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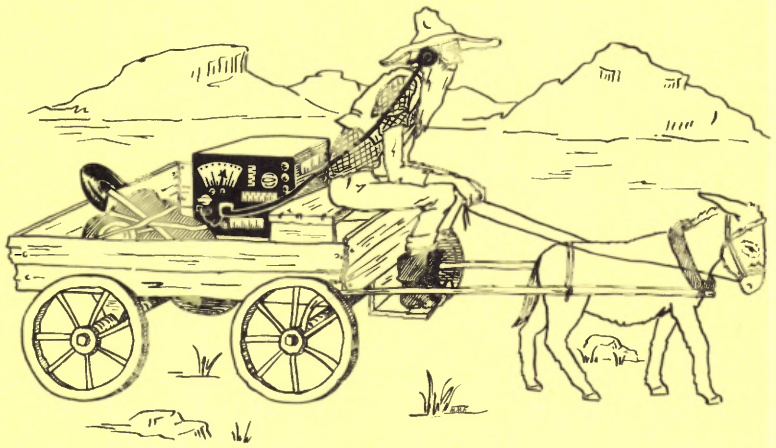
CIRCULAR 40

LEXICON OF NEW MEXICO GEOLOGIC NAMES

PART 1: PRECAMBRIAN AND LOWER PALEOZOIC

Compiled by
Henry L. Jicha, Jr.



NEW MEXICO INSTITUTE OF MINING AND TECHNOLOGY

E. J. Workman, President

STATE BUREAU OF MINES AND MINERAL RESOURCES

Eugene Callaghan, Director

Socorro, August 1956

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LEXICON OF NEW MEXICO GEOLOGIC NAMES: PART 1, PRECAMBRIAN AND LOWER PALEOZOIC

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1956

NEW MEXICO BUREAU OF MINES AND MINERAL RESOURCES
NEW MEXICO INSTITUTE OF MINING AND TECHNOLOGY
SOCORRO, NEW MEXICO

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INTRODUCTION

Acceleration of geologic work in New Mexico has emphasized the need for an up-to-date lexicon of published geologic names used in the state. The author is compiling such a lexicon, which is being issued in appropriate sections in the Circular series of this Bureau. The first part of this compilation, Precambrian and Lower Paleozoic, includes names from the Precambrian through the Devonian. Of the 114 names here presented, 53 have been proposed since 1937. Wilmarth's (1938) Lexicon of Geologic Names of the United States has been drawn upon freely as a basis and guide.

It should be noted that most of the many formation names proposed by C. R. Keyes have not been accepted or used by other geologists working in New Mexico.

USE OF THE LEXICON

In general the pattern set by Wilmarth (1938) is followed. Underlined names are those currently used by the U. S. Geological Survey. Those underlined names preceded by # are accepted by the U. S. Geological Survey but have not been extended into New Mexico by Survey geologists. Names preceded by an asterisk have either been abandoned by their authors or rejected for use in classification by the U. S. Geological Survey. Other names have not been considered by the Committee on Geologic Names of the U. S. Geological Survey for use in Survey reports.

County names and other locality designations mentioned in the captions seldom can provide exact geographic distribution of the unit described, but serve as clues to the part of the state in which the unit occurs.

The following abbreviations are used in text.

approx., approximate or. approximately
aren., arenaceous
argil., argillaceous
btw., between
calc., calcareous
Carbf., Carboniferous
cgl., conglomerate
conf., conformable or conformably
diam., diameter
disconf., disconformably, disconformable, or disconformity
dist., district
div., division
dol., dolomite
dolo., dolomitic
dols., dolomites
equiv., equivalent
fm., formation
fms., formations
ft., foot or feet
gp., group
in., inch or inches
ls., limestone
lss., limestones
loc., locality
mag., magnesian
max., maximum
memb., member
membs., members
mi., mile or miles
min., minimum
mm, millimeter or millimeters
mtn, mountain
mtns, mountains
predom., predominant or predominantly
quad., quadrangle
quads., quadrangles
qtz, quartz
qtzite, quartzite
qtzites, quartzites
qtzitic, quartzitic
qtzose, quartzose

abbreviations (continued)

sh., shale
silic., siliceous, silicified, or silicification
sim., similar
ss., sandstone
sss., sandstones
strat., stratigraphy, stratigraphic, or stratigraphically
subsurf., subsurface
unconf., unconformity, unconformably, unconformable
undiff., undifferentiated

LEXICON

Agua Caliente gabbro

Precambrian: Central northern New Mexico (Picuris Range)

E. Just, 1937 (N. Mex. Bur. Mines and Min. Res. Bull. 13, p 25).
Agua Caliente gabbro. - An exposure of gabbro was found on one of the southern tributaries of Agua Caliente Creek. No definite evidence of an intrusive origin or Precamb. age was discovered. A diorite just NW. of the top of Picuris Peak is also of doubtful age and origin. It is suggested that these rocks may be intrusive and of Keweenawan age. They are not schistose, and were not mapped separately.
A. Montgomery, 1953 (N. Mex. Bur. Mines and Min. Res. Bull. 30, p 35) describes a "bytownite-hornblende meta-intrusive" - a quartz gabbro - which occurs as a widespread sill. It is associated with the schist member of the Vadito fm. of Precamb. age.
Name from Agua Caliente Creek.

Albuquerquan series

A term introduced by C. R. Keyes to designate part of the Precambrian rocks of N. Mex., "exposed to the extent of more than 2,000 ft. in the Tijeras Canyon, E. of Albuquerque." (See his Conspectus of geol. fms. of N. Mex., 1915, p 4.)

Aleman formation (of Montoya group)

Upper Ordovician (Richmond): Southern New Mexico

V. C. Kelley and C. Silver, 1952 (Univ. N. Mex. Pub. in Geol. 4, p 60-62).
Aleman fm. - Alternations of chert and dol. beds which form a strikingly banded outcrop. The chert occurs as irregular bands 1-3 in. thick alternating with 1-6 in. bands of dol. Chert weathers white, brown, and black; dol. weathers light gray to medium gray. Dol. is medium to dark gray, brownish gray, or pinkish gray on fresh exposures and microcrystalline to granular. Fossils occur irregularly as 1-2 in. streaks and lenses of silicified shells. Characteristic fossil is Zygospira recurvirostris. Lies conf. on Upham dol., apparently conf. overlain by Cutter fm. Thickness in Cabal lo Mtns 120-170 ft.

Type locality and section: Cable Canyon, Cabal lo Mtns, NW¼ sec. 10, T. 16 S., R. 4 W.
Name from Aleman station of A. T. S. F. R. R., east of Cabal lo Mtns.

Aneth formation

Upper Devonian: Subsurface, northwestern New Mexico, northeastern Arizona southwestern Colorado and southeastern Utah (Four Corners area)

R. L. Knight and J. C. Cooper, 1955 (Four Corners Geol. Soc. Guidebook, p 56-58). Aneth fm. - Eleven wells in the Four Corners region have penetrated a dark dol. interval interbedded with varying amounts of gray, brown, and black sh., gray siltstone and lighter dots. This distinctive lithologic unit is believed to meet all the requirements of a fm. It is easily distinguishable from other Dev. units in the region and is traceable over a sizable area.

J. C. Cooper, 1955 (Four Corners Geol. Soc. Guidebook, p 59-65). Aneth fm. - The Aneth fm., ranging from 0 to 170 ft., underlies an irregular ellipsoidal area of approx. 2,600 sq. mi. which straddles the four state intersection. The type section at the Shell well lies near the center and is the max. thickness known. This facies wedges out in all directions from the Shell test. The Aneth fm. consists predominantly of dark brown to black, resinous, dense dol., ls. and sh. locally slightly anhydritic with some associated glauconite. In the Continental South Ute Mtn test, located in the extreme NW. corner of N. Mex., some carbonaceous sh. and associated minor coal were logged. The Aneth fm. unconf. overlies the Camb. Ophir fm. and where the Ophir is absent it lies on the Tintic ss. In the Phillips Navajo No. 1 at Chimney Rock the Aneth fm. is underlain by a probable intrusive. The Aneth fm. (probably unconf.) underlies the McCracken ss. memb. of the Elbert fm. (Dev.) The Jefferson ls. of northern Utah is believed to be the approx. equiv. of the Aneth fm.

Type section: Shell Oil Co. Bluff Unit No. 1, sec. 32, T. 39 S., R. 23 E., near Blanding, Utah
Origin of name not given.

Antonio slate

Precambrian: Central New Mexico (Manzano Mtns)

C. R. Keyes, 1915 (Iowa Acad. Sci. Proc., v 22, p 257-259; Conspectus of geol. fms. of N. Mex., p 4, 5). Antonio slates. - Somewhat metamorphosed argil. beds, 2,000 ft. thick, which lie beneath Tijeras qtzite and are well displayed at N. end of Manzano Mtns. Underlain by other but as yet undet. sediments. (Derivation of name not given.)

Armendaris limestone

Ordovician: New Mexico

C. R. Keyes, 1915 (Iowa Acad. Sci. Proc., v 22, p 259, 260). Armendaris lss. - Lss., 300 ft. thick, underlying Montoyan series and unconf. overlying late Camb. qtzites (Lone terrane) in N. Mex. The main body of Early Ordovicic lss. well displayed in Sierra de los Caballos. (Derivation of name not stated.)

#Badito quartzite member (of Hopewell series)

Precambrian: Central northern New Mexico (Picuris Range).

E. Just, 1937 (N. Mex. Bur. Mines and Min. Res. Bull. 13, p 21)
Badito qtzite member. - Bluish-gray qtzite, locally converted to qtz-muscovite schist. Thickness not given.

Origin of name not given. Presumably from town of Badito.

Bat Cave formation (of El Paso group)

Ordovician (Canadian): southern New Mexico.

V. C. Kelley and C. Silver, 1952 (Univ. N. Mex. Pub. in Geol. 4, p 45-52)
Bat Cave fm. - The Bat Cave fm. is composed of two principal divisions of about equal thickness at the type section. The lower unit is slope-forming, light colored, and contains many biostromes and bioherms distributed irregularly in thin- to medium-bedded ls. Surrounding and interspersed with the stromatolitic masses is much gray, bluish gray, and tannish gray detrital ls. The upper unit shows a typical banded outcrop. It consists of medium- to thick-bedded alternating dark gray and medium gray ls., Bolo. ls. and some dol. Most of the beds are very fine grained and dense, and when broken yield a faint fetid odor. Beds of calcarenite or calcirudite are commonly intercalated with the normal autochthonous ls. Cherty beds are occasionally present. The chert weathers light brown to dark brown and occurs as nodules or bands. The topmost beds may locally contain areas of collapse breccia. Thickness 216-305 ft. in the Caballo Mtns. Lies conf. on Sierrite ls. Unconf. overlain by Cable Canyon ss.

.Type locality and section: N. side of Cable Canyon, Caballo Mtns, sec. 10, T. 16 S., R. 4 W.
Name from the Bat Cave in Cable Canyon.

