the flows and the flows are a flow flow and the flows and the flow cones is dark gray to black, aphanit- than 40° and having undulating tuff and welded tuff have locally tion of the thickness is impossible ic to fine grained, and commonly surfaces. The tear faults associated been deformed by the intrusion of California: California Div. Mines because of inadequate exposures

trachytic, with phenocrysts up to

with thrust faults have apparent

porphyry stocks in the northern and

Spec. Rept. 25. and disruption by faults. The prob- 2 mm long of labradorite, olivine, right-lateral displacements; they northeastern parts of the quadwelded tuff is from Miocene to
Pleistocene. The oldest welded tuff

The groundmass consists of labradorite microlites and minute grans

The groundmass consists of labraborizontal displacements along the

ECONOMIC GEOLOGY lies at the west-central edge of the of pigeonite, augite, hypersthene, tear faults, and locally pronounced Mineral exploration has continued Map GQ-95. quadrangle and can be correlated ilmenite, magnetite, and small to drag folds in the shaly beds above intermittently in the Bare Moun- Merriam, C. W., 1940, Devonian with similar rocks in the Bullfrog moderate amounts of biotite and and below some of the thrust faults, tain quadrangle since 1905 (Lincoln,

formation exposed west of Meiklejohn Peak consists of black siliceous
shale in its lower part, and predominantly brown-weathering
carbonaceous shale that contains
scattered interbeds of black chert
and limestone, and conglomerate
with prominent black chert pebbles
in its upper part. Fossils collected
from the limestone beds indicate a
from the gared in
these fans grades downward into
sand and silt in the valley bottoms.
Gravels also occur in stream channels, both on the fans and on the
valley floors. The fans, particularly
their lower ends, have large are separated
from the Paleozoic rocks at the
moderately deformed by faulting
ard tilting in the middle or late
from the Paleozoic rocks at the
form the limestone beds indicate a
from the paleone from the Bare Mountain by a
moderately deformed by faulting and tilting in the middle or late
from the paleox or crawle and tilting

similar in part to the Chainman ably caused by solutions from ther-shale and the Diamond Peak formating from late Tertiary to Recent.

The Solutions from the control or late Tertiary to Recent.

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The solution from the control or late Tertiary to Recent.

The solution from the control or late Tertiary to Recent. 1. The initial folding in the Bare category have been mapped, and County, Nevada: Nevada Univ. Mountain quadrangle imparted a displacements, where observed, are Bull., v. 39, no. 42, 53 p. pian in age (Nolan and others, 1956, p. 56-61). Similar rocks also crop out in Yucca Flat, 30 miles northory on the Yucca Flat, 30 miles northory of the Bare of t Mountain quadrangle. The flows in the northwestern part of the quadrangle are interbedded with tuff and the formation involved the rangle are interbedded with tuff and the formation involved the range are interbedded with tuff and the formation involved the range are interbedded with tuff and the formation involved the range are interbedded with tuff and the formation involved the range are interbedded with tuff and the formation involved the range are interbedded with tuff and the formation involved the range are interbedded with tuff and the formation of Devonian age. Evilying younger tuff and welded tuff, and in alluvial fans. A normal fault with substantial displacement was a formation of Devonian age. Evilying younger tuff and welded tuff, and in alluvial fans. A normal fault with substantial displacement was a formation of Devonian age. Evilying younger tuff and welded tuff, and in alluvial fans. A normal fault with substantial displacement was a formation of Devonian age.

area, northern Panamint Range \_\_\_\_\_1956, Geology of the Ubehebe Peak quadrangle, California:

SiO2. It occurs as steeply dipping Nolan, T. B., Merriam, C. W., and the dark-gray to black extrusive on the map, that trend southwest. Upper Cambrian Nopah formation. Eureka, Nevada: U.S. Geol. Survey basalt described above. The dacite Examples are the thrust faults south The ore lenses are in part bounded Prof. Paper 276. and rhyodacite are gray to dark of Joshua Hollow (see section by low-angle cross faults that dip Palmer, A. R., and Hazzard, J. C., gray and porphyritic with prom- C-C'), the fault overlain by Johnnie (?) gently northward; locally ore shoots 1956, Age and correlation of Corninent white and sine or oligoclase formation that trends northeast- extend along the intersections of field Springs and Bonanza King phenocrysts, commonly about 5 mm ward from Tungsten Canyon, out these faults with the steeply diplong, and black biotite plates about liers of which extend northwestward ping shear zones mentioned above. fornia and southern Nevada: Am 1 mm across. A few dikes contain for 8,000 feet to the summit of Bare A small deposit of fluorspar occurs Assoc. Petroleum Geologists Bull., is as much as 30 feet thick. The green hornblende phenocrysts up Mountain, and the fault that under- along a shear zone in dolomite of v. 40, p. 2494-2499. to 1 mm long. The andesine or lies Wildcat Peak (see section B-B'). the Nopah formation at the Diamond Ransome, F. L., Emmons, W. H., and oligoclase is partly altered to These troughs or wrinkles may be Queen mine on the east side of Bare Garrey, G. H., 1910 Geology and calcite, quartz, sericite, and chlo- due to folding of the thrust faults Mountain. Production from this ore deposits of the Bullfrog disrite. The groundmass consists of at a late stage of the deformation deposit was started on a small scale trict, Nevada: U. S. Geol. Survey locally it is bedded with alternating beds of fine- and coarse-grained beds of fine- and coarse-gra dine, biotite, sericite, calcite, and a were thrust in a southeast direction. Mountain dolomite on the south side 1935, Occurrence of lower Oligo-The attitudes of beds adjacent to of the mouth of Chuckwalla Canyon cene mammal-bearing beds near

REFERENCES

U. S. Geol. Survey Geol. Quad. stratigraphy and paleontology of the Roberts Mountains region, Noble, L. F., 1941, Structural features of the Virgin Springs area, Soc. America Bull., v. 52, p. 941-Geology of the central and southern Death Valley region, Caligraphic section in the vicinity of

SEA LEVEL -

PREPARED IN COOPERATION WITH DEPARTMENT OF THE INTERIOR GEOLOGY OF THE THE NEVADA BUREAU OF MINES UNITED STATES GEOLOGICAL SURVEY BARE MOUNTAIN QUADRANGLE EXPLANATION Alluvium Fan and stream gravels flanking mountains and hills and grading into sand and silt in valley bottoms Older gravels Boulders, cobbles, and finer material of varied lithology in partly dissected fans Fine-grained to aphanitic, dark gray to black, porphyritic basalt flows, dikes, and cinder cones. The rock in flow tops and fragmental cinder cones is mostly sicular and reddish brown to red. Probable range in age: Pliocene to Recent QTrg Porphyry intrusive or flow Dikes, stocks, and flows of white, gray, brown, or reddi rhyolite porphyry and minor dacite and rhyoc range in age: Miocene to Pleistocene White, grav, and vellowish brown tuff; loosely consolistratified; contains broken crystals and small frag in a pumiceous matrix. Probable range in age: Mio-Welded tuff Stony, rhyolitic welded tuff, QTw, gray to reddish brown of feldspar and quartz, and small fragments of stony occur at the base of welded tuff units and locally ar found in the interior or upper parts. Probable range in age: Miocene to Pleistocene Meiklejohn formation Light-colored, pink, gray, and brown tuffaceou locally dominant intercalated beds of dark gray che lenses of medium gray limestone. Minor lithologi commonly cyclical, with graded bedding in clastic rocks. Fossils locally abundant Fluorspar Canyon formation Medium- to dark-gray, locally petroliferous fine- to } but conspicuous zones of deep pink and brown quartgray limestone. Fossils sparse to abundant in the limestone and dolomite Lone Mountain dolomite indistinctly stratified, massive, homogeneous, partly recrystallized, saccharoidal dolomite that is fine to medium-grained. Weathers to a pitted light gray surface in lower and upper parts, and to a blotch light- and medium-dark gray in middle part. Fragments of poorly preserved crinoid stems abund Roberts Mountains formation Light- to dark-gray dolomite, limy dolomite, and limestone in middle, and dolomite in upper part. For mation is faintly to distinctly stratified, laminated to thin bedded and platy to slabby. Fossils abundant in middle. Uppermost dolomite is partly recrystallized and transitional into overlying Ely Springs dolomite Cherty dark-gray very thin-bedded aphanitic to fine-grained dolomite; chert as anastomosing and finely formation, but locally is much more abundant Eureka quartzite Vitreous quartzite with thin sandstone beds at the base and top. Quartzite is chiefly white and grayis arange with some brown staining, fine-grained wit indistinctly thin- to thick-bedded with local fain Pogonip group INTERIOR-GEOLOGICAL SURVEY, WASHINGTON, D. C. 10384 Medium-gray limestone and olive-gray to olive-brown shaly limestone. Lower third has silty and cherty Base map by Topographic Division Geology mapped in 1956-58 SCALE 1:62 500 CONTOUR INTERVAL 40 FEET SECTION ALONG LINE A-A SECTION ALONG LINE C-C' SEA LEVEL SEA LEVEL SECTION ALONG LINE B-B'