Bella shale

Upper Devonian: Southwestern New Mexico (Sierra County)

C. R. Keyes, 1908 (Am. Inst. Min. Eng. Bi-Mon. Bull. 19, p 7-21).
Bella shales. - Green shales, 60 ft. thick, underlying Berenda ls. and overlying Silver shales. No recognizable fossils. Assigned to Dev.

Name from Bella mine, near Lake Valley.
Appears to be upper part of Percha sh.

Bliss sandstone (formation)

Upper Cambrian and Lower Ordovician: Western Texas and southern New Mexico

G. B. Richardson, 1904 (Univ. Tex. Min. Surv. Bull. 9, p 27). Bliss ss. - Massive, compact, fine-textured, fossiliferous gray ss., about 300 ft. thick, varying in color from almost white to brown; toward top locally cross bedded and some of beds hard. Overlies coarse red granite and unconf. underlies El Paso ls. (Ord.)

V. C. Kelley, 1949 (Univ. of N. Mex. Pub. in Geol. 2) reports the presence of beds of oolitic iron ore in the Bliss ss. of New Mexico.

V. C. Kelley and C. Silver, 1952 (Univ. of N. Mex. Pub. in Geol. no.4). propose changing the name Bliss ss. to Bliss fm. because of the diverse lithology of the unit.

R. H. Flower, 1953 (Am. Assoc. Petroleum Geologists Bull. 3, v 37, p 2054-2055). In central N. Mex. the Bliss ss. is Upper Camb. and Lower Ord. The base of the Bliss ss. is middle Franconian (U. Camb.), and its top extends into basal Ord. It may be either Camb. or Ord. or both at any given locality. It represents a period of slow, intermittent deposition of sandy material.

R. H. Flower, 1955 (N. Mex. Geol. Soc. Guidebook, p 65-66). Trempealeauan (latest Upper Comb.) is present in New Mexico or adjacent parts of western Tex. Ord. deposition begins with a characteristic and easily recognizable cross-bedded coarse-grained ss. The beds above are thinly laminated and essentially the same type of deposition as in the lower El Paso beds. The Bliss-El Paso contact in central N. Mex. is gradational marked by a decrease and finally the disappearance of sand and glauconite in the sediments. There is probably some slight local variation in the exact horizon at which the transition occurs. The 225 ft. of the type sec. of the Bliss ss. (Franklin Mtns) appears to be completely Ord. and is separated from the overlying dolomites of the El Paso by a zone with large sparsely scattered foreign pebbles.

Named for Fort Bliss, El Paso Co., Tex.

Blue Springs schist

Precambrian: Central New Mexico (Los Pinos and Manzano Mtns)

J. T. Stark and E. C. Dapples, 1946 (Geol. Soc. America Bull. v 57, p 1121-1172). Blue Springs schist. - A thick series of siltstones, slates, and sericitic schists, which are parallel with the enclosing fms. and appear to rest conf. upon the Sais qtzite and below the White Ridge qtzite. Thickness ranges from about 300 ft. in the N. to nearly 4000 ft. in S. Massive beds of brittle, red and gray slates and siltstones characterize the basal part of the fm. The central part is largely green, sericitic schists in which some zones are prominently contorted and crenulated. The schistose beds are intercalated with the more massive slates and aren. siltstones. Many of the beds are spotted with biotite and blobs of granulated white qtz. Near the top of the fm. are beds of dense, red and gray aren. slates, which become increasingly schistose as the overlying White Ridge qtzite is approached.

Name from Blue Springs, on west side of Los Pinos Mtns.

Box member (of Percha shale)

Upper Devonian: Southwestern New Mexico (Mimbres Mtns area)

F. V. Stevenson, 1945 (Jour. Geology, v 53, p 217-245). Box memb. - The Percha is divided into Ready Pay memb. (lower) and Box memb. (upper). The Box memb. is composed of green to gray calc. shales with intercalated lenses and nodules of ls. The unit becomes progressively more calc. to the west of Hillsboro; on Bear Mtn, northwest of Silver City, interbedded in the sh. are many massive beds of ls., one attaining a max. of 16 ft. This contrasts strongly with the scattered ls. nodules found in the Box memb. in the region of Hillsboro and Lake Valley. The memb., which has not been recognized outside of the Mimbres region, carries the entire Percha fauna. The lower contact grades without marked break into the Ready Pay memb. Upper contact unconf. with overlying Miss. fms. Equiv. to Ouray ls. of Colo. Thickness at type loc. 46.6 ft.

Type locality and section: SW¼SW¼SE¼ sec. 14, T. 16 S., R. 7 W., Sierra Co., N. Mex.
Name from "The Box," 2½ mi southeast of Hillsboro on Percha Creek.

#Bromide formation (of Simpson group)

Middle Ordovician: Central and southern Oklahoma (Arbuckle Mtns.), subsurface of west Texas and southeastern New Mexico (Permian Basin)

E. 0. Ulrich, 1911 (Geol. Soc. America Bull., v 22, pl 27), showed a new fm., called Bromide, of Black River and uppermost Chazy age, as overlying, in places unconf., the Simpson fm. and unconf. underlying Viola ls., in Arbuckle Mtns., Okla., the type region of the Simpson and the Viola. As originally defined and used up to this time the Viola rested on the Simpson.

E. 0. Ulrich, 1927 (Okla. Geol: Surv. Bull. 45, p 21-32). Simpson fm. of Taff comprises at least 3 faunas of exceedingly diverse origin and geographic distribution. None of these faunas, nor any beds that might contain them, are found in southern Mo. or Ark. The closing stage, provisionally added to top of Bromide div. of Simpson, contains a good representative of Decorah and Prosser faunas of Minn. (Black River and lower Trenton). Typical Bromide is of late Chazy age (and is shown as constituting topmost part of Simpson fm.).

F. C. Edson, 1927 (Am. Assoc. Petroleum Geologists Bull., v 11, p 967-975). Simpson fm. divided into Bromide group above and "Wilcox" sand below. The Bromide is a series of mag. limes and sands, in places interbedded with small amounts of green sh. Thickness 315 to 495 ft. in Arbuckle Mtns; 0 to 600 ft. in Mid-Continent field. The descriptive term "post-Wilcox" was applied by Luther White to these beds to indicate that part of Simpson fm. which is younger than "Wilcox" sand. Ulrich (1911) classified Bromide fm. as occurring btw. Simpson fm. and Viola ls. Taff mapped type loc. of Bromide fm., near Bromide, sec. 19, T. 1 S., R. 8 E., as lower Viola ls. This outcrop is made up of sediments that in every way resemble the "post Wilcox" well cuttings. It is suggested that the term "post-Wilcox" be dropped and that Bromide be retained to designate the group of sediments that occurs btw. "Wilcox" sand and Viola lime.

E. 0. Ulrich, 1929 (Letter dated Nov. 11, 1929, published by C. E. Decker in Okla. Geol. Surv. Bull. 55, p 40, 1931). As used by me in past 2 yrs the Bromide includes all beds of Black River and Trenton ages that were deposited in Arbuckle region.

F. C. Edson, July 1930 (Am. Assoc. Petroleum Geologists Bull., v 14, p 947). Bromide fm. is overlain, with angular unconf., by Viola ls. and underlain, with angular unconf., by Tulip Creek fm.

C. E. Decker, Dec. 1930 (Am. Assoc. Petroleum Geologists Bull., v 14, p 1498-1505). Bromide fm. - Chiefly Lss. and some sh., some ss., with a ss. of variable thickness at base. Thickness of fm. 171 to 600± ft. Of Trenton and Black River age. Overlies Tulip Creek fm. and underlies Viola ls. As Bromide has been used more extensively in connection with Simpson it seems best to retain it for the upper fm. and drop Criner.

C. E. Decker and C. A. Merritt, 1931 (Okla. Geol. Surv. Bull. 55, p 11-12, 98). The Simpson is here raised to a group, divided into 5 fms. (ascending): Joins, Oil Creek, McLish, Tulip Creek, and Bromide. Heretofore Bromide, in various tables, has been used to represent a number of different horizons, but its last use

limits it to the upper part of the section exposed in hill just W. of the hotel at Bromide, and it was thought that the fauna represented in this section was younger than that found in upper part of Simpson elsewhere. Further studies of a section above the 3 artesian wells at NE. edge of Bromide, and sections on Robertson ranch about 3 mi S. of Bromide, have contributed evidence to show that certain parts of fauna and the physical characteristics of upper part of the Simpson at E. end of mtns are almost identical with those of upper part of Simpson in most of its outcrops.

E. 0. Ulrich, 1933 (Geol. Soc. America Bull., v 44, p 105).
Bromide fm. included in Simpson group. Typical Bromide correlates with Lowville.

C. E. Decker, 1941 (Am. Assoc. Petroleum Geologists Bull., v 25, p 650-667), presents new sections of the Simpson group. The Bromide fm. is described as consisting of lss., shales, and sss. Lss. occur at the top, shales alternate with Lss. in the middle, and shales separate the sss. at the base. The Lss. are brown, gray, and yellowish, shales green, and sss. brown and white. Thickness in Okla. 128-675 ft. Correlated by graptolites with Platteville of Wis.

R. H. Schweers, 1949 (Am. Assoc. Petroleum Geologists Bull., v 33, p 2029-2038). Since, on paleontological grounds, all of the formational units of the Okla. type Simpson can be shown to be represented in the subsurface of W. Tex.; and since the group in W. Tex. can also be subdivided on lithologic grounds, not in conflict with the former, it is proposed that the Okla. formational names be applied to the recognized subdivisions of the subsurf. Simpson.

Named for the town of Bromide, Johnston Co., where type section is on a hill NW. of Galbraith Hotel.

Cable Canyon sandstone (of Montoya group)

Upper Ordovician: Southern New Mexico

V. C. Kelley and C. Silver, 1952 (Univ. of N. Mex. Pub. in Geol. 4, p 58-59).
Cable Canyon ss. - Coarse-grained granulitic ss. with dolo. cement. Medium gray when fresh, with angular grains of white, gray, pale rose, smoky, and blue-gray qtz. Weathered exposures are characteristically rough with protruding grains and mottled gray and brown in color. Characteristic texture is unsorted small-pebble and granule cgl. though some well-sorted medium-grained ss. occurs. Lies unconf. on Bat Cave fm., overlain conf. and gradationally by Upham dol. Thickness 17-35 ft. in Cabal lo Mtns.

Type locality and section: Cable Canyon, Cabal lo Mtns, NW¼ sec. 10, T. 16 S., R. 4 W.

Named for Cable Canyon.

Cabresto metaquartzite

Precambrian: Central northern New Mexico (Taos Range)

P. McKinlay, 1956 (N. Mex. Bur. Mines and Min. Res. Bull. 42).
Cabresto metaqtzite. - The Cabresto metaqtzite was named from exposures along the south end of the Costilla quad. Thick ledges of qtzite also are exposed in seven other localities within Costilla and Latir Peak quads. The qtzite in these areas ranges from 200 to over 1000 ft. in thickness. Exposures are gray to cream and are composed of 2- to 10-foot layers of coarsely crystalline glassy to milky-white qtz. with scattered muscovite flakes. The massive layers are separated by thin muscovite and biotite-magnetite-garnet bands. Locally magnetite grains are arranged in narrow layers, 2 in. to more than a foot apart, that parallel the mica layers. Relict structures include outlines of qtzite cobbles and pebbles in the lower part.

Type locality: Along Cabresto Canyon, Taos Range.

Canutillo formation

Middle Devonian: West Texas (Franklin and Hueco Mtns)

L. A. Nelson, 1940 (Am. Assoc. Petroleum Geologists Bull., v 24, p 157-172).
Canutillo fm. - 175 ft. of sediments consisting of cherty ls., light brown in color, immediately overlying the Fusselman (Sil.); a thin bed of fossiliferous gray ls.; a thin bed of dense, almost black ss., which weathers brown; and about 40 ft. of black fissile sh. at the top of the fm. Identified as Middle Dev.

F. V. Stevenson, 1942 (N. Mex. Bur. Mines and Min. Res. Bull. 18, p 22-24).
Although the Canutillo fm. in Texas is considered to be medial Dev. in age, its fauna and the geol. history of the southwest indicate that it is more probably early late Dev. The Canutillo rests unconf. upon the Fusselman ls. of Sil. age. The basal part consists chiefly of massive calc. siltstone. It is overlain by thin beds of varicolored sh. interbedded with massive thick beds of calc. brown siltstone. The shales, which constitute less than 20 percent of the fm., tend to pinch out laterally along the outcrop. The entire fm. is more silk. and massive than the overlying Sly Gap fm. (Dev.). The ave. thickness is btw. 25 and 30 ft. The most complete known exposure, with a thickness of 88 ft., is in San Andres Canyon in the San Andres Mtns.

F. V. Stevenson, 1945 (Jour. Geology, v 53, p 217-245), states that the upper 40 ft. of black sh. may equal Ready Pay memb. of Percha sh. Also states that beds formerly classed as Canutillo fm. in N. Mex. (1942, N. Mex. Bur. Mines and Min. Res. BuII.18) are renamed Onate fm. and no Canutillo fm. occurs in N. Mex.

L. R. Laudon and A. L. Bowsher, 1949 (Geol. Soc. America Bull., v 60, p 36), describe the Canutillo fm. as 15 ft. of soft, thin-bedded, gray siltstone lying on 42 ft. of very cherty ls., probably Dev. (This is not as described by Nelson. Nelson includes the cherty ls. in the Canutillo fm.)

Type section: Franklin Mtns opposite Vinton, Tex.
Name from town of Canutillo, Tex., on A. T. S. F. R. R., 13 mi. N. of El Paso, Tex.

Carrasco limestone

Upper Cambrian (?): Southwestern New Mexico (Silver City region)

C. R. Keyes, 1915 (Iowa Acad. Sci. Proc., v 22, p 257-259; Conspectus of geol. fms. of N. Mex., p 4, 5). Carrasco lss. - Main calc. memb. of Late Ordovicic age well displayed back of Carrasco smelter property near Silver City. Thickness 75 ft. (On p 4 he puts it in "Late Cambric"; on p 5 in "Late Ordovicic.")

Chiricahuan series

A term introduced by C. R._ Keyes to cover 300 ft. of qtzites (called Lone by him) of late Camb. age in N. Mex. and Ariz. Named for Chiricahua Range, N. Mex. (See his Conspectus of geol. fms. of N. Mex., 1915, p 4, 6).

Chloride formation

Devonian or Mississippian (?): Southwestern New Mexico (Sierra County)

C. R. Keyes, 1904 (Am. Jour. Sci., 4th, v 18, p 360-362). Chloride fm. - Dev. Lss., 200 ft. thick. Underlie Lake Valley ls. and overlie Ord. Lss.

Chloridian series

A term introduced by C. R. Keyes to cover 75 ft. of Upper Camb. Lss. (called by him Carrasco) in N. Mex., and Abrigo ls. (700 ft. thick) of Ariz. (See his Conspectus of geol. fms. of N. Mex., 1915, p 4, 6.)

Cibola limestone

Silurian (?): Southwestern New Mexico (Silver City district)

C. R. Keyes, 1915 (Iowa Acad. Sci. Proc., v 22, p 257-259; Conspectus of geol. fms. of N. Mex., p 3,6). Cibola lss. - Important mid-Siluric ls. memb. outcropping at Cibola mill, at Silver City. Thickness 175 ft. Underlies Naiad ls., and with it comprises Santa Ritan series. Assigned to Sil.

Cleveland Gulch quartzite member (of Hopewell series)

Precambrian: Central northern New Mexico (Petaca area)

E. Just, 1937 (N. Mex. Bur. Mines and Min. Res. Bull. 13, p 42). Cleveland Gulch qtzite memb. - A prominent qtzite and qtz-mica schist of sedimentary origin exposed between Tusas and Kiawa Mtns. May correlate with Badito qtzite of the Picuris area.

Origin of name not given.

Connell sandstone member (of Oil Creek formation)

Middle Ordovician: Subsurface of West Texas and eastern New Mexico

R. H. Schweers, 1949 (Am. Assoc. Petroleum Geologists Bull., v 33, p 2029-2038). Connell ss. memb. - 40 ft. of light tan, medium- to coarse-grained, loosely cemented ss. 93 ft. above top of Ellenburger dol. and at base of Oil Creek fm.

Type locality and section: Texas Co. W. E. Connell No. 33, in NEINIE sec. 1, Blk B-22, PSL Surv., Jordan area, Ector Co., Texas.
Name from well name.

Contadero formation

Upper Devonian: Central New Mexico (San Andres Mtns, local)

F. V. Stevenson, 1945 (Jour. Geology, v 53, p 217-245). Contadero fm. - A series of carbonaceous shales and Lss. above the Sly Gap fm. and below the Miss. Caballero fm. in the central part of the San Andres Mtns. The

basal gray ls. beds of the Contadero rest without apparent disconf. on the Sly Gap fm. but the gray-black shales and thin, ls. top beds of the Contadero are separated from the overlying Caballero fm. by an erosional disconf. Fauna similar to that of the Sly Gap fm. Thickness 0-70 ft. He notes that the Contadero may be a facies equiv. in age to the Ready Pay memb. of the Percha shale, and a tongue in the Sly Gap fm. The color of the fm. is gray, olive-brown, green, and gray green. Uppermost beds weather red.

R. H. Flower, 1955 (N. Mex. Geol. Soc. Guidebook, p 69). The age of the Contadero is probably not materially younger than that of the Sly Gap which it overlies. It contrasts with the Sly Gap primarily in lithology and preservation of fossils.

F. E. Kottlowski, 1955 (N. Mex. Geol. Soc. Guidebook, p 140). The contact of the Sly Gap and Contadero is drawn where gray Lss. overlie tan beds of the Sly Gap. The combined Ready Pay-Contadero fm. would thicken S. from Rhodes Canyon and thin or be absent to the N. In Rhodes Canyon the Caballero fm. (Miss.) is absent (Laudon and Bowsher, 1949), and the Contadero underlies the upper Percha.

Type locality and section: SI sec. 8, T. 13 S., R. 4 E., 2000 ft. N. of road through Rhodes Pass, in San Andres Mtns.

Cristobal limestone

Ordovician: Southern New Mexico

C. R. Keyes, 1915 (Iowa Acad. Sci. Proc., v 22, p 257-259; Conspectus of geol. fms. of N. Mex., p 4, 6). Cristobal Lss. - Main body of late Ordovicic ls. section in Franklin, Caballos, Fra Cristobal, and Mimbres Ranges. Thickness 165 ft.

Cutter formation (of Montoya group)

Upper Ordovician: Southern New Mexico and West Texas

V. C. Kelley and C. Silver, 1952 (Univ. N. Mex. Pub. in Geol. 4, p 62•64). Cutter fm. - Light gray-weathering, generally unfossiliferous claystone, ls., calcitic dol., and dol. The ls. is medium gray to dark gray on fresh surfaces. The dol. is light gray to dark gray. The ls. weathers blue gray; the dol. and calcitic dol. weather light gray or tan. Both the ls. and dol. are generally microgranular or submits. and have conchoidal fracture. Chert is unevenly

distributed as occasional black bands 2-6 in. in diameter. Thickness 50-130 ft. in Cabal lo Mtns.

L. C. Pray, 1953 (Am. Assoc. Petroleum Geologists Bull., v 37, p 1907). The Cutter fm. of Kelley and Silver is the same as the Valmont fm. The Cutter fm. should probably not be included in the Montoya fm. The Cutter (Valmont) is probably more correctly related to the Fusselman dol. (Sil.).

Type locality and section: Cable Canyon, Caballo Mtns, NWT sec. 10, T. 16 S., R. 4 W.

Name from Cutter station on A. T. S. F. R. R. east of Caballo Mtns.

Dixon granite

Precambrian: Central northern New Mexico (Picuris Range)

E. Just, 1937 (N. Mex. Bur. Mines and Min. Res. Bull. 13, p 13, 24-25). Dixon granite. - The typical Dixon granite is fairly coarse grained, but varies a good deal in texture and composition from place to place. In the gorge of the Rio Pueblo it is even-grained pink and gray biotite granite. In the hills near the Harding mine it is pink, almost lacking in ferromagnesian minerals, and the qtz grains are rounded. At the east end of the Rio Pueblo gorge the granite is dark colored from an abundance of biotite and contains large twinned orthoclase phenocrysts of light flesh tint. At the last mentioned locality the porphyritic phase is intruded by aplite dikes. In places flowage has converted the granite to schist. Most specimens of the granite studied in thin section show extensive granulation not perceptible to the naked eye. The Dixon granite is younger than the Proterozoic rocks of sedimentary origin and is intrusive into them.

A. Montgomery, 1953 (N. Mex. Bur. Mines and Min. Res. Bull. 30, p 37). The Embudo granite borders the Picuris range on the S. and on the E. This rock was called by Just (1937) the Dixon granite, but this name has priority elsewhere. The new name, Embudo, is taken from the town of Embudo, located 2 mi. W. of Dixon and 4 mi. W. of extensive outcrops of the granite.

Name from the town of Dixon.

Dragoonan series

A term introduced by C. R. Keyes for lower part of Camb. rocks of N. Mex. and Ariz. Named for Dragoon Mtns, SE. Ariz. (See his Conspectus of geol. fms. of N. Mex., 1915, p 4, 6.)