Nopah formation

Fine- to coarse-grained light-to dark-gray dolomite,

Bonanza King formation Fine-grained gray dolomite with indistinct thick strat ification, and fine- to medium-grained dolomite with

Lower part is uniformly gray; middle and uppe

Carrara formation

Interstratified greenish-gray to brownish-gray mica-ceous shale with interstratified dark-gray very fine-

grained limestone and minor siltstone in lower ha

and marble in upper half. Small ellipsoidal alg

Stirling(?) quartzite\*

Light-gray, orange, and brown, indistinctly stratified,

fine- to medium-grained quartzite with thin lenses

in basal and top parts. The quartzite is gritty and onglomeratic locally, thinly laminated to thin

bedded, slabby to massive, parallel and low angle

Cis Cia Cin

Johnnie (?) formation\*

Sandstone, siltstone, shale, and minor carbonate rock

as several hundred feet thick. Commonly meter

and conglomerate interstratified in zones as much

One marble bed in the upper part of the formation

is, light-olive-, greenish-, or brownish-gray mica-

"Recent studies of the Lower Cambrian rocks in the Bare Mountain

and surrounding areas by the present authors, and C. A. Nelson, A. R. Palmer, and J. H. Stewart indicate that the rocks here

mapped as Stirling(\*) quartzite are probably actually equivalent to the Zabriskie quartzite of Hazzard (1937, p. 309), and that the upper part of the underlying Johnnie(\*) formation, in which fossils have been found, is probably equivalent to the Wood Canyon formation. The designation Johnnie(\*) for the lower part of

Dashed where approximately located

Normal or reverse fault, showing dip and relative

movement

Dashed where approximately located, dotted where

concealed. U, upthrown side; D, downthrown side

Thrust fault, showing dip

Dashed where approximately located, dotted where

Strike and dip of inclined beds

Strike and dip of overturned beds

Strike and dip of vertical beds

Horizontal beds

Strike and dip of inclined foliation

Strike and dip of vertical foliation

Quarry

that formation is still considered to be valid.

cross-stratified where visibly layered

Cim, yellowish-brown marble

shale in lower half locally contains trilobites

inated limestone

medium- to dark-gray limestone, and brown shale. Dolomite predominates in alternating thin and thick,

ight-and dark-gray bands, and is partly sandy in the lower part. Basal beds, Cns, are shale and lan

GEOLOGIC MAP OF THE BARE MOUNTAIN QUADRANGLE, NEVADA H. R. Cornwall and F. J. Kleinhampl

SECTION ALONG LINE D-D'

SEA LEVEL