Elbert formation

Upper Devonian: Southwestern Colorado and subsurface in southeastern Utah, northeastern Arizona, and northwestern New Mexico (Four Corners area)

W. Cross, 1904 (Am. Jour. Sci., 4th, v 18, p 245-252). Elbert fm. - The strata overlying Ignacio fm. (chiefly qtzite and believed to be of Upper Camb. age), underlying Ouray ls., and carrying fish remains at base and near top, which seem unquestionably to form a lithologic, strat. and faunal unit. At Devon Point the Elbert consists of (descending): (1) Red sh. or clay, 5 ft.; (2) ss. or qtzite containing fish scales in places, 1+ ft.; (3) calc. shales and thin ls., buff or gray, breaking readily into slabs, salt casts common, 25 ft.; (4) thin layers of alternating qtzite, dull-gray aren. ls., and red calc. sh., 8 ft.; (5) hard fine-grained gray qtzite, 2 to 4 ft.; (6) red calc. sh., 4 in. to 1 ft.; (7) yellow earthey ls., 9 in.; (8) calc. and sandy shales, variegated, yellow, buff, lilac, 4 in. to 1 ft.; (9) fine-grained yellow-brown qtzite, 1 ft.; (10) sandy sh., red, greenish, or mottled, a harder layer in middle, 5 ft.; (11) sandy ls., shaly in part, rich in fish scales and plates, 1+ ft.; (12) red sh., calc., and sandy, with specks of bone or shell, 2 ft. Total thickness at Devon Point 54 ft. The Elbert has been observed below Ouray ls. in several quads. of San Juan region, and many exposures have been studied. Its most persistent feature is the crumbling calc. sh. div., with its casts of salt crystals. The most important variation in its lithology is appearance of dense earthy ls. of conchoidal fracture, in several beds in upper part. Only fossils found are fish remains. Appears to correlate with "Parting qtzite" of central Colo.

R. L. Knight and J. C. Cooper, 1955 (Four Corners Geol. Soc. Guidebook, p 56-58), redefined the Elbert fm. into two membs., an upper memb. and the underlying McCracken ss. memb. The type locality for the two membs. is that logged by the Shell Bluff No. 1, located in sec. 32, T. 29 S. R. 22 E., San Juan Co., Utah.

J. C. Cooper, 1955 (Four Corners Geol. Soc. Guidebook, p 63). The McCracken ss., ranging from 0 to 580 ft., underlies a great portion of the Four Corners area. To the W. in central Utah this unit passes into Elbert fm. undiff. The McCracken ss. consists predom. of white, light gray to red ss., fine to medium grained, some coarse, poorly sorted, commonly glauconitic, with a few streaks of sandy dol. The McCracken ss. grades upward into the sandy dol. of the upper memb. of the Elbert fm. The Aneth fm. underlies the McCracken ss., probably unconf. The McCracken ss. is believed to be equiv. to the Ignacio ss. as exposed at Baker's Bridge, Colo., which, in the past, has been assigned an Upper Camb. age. (See Ignacio qtzite). The upper memb. of the Elbert fm., ranging in thickness from 0 to 307 ft., consists of thin bedded, dense to finely sucrose dol., locally anhydritic, commonly with floating frosted sand grains. The dol. is associated with thin interbeds of gray-green, waxy and red, clayey shales generally sandy. The lower portion of the unit contains thin ss. beds which grade downward into the underlying McCracken ss. The upper memb. is probably unconf. overlain by the Ouray ls.

Name from exposures on Elbert Creek, a western tributary of Animas River.

#Ellenburger limestone (group)

Lower Ordovician (Canadian): Central Texas and subsurface of West Texas and southeastern New Mexico

S. Paige, 1911 (U. S. Geol. Survey Bull. 450, p 24). Ellenburger ls. - Chert-bearing Lss. and dolomites, with usually a conglomeratic ls. at top. Thickness probably 1,000 ft. Unconf. may exist near top. Overlies, possibly unconf. **at** places, Wilberns fm. and underlies Carbf.

T. Cole, 1942 (Am. Assoc. Petroleum Geologists Bull., v 26, p 1398-1409), divided the Ellenburger ls. into five zones and fifteen units on basis of chert residues. Gave standard section for W. Texas as Loffland Bros. et. al. J. B. Tubb well No. 3, sec. 9, Blk B-27, PSL Surv., Crane Co., Texas.

P. E. Cloud, Jr., V. E. Barnes, and J. Bridge, 1945 (Univ. Tex. Pub. 4301, p 133-161). The "Ellenburger limestone" of early reports is revised to group status, restricted to rocks of Lower Ord. age, and divided into three fms. In upward succession the named divs. of the Ellenburger gp. are the Tanyard fm., comprising the Threadgill and Staendebach membs., the Gorman fm.; and the Honeycut fm. Although the three fms. of the Ellenburger gp. are essentially equivalent to previously named strat. units in Mo., new strat. names were introduced for the Llano region because of lithic differences and geographic isolation.

P. E. Cloud, Jr. and V. E. Barnes, 1948 (1946) (Univ. Tex. Pub. 4621). Reconnaissance study of the rocks comprising the Ellenburger Hills indicates them to belong principally, if not wholly to the Tanyard fm.; yet by definition and subsequent usage the "Ellenburger ls." had come to include not only all Lower Ord. dols. and Lss. in the Llano region and the adjacent subsurface, but the immediately subjacent carbonate rocks of the Upper Camb. as well. The carbonate rocks of the Llano region that were formerly lumped as the "Ellenburger ls." are divisible at most places along a boundary set up on conventional faunal evidence into two clearly different sets of rock units - one Upper Camb. and the other Lower Ord. As revision was necessary, the term Ellenburger was used as a group term because it required the least revision of previous concepts. The Lss. of the Ellenburger gp. are predom. sublith., pearl gray to woodash gray and old ivory, varying to ordinary brownish grays and light browns. They are commonly although not generally stromatolitic, indicating an at least partial algal origin and generally a shallow water environment. Deposition in shallow waters is also indicated by ripple marks and intraformational breccias; and local, temporary subaerial exposure is suggested by the presence of contraction polygons

in some of the more thinly bedded Lss. Pellet Lss. occur locally throughout the Ellenburger gp. The lss. tend to weather smooth to solution pitted or grooved and medium to light bluish gray, or locally almost white. The dots. vary from microgranular to coarse grained. The more vividly colored microgranular to very fine grained doll. occur in the Honeycut fm., and they show greater lateral persistence than the coarser grained, light colored dots. of the Tanyard fm. The latter are apt to grade laterally to ls. with
great abruptness. The fine to coarse grained dots. weather rough to pitted and medium gray to iron-gray. The microgranular to very fine grained dol. weathers sphenoidally jointed to hackly surfaced, smooth, and medium gray to light yellowish gray. As a rule the lss. of the Ellenburger gp. are lighter colored and finer grained than the Carbf. lss. above, or those of the Camb.
below. The dots. tend to be coarser grained and lighter colored, or finer grained and more vividly colored than the dol. of the Camb., whereas dol. is rare in the Carbf. strata.

L. Hendricks, 1953 ($U_n i_v$. Te_x. Bur. Econ. Geology Rept. Invest. 11), divides the Ellenburger gp. into its formational units in the subsurface on the basis of the character of insoluble residues. However, change in quality of the residue does not in all places coincide with formation boundaries within
the group but is evidently consistent enough to yield a clue to formation identity. Ellenburger gp. correlative with El Paso limestone.

The type section of the Ellenburger gp. is a series of type sections given for each of the units of the gp. (which see).

Named for Ellenburger Hills, Burnett Co., Tex.

El Pasan series

A term employed by C. R. Keyes to cover the Ord. Lss. of western Texas and southern N. Mex., which were formerly all included in El Paso ls., but which are now divided into Montoya ls. (above) and El Paso ls. restricted (below). He also applies the name to supposedly contemp. deposits in other states.

El Paso limestone (group)

Lower Ordovician: Western Texas and southern New Mexico

G. B. Richardson, 1904 (Univ. Tex. Min. Surv. Bull. 9, p 29). El Paso ls. - Mainly massive gray fossiliferous ls., locally aren. at base and containing throughout bands of chert irregularly distributed. Of variable hardness. Ranges in color from drab and buff, with locally reddish and bluish streaks, to prevailing gray.

Thickness 1,200 ft. Comprises all of Ord. in Franklin Mtns. Underlies Sil. ls. In places overlies Camb. Bliss ss. and in other places rests on Precamb. rocks.

G. B. Richardson, 1908 (Am. Jour. Sci., 4th, v 25, p 476, 477-479), restricted El Paso ls. to lss. of Lower Ord. age, and named the lss. of Upper and Middle Ord. age the Montoya ls. He described El Paso ls. thus restricted as gray, chiefly mag. ls., usually massive but locally thin-bedded; lower 100 ft. characteristically aren. and weathers brownish. Thickness 750 ft. in Van Hon quad. and 1,000 ft. in El Paso quad. Not sharply separated from Montoya ls. In El Paso quad. overlies Bliss ss. with apparent conformity, where that fm is present; where it is absent the El Paso rests on Precamb. In Van Horn quad. it overlies Van Horn ss.

P. E. Cloud, Jr. and V. E. Barnes, 1948 (1946) (Univ. Tex. Pub. 4521, p 72-75, 361-369). The El Paso section, at the south end of the Franklin Mtns, and just outside the corporate limits of El Paso, El Paso County, Texas, would make a good type section for the El Paso formation. 1,590 ft. of section were measured in detail at this locality.

V. C. Kelley and C. Silver, 1952 (Univ. N. Mex. Pub. in Geol. 4, p 39-56), raise the El Paso to a group in southern N. Mex. It includes 2 fms.; the Sierrite ls. (lower) and the Bat Cave fm. (upper). The type section for these units is Cable Canyon, Cabal lo Mtns, sec. 10, T. 16 S., R. 4 W.

The El Paso was originally thought to contain some beds of Upper Camb. age. It has been restricted to beds of Lower Ord. age.

Named for exposures in Franklin and Hueco Mtns, El Paso quad., Texas.

Embudo granite

Late Precambrian: Central northern New Mexico (Picuris Range)

A. Montgomery, 1953 (N. Mex. Bur. Mines and Min. Res. Bull. 30, p 37-46). Embudo granite. - The Embudo granite borders the Picuris range on the S. and on the E. This rock was called by Just (1937) the Dixon granite, but this name has priority elsewhere. The new name, Embudo, is taken from the town of Embudo, located 2 mi. W. of Dixon and 4 mi. W. of extensive outcrops of the granite. The Embudo granite consists of several distinctive rock types, all related to a single magma source. The rock is a quartz monzonite. It consists of: (1) coarse-grained, partly-porphyritic biotite granite; (2) light-colored, partly-porphyritic gnelssic granite; (3) flesh-colored, coarse-grained to pegmatitic leucogranite. Modes range as follows: qtz - 26-50%, microcline - 20-35%, al bite-oligoclase - 26-33%, biotite, etc. - 0-10%. The Embudo granite is younger than the Ortega and Vadito fms., and is intrusive into them.

Frondosa limestone

Ordovician: Southern New Mexico

C. R. Keyes, 1915 (Iowa Acad. Sci. Proc., v 22, p 257-259; Conspectus of geol. fms. of N. Mex., p 4, 7). Frondosa lss. - Main body of Mid Ordovicic series in Franklin Mtns, which carries a Galena-Trenton fauna. Thickness 100 ft.

Fusselman limestone (dolomite)

Silurian: Western Texas and southern New Mexico

G. B. Richardson, 1908 (Am. Jour. Sci., 4th, v 25, p 476-480). Fusselman ls. - Massive, whitish, mag. ls. approx. 1,000 ft. thick. Overlies Montoya ls., apparently conf. Underlies Hueco ls., also apparently conf. Contains fossils of upper Niagaran age. Outcrops in El Paso quad., in Franklin and Hueco Mtns.

N. H. Carton, 1917 (U. S. Geol. Survey Prof. Paper 108-C, p 42-43). Fusselman ls. - In the San Andres and Sacramento Mtns the fm. comprises two membs. - an upper of hard dark-colored massive ls. marked by a cliff at most places, and a lower of fine-grained dol., most of which weathers nearly white. The upper member contains fossils, but the lower one has yielded no fossils and is arbitrarily placed in the fm. because it is distinct from the underlying cherty beds, which are characteristic of the upper part of the Montoya.

K. C. Dunham, 1935 (N. Mex. Bur. Mines and Min. Res. Bull. 11, p 43), refers to the Fusselman as Fusselman dol. because of its largely Bolo. character.

V. C. Kelley and C. Silver, 1952 (Univ. N. Mex. Pub. in Geol. 4, p 62-68), designate Darton's (1917) lower unit of the Fusselman as a new fm., the Cutter fm. of the Montoya gp. of Ord. age.

L. C. Pray, 1953 (Am. Assoc. Petroleum Geologists Bull., v 37, p 1911-1917). The Fusselman (?) fm. of Sacramento Mtns consists almost entirely of dark-weathering, chert dol. Lower Fusselman of Darton (1917) has been separated from Fusselman as Valmont fm. of Upper Ord. age. Fusselman (?) in Sacramento Mtns appears to be Lower Sil. and may not be same as type Fusselman (Upper Sil.).

Flower, R. H., 1955 (N. Mex. Geol. Soc. Guidebook, p 69). Recently Pray (1953) reported a fauna from the restricted Fusselman of the Sacramento Mtns regarded as Alexandrian (Lower Sil.). If this is correct, the Fusselman may actually contain several divisions of the Sil., for the large Pentamerus oblongus suggests Clinton or Racine age, and the smaller Conchidium suggests a similar age range.

Name from Fusselman Canyon, Franklin Mtns.

Garnuan series

A term introduced by C. R. Keyes for a part of the Precamb. rocks of N. Mex. (See his Conspectus of geol. fms. of N. Mex., 1915, p 4, 7. Derivation of name not stated.)

#Gorman formation (of Ellenburger group)

Lower Ordovician: Central Texas and subsurface of western Texas and southeastern New Mexico

P. E. Cloud, Jr., V. E. Barnes, and J. Bridge, 1945 (Univ. Tex. Pub. 4301, p 133-161), named Gorman fm. (See this ref. under Ellenburger gp.)

P. E. Cloud, Jr., and V. E. Barnes, 1948 (1946) (Univ. Tex. Pub. 4621). Gorman fm. - The lowest microgranular dol. in significant quantities in the outcropping Ellenburger rocks is at the base of the Gorman fm., and it occurs intermittently from the Tanyard-Gorman contact to the top of the Ellenburger gp. The Gorman has a lower dol. facies, 80-240 ft. thick, of microgranular to fine-grained dol., varicolored in yellowish, pinkish, and brownish tones. These dols. commonly weather to smooth, crudely sphenoidal blocks of gray and dull yellow. The upper calcitic facies, 240-390 ft. thick, consists principally of sublith. thickly to thinly bedded ls. with locally interbedded microgranular to fine-grained dol. The ls. is mostly pearl gray to woodash gray, grading to old ivory and brownish gray, and locally molted pink or yellow. It weathers to medium or light bluish gray and is not commonly reticulate. A sequence of unusually pure and thickly bedded ls. occurs in the top 40 to 60 ft. of the Gorman fm. and is succeeded immediately by the thin bedded dols. and lss. of the lower Honeycut, commonly aren. at the base. Chert in the lower Gorman consists of porcelanous white to woodash gray chert with scattered dolomolds and qtzose matter, irregularly interlayered with qtz druse weathering russet and commonly containing fossils. Porcelanous to subporcelanous, white, shiny-weathering chert is less qtzose in the upper Gorman. Thickness of Gorman is 430-500 ft. Correlated with the Roubidoux fm. of Mo.

Type section: Near Gorman Falls on Gorman Creek, SE. San Saba Co. and SW. Lampasas Co., Tex.

Name from Gorman Falls

Graphic lavas

Precambrian: Central New Mexico (Magdalena Mtns)

C. R. Keyes, 1915 (Iowa Acad. Sci. Proc., v 22, p 257-259; Conspectus of geol. fms. of N. Mex., p 4, 7). Graphic lavas. - Bedded volcanic sequence superposed on Precamb. rocks of Magdalena Mtns. (Derivation of name not given. On p 4 they are shown as Precamb.)

Hawkins limestone

Cambrian: Southwestern New Mexico (Grant County)

C. R. Keyes, 1915 (Iowa Acad. Sci. Proc., v 22, p 257-259; Conspectus of geol. fins. of N. Mex., p 4, 8). Hawkins lss. - Important calc. beds of Cambric age intercalated in basal section of qtzites exposed in Grant Co. Thickness 50 ft. (Derivation of name not given. According to E. Kirk and others Middle Camb. is absent in N. Mex.)

Hondo slate

Precambrian: Central northern New Mexico (Picuris area)

E. Just, 1937 (N. Mex. Bur. Mines and Min. Res. Bull. 13, p 23). Hondo slate. - The Hondo slate is characteristically black and has well-developed schistosity. In a few localities, zones are exposed that resemble streaks of "iron fm." In many places the black slate grades into qtz-muscovite schist. Lies on Ortega qtzite. Thickness up to 1 mi.

A. Montgomery, 1953 (N. Mex. Bur. Mines and Min. Res. Bull. 30, p 19). The Pilar phyllite, or Hondo slate of Just, is the youngest rock of the Ortega fm. and the most distinctive horizon-marker in the Picuris range. The old name, Hondo, had been applied to other rocks prior to Just's usage, and hence seems best abandoned.

Name from Hondo Canyon, Picuris range.

#Honeycut formation (of Ellenburger group)

Lower Ordovician: Central Texas and subsurface of western Texas and southeastern New Mexico

P. E. Cloud, Jr., V. E. Barnes, and J. Bridge, 1945 (Univ. Tex. Pub. 4301, p 133-161), named Honeycut fm. (See this ref. under Ellenburger gp.)

P. E. Cloud, Jr. and V. E. Barnes, 1948 (1946) (Univ. Tex. Pub. 4621). Honeycut fm. - All strata above the Gorman fm. at the surface in central Tex. are termed Honeycut fm. Thickness 0-678 ft. Appears to be absent W. of long. 98°55' on surface. The Honeycut consists of thin bedded lss. and dols., intimately interbedded. The microgranular to very fine-grained dols. of the Honeycut fm. are light gray to yellowish gray, pale beige, flax and old ivory. Dols. are microgranular to very fine grained and yellowish, pinkish, and brownish gray. The ls. weathers to medium and light tones of bluish gray; the dol. weathers in tones of dull gray and yellow. Where fully developed the Honeycut fm. may be divided into a lower facies of interbedded lss. and dols., a median facies of predominantly microgranular to very fine-grained dol. and an upper facies of predominantly ls. The basal bed of the Honeycut is typically aren. Cannonballs of chert and silic. ls. are common in the Honeycut fm. Equiv. to Jefferson City gp. in Mo. Equivs. of the Honeycut fm. appear in the type section of the El Paso fm. at El Paso, Texas.

Type section: 5 mi. E. of Johnson City, Blanco Co., Tex.
Name from Honeycut Bend on Pedernales R., Blanco Co., Tex.

Hopewell series

Precambrian: Central northern New Mexico (Picuris and Petaca areas)

E. Just, 1937 (N. Mex. Bur. Mines and Min. Res. Bull. 13, p 21). Hopewell series. - Dark schists, formed from a succession of basalt and andesite extrusives with some qtzite membs. Although some of the basalts are readily identifiable from their porphyritic and amygdaloidal texture, the series contains a good deal of black hornblende-chlorite schist for which an igneous origin is merely inferred. Locally schists are composed of biotite, muscovite, and qtz, presumably sedimentary in origin. Lowest Precamb. fm. in area. Overlain by Ortega qtzite. Thickness 3/4 mi. to 1 mi. +.

A. Montgomery, 1953 (N. Mex. Bur. Mines and Min. Res. Bull. 30, p 21). The Vadito fm. is the upper fm. of the Precamb. series in the Picuris range. This fm. is at least the partial equiv. of the Hopewell series of Just.

Named for the town of Hopewell.

#Hunton limestone (group)

Silurian and Devonian: Southeastern Oklahoma and subsurface of western Texas and southeastern New Mexico

J. A. Taff, 1902 (U. S. Geol. Survey Atoka Folio, No. 79). Hunton ls. - Nearly pure white ls. and limy marls. Overlies Sylvan sh. and underlies Woodford chert.

J. A. Taff, 1903 (U. S. Geol. Survey Tishomingo Folio, No. 98). Hunton ls., 0 to 200 ft. thick, is divisible into 3 memos. (descending): (1) Crystalline and in part cherty bluish to white ls. with occasional thin marly strata, in places overlain by several ft. of very cherty ls.; (2) 100 ft. of white or cream-colored and occasionally pinkish rather soft ls. interstratified with more friable marly lime and, rarely, calc. clay, with a few ft. of marly white ls. at top; (3) whitish massive crystalline ls., which in places includes a bed of oolite at or near base and thin-bedded compact ls. at top; thickness few ft. to 25±. Upper memb. contains Oriskany and perhaps Onondaga fossils; middle memb. contains Helderberg fossils; and basal memb. contains Niagara fossils in thin-bedded compact ls. at top and Clinton fossils in underlying beds.

C. A. Reeds, 1911 (Am. Jour. Sci., 4th, v 32, p 256-268). Hunton ls. of Taff is here divided into 4 fms. in Arbuckle Mtns (descending): (1) Bois d'Arc ls., 0 to 90 ft., of Becraft (Oriskany) age, according to C. Schuchert (1922) and E. 0. Ulrich (1927); (2) Haragan sh., 0 to 166 ft., of New Scotland age; (3) Henryhouse sh., 0 to 233 ft., of Niagaran age; and (4) Chirnneyhill ls., 0 to 53 ft., of Alexandrian age. Overlies Sylvan sh. with unconf. The Bois d'Arc ls. corresponds to the upper Hunton of Taff; the Haragan and Henryhouse correspond to the middle Hunton of Taff; and the Chimneyhill corresponds to lower Hunton of Taff.

C. N. Gould, 1927 (Univ. Okla. Bull., Proc. Okla. Acad. Sci., v 6, pt 2, p 235). Hunton will probably remain as a group name, for purposes of mapping.

S. W. Lowman, 1930 (Am. Assoc. Petroleum Geologists Bull., v 14, p 618-619), identified rocks equiv. to Sil. part of Hunton gp. in well in western Tex.

T. S. Jones, 1949 (Strat. Problems Comm. West Tex. Geol. Soc.), zoned the Hunton age rocks of W. Texas into seven mappable units.

Lloyd, E. R., 1949 (N. Mex. Bur. Mines and Min. Res. Bull. 29), indicates that the use of the term Hunton was extended to the subsurf. of SE. N. Mex.

Named for exposures near former hamlet of Hunton, SW. part of Coal Co., Okla.

#Ignacio quartzite

Upper Cambrian or Upper Devonian (?): Southwestern Colorado and subsurface of southeastern Utah, northeastern Arizona, and northwestern New Mexico

W. Cross and A. C. Spencer, 1899 (U. S. Geol. Survey La Plata folio, No. 60, P. 8).

W. Cross, 1901 (U. S. Geol. Survey Bull. 182, p 35). Earliest Paleozoic fm. of Silverton quad., Colo., is a qtzite with some sandy shales 100 to 200 ft. thick, which is seen on W. side of Animas River from the monzonite contact to Molas Lake, and imperfectly on E. side of the Animas. This qtzite has been traced down the Animas to below Rockwood, and is called Ignacio qtzite, from its characteristic development on the bench where lake of that name is situated. A southerly dip carries this qtzite onto S. slope of Needle Mtns, where a few indistinct fossils indicate its Comb, age. The rather shaly beds, often calc. (Elbert fm.), succeeding the qtzite have not yielded fossils. The Ignacio qtzite overlies Algonkian qtzites and slates.

H. Barnes, 1954 (Am. Assoc. Petroleum Geologists Bull., v 38, p 1780-1791). Neither an eroded surface nor a distinct lithologic change occurs at the contact of the Ignacio qtzite and the Elbert fm. as might be expected if the two fms. were separated by an unconf. On the contrary, the descriptions of the Elbert fm. suggest a lithologic transition that should be expected between sandy and calc. rocks in an interfingering sequence. The paleontological evidence that has been used to establish a late Camb. age for the Ignacio qtzite is not conclusive. The geographic distribution of the two fms. is similar. Therefore, in view of the weakness of available fossil evidence and the relative strength of the strat. evidence, the Ignacio, Elbert, and Ouray fms. are believed to represent essentially continuous deposition. Further, because fossils of Late Dev. age occur at the base of the Elbert - or the top of the Ignacio - it is suggested that the Ignacio is also Dev. in age.

R. L. Knight and J. C. Cooper, 1955 (Four Corners Geol. Soc. Guidebook, p 56-58), apply the name McCracken ss. memb. of Elbert fm. to a subsurface Upper Dev. sand which they correlate tentatively with the Upper Dev. (?) Ignacio qtzite on the basis of well evidence.

Incarnation granite

Age (?): Central New Mexico

C. L. Herrick, 1904 (Jour. Geology, v 12, p 237-251). Near Socorro the Incarnation granite unconf. underlies Sandia fm. Named for mining dist. in which it occurs. (Assumed to be Precamb. because to author's knowledge only Precamb. granites underlie Sandia fm. in Socorro area.)

#Joins formation

Lower and Middle Ordovician: Central southern Oklahoma (Arbuckle Mtns) and subsurface of western Texas and southeastern New Mexico

C. E. Decker, 1930 (Am. Assoc. Petroleum Geologists Bull., v 14, p 1498-1505). Joins fm. - Chiefly ls., but some ss. and sh. Underlies Oil Creek fm. (Overlies Beekmantown (?) cgl., according to table on p 1498, but in sections on p 1500 and 1501 this cgl. is included in Joins fm.) Occurs only in W., SW., and central parts of Arbuckle Mtns. ls of early Chazy age. Thickness 30 to 300± ft.

C. E. Decker, and C. A. Merritt, 1931 (Okla. Geol. Surv. Bull. 55, p 11+). The Simpson ls. here raised to a group, divided into 5 fms. (ascending): Joins, Oil Creek, McLish, Tulip Creek, and Bromide. Fossils believed to be very basal Chazy.

C. E. Decker, 1941 (Am. Assoc. Petroleum Geologists Bull., v 25, p 650-667). The Joins consists chiefly of thin lss., some of which are shaly. It has a thin cgl. at the base and a few other cgls. within it at various intervals above the base. Considered to be partly of Beekmantown (Lower Ord.) age on the basis of graptolites.

R. H. Schweers, 1949 (Am. Assoc. Petroleum Geologists Bull., v 33, p 2029-2038). Since, on paleontological grounds, all of the formational units of the Okla. type Simpson can be shown to be represented in the subsurface of W. Tex., and since the group in W. Tex. can also be subdivided on lithologic grounds, not in conflict with the former, it is proposed that the Okla. formational names be applied to the recognized subdivisions of the subsurf. Simpson.

See also 1933 entries under Simpson fm.

Named for exposures on Joins ranch, in Carter Co., T. 2 S., R. 1 W., N. and NW. of Woodford.

Lacorocah metatuff member (of greenstone complex, Northern Manzano Mtns)

Precambrian: Central New Mexico (North Manzano Mtns)

P. Reiche, 1949 (Geol. Soc. America Bull. v 60, p 1183-1212). Lacorocah metatuff memb. - Light gray, crudely bedded, weakly schistose metatuff, with clastic texture and rare or no qtz. Some beds are crowded with light gray, slaty, flattened pebbles. A thickness in excess of 1,000 ft. is present btw. a fault on the NW. and a southeastern contact of undetermined character. The memb. shows a great diversity; it ranges from altered acidic lava, now qtz-albite rock, to a talc-tremolite aggregate presumably of very basic igneous origin.

Type locality and section: NW¼ sec. 22, T. 8 N., R. 5 E.

Named from Hell's Canyon, N. Manzano Mtns. Tewa word for Hell's Canyon is Lacorocah.

Lone quartzite

Upper Cambrian: Southwestern New Mexico (Silver City region)

C. R. Keyes, 1915 (Iowa Acad. Sci. Proc., v 22, p 257-259; Conspectus of geol. fms. of N. Mex., p 4, 8). Lone qtzite. - Late Camb. section of alternating qtzites and metamorphosed lss. well displayed in Lone Mtn, near Silver City. Thickness 300 ft.

The Upper Camb. qtzite of Silver City region has for many years been called Bliss ss. by U. S. Geol. Survey.

Los Pinos granite

Precambrian: Central New Mexico (Los Pinos Mtns)

J. T. Stark and C. E. Dapples, 1946 (Geol. Soc. America Bull., v 57, p 1121-1172). Los Pinos granite. - Medium-coarse-grained, pink rock composed largely of orthoclase, microcline, albite and qtz. Biotite is the most prom. dark mineral. The granite has intruded, assimilated, and granitized the Sais, Blue Springs, White Ridge, and Sevilleta formations. Xenoliths of these rocks and many "knots" of gray sericitic schist occur throughout the granite. The granite is slightly schistose. In a few areas miarolitic cavities are common. Believed to be correlative with Priest granite of Manzano Mtns.

Name from Los Pinos Mtns.

McCracken sandstone member (of Elbert formation)

Upper Devonian: Subsurface of southwestern Colorado, southeastern Utah, northeastern Arizona and northwestern New Mexico (Four Corners area)

R. L. Knight and J. C. Cooper (Four Corners Geol. Soc. Guidebook, p 56-58), redefined the Elbert fm. into two membs., an upper memb. and the underlying McCracken ss. memb. The type locality for the two membs. is the Shell Bluff No. 1 well, located on McCracken Mesa, in sec. 32, T. 29 S., R. 22 E., San Juan Co., Utah. The McCracken ss., logged from 8049-8161 ft. (thickness 112 ft.), consists of glauconitic sands with some minor dol. streaks.

J. C. Cooper, 1955 (Four Corners Geol. Soc. Guidebook, p 63). McCracken ss. memb. - The McCracken ss., ranging from 0 to 580 ft., underlies a great

portion of the Four Corners area. To the W. in central Utah this unit passes into the Elbert fm. undiff. The McCracken ss. consists predom. of white, light gray to red ss., fine to medium grained, some coarse, generally poorly sorted, commonly glauconitic, with a few streaks of sandy dol. The McCracken ss. grades upward into the sandy dol. of the upper memb. of the Elbert fm. The Aneth fm. underlies the McCracken ss., probably unconf. The McCracken ss. is believed to be equiv. to the Ignacio ss. as exposed at Baker's Bridge, Colo., which in the past has been assigned an Upper Camb. age (See Barnes, 1954, under Ignacio qtzite). Additional well information is needed to definitely correlate the Ignacio ss. with the McCracken ss.

Name from McCracken Mesa, near Bluff, San Juan Co., Utah.

McKee sandstone member (of Tulip Creek formation)

Middle Ordovician: Subsurface of western Texas and southeastern New Mexico

T. Cole, C. D. Cordry, and H. A. Hemphill, 1942 (Am. Assoc. Petroleum Geologists Bull., v 26, p 279-282). McKee ss. memb. - 53 ft. of coarse gray and brown ss., silty ss., and sandy sh. Most sands have rounded, frosted grains. Upper part green to greenish gray. Top 305 ft. below 1st red sh. break in the Simpson, 840 ft. above top of Ellenburger. Same as bed 12, zone D of Powers. Consists of (ascending): (1) gray-brown coarse ss. with abundant frosted sand grains, 10 ft.; (2) Coarse green ss. with abundant rounded frosted sand grains, 22 ft.; (3) Green cal c. sand with streaks of sandy green sh., 8 ft.; (4) greenish silty ss., 2 ft.; (5) green sh., 2 ft.; (6) coarse green sand with abundant frosted sand grains, 11 ft. At base of Tulip Creek fm.

Type section: Magnolia Petrol. Co. J. S. McKee No. 1-A, sec. 24, Blk 9, H. & G. N. Surv., Pecos Co., Tex.
Name from well name.

#McLish formation

Middle Ordovician (Chazy): Central southern Oklahoma (Arbuckle and Wichita Mtns) and subsurface of western Texas and southeastern New Mexico

C. E. Decker, 1930 (Am. Assoc. Petroleum Geologists Bull., v 14, p 1498-1505). McLish fm. - Chiefly lss.; some sh.; with ss. (8 to 200 ft. thick) at base and some sss. higher up. Contains limited but very distinctive fauna. Thickness

300 to 500+ ft. Underlies Tulip Creek fm., and overlies Oil Creek fm. Same as Falls fm., and latter name abandoned.

C. E. Decker and C. A. Merritt, 1931 (Okla. Geol. Surv. Bull. 55, p 12, 98). A 7-partite div. of Simpson gp. has been used during part of this study, and the 2 additional fm. names used temporarily are Falls Creek and Criner. These 2 fm. names were later discarded.

E. 0. Ulrich, 1933 (Geol. Soc. America Bull., v 44, p 105). Falls fm. is an older unit than McLish. It is confined mainly to SW. half of Arbuckle uplift and McLish to NE. half, the two fms., occurring one above the other in a few intermediate localities. Simpson gp. divided into 8 fms. (See this entry under Simpson fm.)

C. E. Decker, 1933 (See this entry under Simpson fm.)

C. E. Decker, 1941 (Am. Assoc. Petroleum Geologists Bull., v 25, p 650-667) The subdivision of the Simpson gp. into five formations is retained as used in Bull. 55 of the Okla. Geol. Surv.

T. Cole, C. D. Cordry, and H. A. Hemphill, 1942 (Am. Assoc. Petroleum Geologists Bull., v 26, p 279-282), proposed the name Waddell ss. memb. for the basal ss. of the McLish in the subsurface of W. Texas.

R. H. Schweers, 1949 (Am. Assoc. Petroleum Geologists Bull., v 33, p 2029-2038). Since, on paleontological grounds, all of the formational units of the Okla. type Simpson can be shown to be represented in the subsurf. of W. Tex., and since the group in W. Tex. can also be subdivided on lithologic grounds, not in conflict with the former, it is proposed that the Okla. formational names be applied to the recognized subdivisions of the subsurf. Simpson.

Named for McLish ranch, T. 1 S., R. 7 E., Johnston Co.

Mangos quartzite

Upper Cambrian: Southwestern New Mexico (Silver City region)

C. R. Keyes, 1915 (Iowa Acad. Sci. Proc., v 22, p 257-259, Conspectus of geol. fms. of N. Mex., p 4, 9). Mangas qtzite. - Basal siliceous memb., 100 ft. thick, of Mid Cambric section exposed near Silver City. (Derivation of name not stated. According to E. Kirk and others the Middle Camb. is absent in N. Mex. This probably refers to the Bliss ss.)

Martinian series

A term introduced by C. R. Keyes in 1915 to cover upper part of Dev. section in N. Mex., the lower part being called Perchan series. (See his Conspectus

of geol. fms. of N. Mex., 1915). In 1922 he applied Martinian series to the lower part of Upper Dev. in Ariz. and Perchan series to upper part.

Mimbres limestone

Silurian and Ordovician: Southwestern New Mexico

C. H. Gordon, 1907 (Sci., n. s., v 25, p 824-825; Jour. Geology, v 15, p 91-92). Mimbres ls. - 900 to 1,200 ft. thick, underlies Dev. Percha sh. and overlies Upper Comb. Shandon qtzite (Bliss ss.). The greater part of these lss. contains Richmond fauna, but upper 100+ ft. have yielded Sil. fauna.

Now separated into Fusselman ls. (Niagaran), Montoya ls. (Richmond), and El Paso ls. (Canadian), and name abandoned.
Named for Mimbres Mtns, W. part of Sierra Co.

Mimbresian series

A term introduced by C. R. Keyes to cover his Cristobal lss. (of Richmond, late Ord. age) of N. Mex. (See Iowa Acad. Sci. Proc., v 22, 1915, p 257-259.) In his Conspectus of geol. fms. of N. Mex., 1915, p 9, he defined it as "term restricted to Late Ordovicic section in Mimbres, Caballos, and Franklin Ranges that carries the Richmond fauna." In 1922 (Pan-Am. Geol., v 38) he stated this is not Mimbres ls. of Government repts.

Monte Largo granite

Precambrian: Central New Mexico (Southern Manzano Mtns)

J. T. Stark, 1956 (N. Mex. Bur. Mines and Min. Res. Bull. 34). Monte Largo granite: A small, stock-like mass of granite, qtz monzonite, and diorite approx. 12 mi. square. Intrudes Blue Springs schist and Sais qtzite. The rock appears sim. to the Ojito granite. The granite is coarse to medium-coarse grained and composed almost entirely of asussuritized feldspar, qtz, and chloritized biotite and hornblende. It shows schistose structure, schist inclusions more or less parallel to the schistosity, and numerous short lens-shaped qtz-filled vugs, which ave. 2 to 4 in. long and 1 in. wide. The feldspars are albite-oligoclase, orthoclase, microperthite. Qtz is 20-25 percent of the rock.

Name from Monte Largo Canyon, secs. 26, 27, 34, 35, T. 5 N., R. 5 E.

Montoya limestone (group)

Upper Ordovician: Western Texas and southern New Mexico

G. B. Richardson, 1908 (Am. Jour. Sci., 4th, v 25, p 476-479). Montoya ls. - Upper part, which carries Richmond fossils, according to E. 0. Ulrich, is prevailingly gray ls., characteristically mag., in places seamed with conspicuous bands of chert a few inches thick; some beds are almost white, others are dark. Lower part is commonly marked, in El Paso quad., Tex., by massive dark-colored ls., containing little or no chert and carrying characteristic Galena fossils, according to E. 0. Ulrich. The two parts cannot always be distinguished lithologically. Thickness 250 ft. In Van Horn quad. the base of Montoya is commonly marked by presence of thin-bedded earthy yellow and reddish ls., but otherwise in both quads. the contact with underlying El Paso ls. is apparently conf. ls overlain by Fusselman ls., of Niagara age.

L. P. Entwistle, 1944 (N. Mex. Bur. Mines and Min. Res. Bull. 19, p 16-19), divided the Montoya into three membs. (ascending): Second Value memb., Par Value memb., and Raven memb.

V. C. Kelley and C. Silver, 1952 (Univ. N. Mex. Pub. in Geol. 4, p 56-66), raised the Montoya to a group, including 4 fms., (ascending) Cable Canyon ss., Upham dol., Aleman fm. and Cutter fm., the last named being Darton's (1917) lower memb. of Fusselman ls., which is shown to be of Ord. age.

,L. C. Pray, 1953 (Am. Assoc. Petroleum Geologists Bull., v 37, p 1907). Kelley and Silver have extended the term Montoya of Richardson to include strata called lower Fusselman by Darton. The Cutter fm. should probably not be included in the Montoya gp. as its inclusion expands the original definition of Montoya fm. and the Cutter is probably more correctly related to the Fusselman dol.

Further studies of faunas contained in Montoya ls. resulted in assigning the lower fauna to pre-Richmond Upper Ordovician.

Named for Montoya station, on A. T. S. F. R. R., about 10 mi. above El Paso, Tex.

Montoyan series

A time term employed by C. R. Keyes to cover a part of Montoya ls.

Naiad limestone

Silurian (?): Southwestern New Mexico (Silver City region)

C. R. Keyes, 1915 (Iowa Acad. Sci. Proc., v 22, p 257-259; Conspectus of geol. fms. of N. Mex., p 3, 10). Naiad ls. - Main ore-bearing fm. at Georgetown, Silver City, and elsewhere in these districts. Thickness 250 ft. Overlies Cibola ls., both of which comprise Santa Ritan series. Assigned to Sil. (Derivation of name not given.)

Ninos schist

Precambrian: Central northern New Mexico (Las Vegas region)

C. R. Keyes, 1915 (Iowa Acad. Sci. Proc., v 22, p 257-259; Conspectus of geol. fms. of N. Mex., p 4, 10). Ninos schists. - Lower and principal schistose section above Azoic gneisses in Solitario Mtn region NW. of Las Vegas. Thickness 1,000 ft. (Derivation of name not given.)

#0i1 Creek formation

Middle Ordovician (Chazy): Central southern Oklahoma (Arbuckle Mtns) and subsurface of western Texas and southeastern New Mexico

C. E. Decker, 1930 (Am. Assoc. Petroleum Geologists Bull., v 14, p 1498-1505). Oil Creek fm. - Consists chiefly of dots. and lss., with some sh. and ss. beds, and at base a ss. from 8 to 200 ft. thick. Underlies McLish fm. and overlies Joins fm. Thickness of fm. 1,600 to 2,300+ ft. Of Chazy age.

C. E. Decker and C. A. Merritt, 1931 (Okla. Geol. Surv. Bull. 55, p 11±). The Simpson is here raised to a group, divided into 5 fms. (ascending) Joins, Oil Creek, McLish, Tulip Creek, and Bromide. Oil Creek is of lower Chazyan age.

R. H. Schweers, 1949 (Am. Assoc. Petroleum Geologists Bull., v 33, p 2029-2038), proposed the name Connell ss. memb. for the basal ss. of the Oil Creek in the subsurf. of W. Tex. Since, on paleontological grounds, all of the formational units of the Okla. type Simpson can be shown to be represented in the subsurf. of W. Tex., and since the group in W. Tex. can also be subdivided on lithologic grounds, not in conflict with the former, it is proposed that the Okla. formational names be applied to the recognized subdivisions of the subsurf. Simpson.

Named for exposures on Oil Creek, W. Johnston Co. and SE. Murray Co., Okla.

Ojito granite

Precambrian: Central New Mexico (North Manzano Mtns)

P. Reiche, 1949 (Geol. Soc. America Bull., v 60, p 1183-1212). Ojito granite. - Light gray, massive, medium-grained granite, locally gradational to qtz monzonite. Extent 7 mi. N. - S., 2.75 mi. E. - W. Discordant contact with intruded earlier Precamb. rocks. Faulted off on W. Apart from silic., contact alteration of adjacent sediments is very slight.

Named from El Ojito Canyon, N. Manzano Mtns.

Onate formation

Middle (?) or Late (?) Devonian: Southern New Mexico (Sacramento and San Andres Mtns)

F. V. Stevenson, 1945 (Jour. Geology, v 53, p 217-245). Onate fm. - The Onate fm. consists of a gray-brown to buff variable and intergradational series of sh., siltstone, fine ss., and ls. Identification of these sediments for correlation purposes is complicated by lateral intergradational changes, a lack of sufficient index fossils, and the absence of strong color contrasts between the beds. The base of the Onate is easily located. The older Paleozoic fms. which are massive lss. and silk. dols., are separated by an erosional unconf. from the relatively thin-bedded clastic units of the superjacent Onate fm. The top of the Onate is not marked by any disconf. readily detectable in the field. An outstanding difference btw. the Onate and the overlying Sly Gap fm., however, is the gray-brown color of the former and the tan to light yellow color of the latter. Leiorhynchus sp. occurs in Onate but not in Sly Gap. Thin shaly beds containing ribbon-like bryozoa (Sulcoretopora anomalotruncata) occur within 3 or 4 ft. of the top of the Onate in most sections. Weathers to step-like outcrop. Thought to be at least a partial correlative of the Canutillo fm. Thickness 86 ft. at type loc. Ave. 35 ft. in Sacramento Mtns.

Type locality and section: N. slope of San Andres Canyon, sec. 18, T. 18 S., R. 4 E., San Andres Mtns.
Named from Onate Mtn, San Andres Mtns.

#Ophir formation

Middle Cambrian: Central Utah and subsurface of southeastern Utah and northwestern New Mexico (Four Corners area)

G. F. Loughlin, 1919 (U. S. Geol. Survey Prof. Paper 107, p 25-27). Ophir fm. - Name proposed by B. S. Butler, for the shales (locally slates), with a little ss. and intercalated ls. beds, overlying Tintic qtzite as here restricted and

underlying Teutonic ls. in the ranges of central Utah. Thickness 159 to 475+ ft. Well exposed at Ophir, eastern Toole Co. Lower part of these beds (100 to 190 ft.) was included in Tintic qtzite as originally defined, but Tintic is herein restricted to the massive qtzites.

J. C. Cooper, 1955 (Four Corners Geol. Soc. Guidebook, p 59-65). The Ophir fm., which can be traced into the Four Corners area by a few scattered wells, ranges from 0 to 375 ft. This unit, which has been penetrated by 12 wells, consists predom. of thin bedded, gray-green and red micaceous sh. that is commonly sandy. The sh. generally contains numerous, intercalated, thin beds of cream and red silty, micaceous dol. and ls. that often carry glauconite. The Ophir fm. commonly contains thin beds of red and green, glauconitic ss., especially near the base. To the NW. in Utah the fm. grades to a gray to brown, glauconitic, micaceous siltstone with numerous sh. and dol. interbeds as above. The Ophir fm., which is equiv. to the Bright Angel sh. of Grand Canyon, overlies the Tintic ss. with a transitional contact and is overlain conf. by the Bowman-Hartman ls. undiff. To the E., where Upper Camb. rocks have been either beveled by erosion or not deposited, the Ophir fm. is overlain by Dev. rocks.

Ortega formation

Precambrian: Central northern New Mexico (Picuris Range and Petaca area)

A. Montgomery, 1953 (N. Mex. Bur. Mines and Min. Res. Bull. 30, p 6-21). Ortega fm. - Consists of lower qtzite at least 2,500 ft. thick, Rinconada schist memb., 1,800 ft. thick, and Pilar phyllite memb., at least 2,300 ft. thick. The lower qtzite is coarse-grained, with thin beds of sillimanite-kyanite gneiss. The rock is glassy, mostly massive but locally slabby.

Color is ordinarily gray to gray-white but may be pale brown with streaky or mottled appearance due to iron-oxide staining. Other colors are milky white, dark-smoky or nearly gray-black, rarely pale bluish-green. Very minor dark grains, tourmaline, hematite, or ilmenite, and minute kyanite or sillimanite. Rinconada schist is made up of andalusite-biotite hornfels, staurolite gneiss and schist, qtzite, and muscovite-qtz-biotite-garnet phyllite. Pilar phyllite is gray-black carbonaceous qtz-mica phyllite with a slaty cleavage. Ortega fm. is oldest Precamb. fm. in Picuris range.

Named for Ortega Mtns.

Ortega quartzite

Precambrian: Central northern New Mexico (Petaca area and Picuris Range)

E. Just, 1937 (N. Mex. Bur. Mines and Min. Res. Bull. 13). Ortega qtzite. - Bluish-gray qtzite and conglomeratic qtzite, and gray to buff qtz-muscovite schist (Rinconada schist memb. in Picuris range, Petaca schist in Petaca area). Thickness 1 to 5 mi. Lies on Hopewell Series.

A. Montgomery, 1953 (N. Mex. Bur. Mines and Min. Res. Bull. 30, p 6), calls the Ortega qtzite of Just a member of the Ortega fm., which includes basal qtzite, Rinconada schist memb., and Pilar phyllite memb. (Hondo slate of Just). Ortega fm. is oldest Precamb. fm. in Picuris range and is overlain by Vadito fm. which is at least partly equiv. to Hopewell series of Just.

Named for Ortega Mtns.

#Ouray limestone

Upper Devonian: Southwestern Colorado and subsurface of southeastern Utah, northeastern Arizona and northwestern New Mexico (Four Corners area)

A. C. Spencer, 1900 (Am. Jour. Sci., 4th, v 9, p 125-129). Ouray ls. is name proposed for only memb. of pre-Carbf. section of San Juan region, SW. Colo., which is definitely shown by its fossils to be of Dev. age. Named for prominent occurrence in vicinity of Ouray at junction of Canon Creek with Uncompahgre River. The fm. consists of 100 to 300 ft. of massive ls. In places it is one massive unit; in other places it consists of 2 or 3 massive beds separated by greenish crumbling marls. The ls. is usually white, but sometimes is stained red or pink. Certain strata are somewhat coarsely crystalline, but as a rule the ls. is fine grained. The Dev. fossils (identified by G. H. Girty) were found a short distance below top. Neither the top nor the basal layers have yielded fossils. Rests on 0 to 100 ft. of Dev. sh., and, in places, on Algonkian; and underlies, apparently conf., rocks containing, a few ft. above Ouray ls., Upper Carbf. fossils. The Lower Carbf. appears to be absent, but possibly a few ft. of unfossiliferous ls. above the true Dev. and not differentiated from it may be of Lower Carbf. age.

A. C. Spencer, 1900 (U. S. Geol. Survey 21st Ann. Rept., pt. 2, p 37-78). Ouray ls. (Dev.) is overlain by Hermosa fm. (Penn.). The sh. on which Ouray ls. rests may be pre-Dev.

W. Cross, 1904 (Am. Jour. Sci., 4th, v 18, p 245-252). Ouray ls. of San Juan region is a lithologic unit, and contains Miss. fossils in upper part and Dev. fossils in lower part. It overlies Elbert fm. (Dev. sh.).

W. Cross and E. Howe, 1905 (Geol. Soc. America Bull., v 16, p 470-496). Ouray ls. of SW. Colo. is unconf. overlain by Molas fm. (Penn.).

W. Cross, A. C. Spencer, and F. L. Ransome, 1905 (U. S. G. S. Rico folio, no. 130). Ouray ls., 100 to 300 ft. thick, is of Miss. and Dev. age. When defined by Spencer it was supposed to be all Dev. It is a lithologic unit and the Miss. and Dev. cannot be separated. The Miss. fauna is found also in Leadville ls.

W. S. Burbank, 1930 (Colo. Sci. Soc. Proc., v 12, no. 6). The Ouray ls. is chiefly of Miss. age, the Dev. part being 65 to 70 ft. thick, and the Miss. part 180 to 235 ft. thick. Fossils 15 to 20 ft. above base are pronounced by Kirk to be Upper Dev. No other fossils found in Dev. part of the ls. The Dev. part is chiefly gray, buff, or white lss. of medium grain; the Miss. part is largely gray or brownish-gray crystalline ls. alternating with beds of ls. breccia containing red shaly seams. The top of the Dev. part in Ouray dist. is drawn at base of a blue-gray thin-bedded ls. that commonly contains nodules of black chert. An inconspicuous ls. breccia occurs at places in overlying beds. At Box Canyon the dark-colored chert-bearing beds and the breccia are both absent, but base of Miss. ls. seems to be marked by ss. layers containing calc. cement.

E. Kirk, 1931 (Am. Jour. Sci., 5th, v 22, p 224). Ouray ls. here restricted to the Dev. part of Ouray ls. as previously used, the Miss, part to hereafter be called Leadville ls. It is understood that Ouray will not be applied outside of SW. Colo.

J. C. Cooper, 1955 (Four Corners Geol. Soc. Guidebook, p 63). Ouray ls. - The Ouray ls. ranges from 0 to 238 ft. in the Four Corners area, thickening gradually to the NW. The unit consists of a massive, dense, argil. ls., ranging from buff, tan, cream to gray in color, with some thin streaks of waxy, gray-green, clayey shales. In Utah the ls. is locally slightly sandy and in places the basal portion carries ss. Brachiopod and crinoid fragments occur in some of the wells. Dev. fossils have been reported in one test. The Ouray ls. is overlain unconf. by the Miss. Madison fm. and underlain probably unconf. by the Elbert fm.

Par Value member (of Montoya limestone)

Middle Ordovician: Southwestern New Mexico (Silver City area)

L. P. Entwistle, 1944 (N. Mex. Bur. Mines and Min. Res. Bull. 19, p 16-19), divided the Montoya into three membs. (ascending): Second Value memb., Par Value memb., and Raven memb. Overlying the Second Value member is a persistent unit composed of alternating bands of red chert and gray dol. The proportions are about one-third chert and two-thirds dol. This unit has been found in many other areas in the SW. part of N. Mex. The base of the Par Value memb. is a very distinctive horizon. Thickness 65 ft. on Par Value claim.

Type locality and section: Par Value claim, Boston Hill area, Central mining dist.

Pecursian series
Picursian series

Terms introduced by C. R. Keyes to cover upper part of old Precamb. rocks in N. Mex. (See his Conspectus of geol. fms. of N. Mex., 1915, p 4, 10.)

Penasco quartzite.

Precambrian: Central northern New Mexico (Santa Fe region)

C. R. Keyes, 1915 (Iowa Acad. Sci. Proc., v 22, p 257-259; Conspectus of geol. fms. of N. Mex., p 4, 10). Penasco qtzite. - Main body of siliceous section exposed near Pecuris, N. of Santa Fe. Thickness 400 ft. (Derivation of name not given.)

Percha shale

Upper Devonian: Southern New Mexico and southwestern Texas

C. H. Gordon, 1907 (Am. Jour. Sci., 4th, v 24, p 58-64; Sci., n. s., v 25, p 824-825; Jour. Geology, v 15, p 91-92). Percha sh. - Sh. underlying Lake Valley ls., overlying Mimbres ls., and carrying an Upper Dev. fauna in lower part. ls 200 ft. thick in Sierra Co. and 500 ft. thick in Grant Co. At Lake Valley it consists of 60 ft. of grayish-yellow and blue shales underlain by 100 ft. of black flssile sh.

F. V. Stevenson, 1942 (N. Mex. Bur. Mines and Min. Res. Bull. 18, p 23-24). The Dev. strata of N. Mex. are divided into three fms., all of late Dev. age. The divisions are based on sedimentary and faunal breaks, and to a certain

extent on superposition. In ascending order the formations are named Canutillo, Sly Gap, and Percha. The Percha sh. is readily divisible into two parts. The lower unit, which makes up two-thirds of the total thickness, consists of black carbonaceous flssile sh. without fossils. The upper unit consists of gray and green shale with lenses and nodules of ls. Fossils are generally confined to the ls. lenses and nodules in the sh.

F. V. Stevenson, 1945 (Jour. Geology, v 53, p 217-245), divided the Percha sh. into Ready Pay memb. (lower) and Box memb. (upper). Designates type loc. for Percha sh. as 2½ mi. SE. of Hillsboro near Percha Creek, in SW¼SW¼SE¼ sec. 14, T. 16 S., R. 7 W.

M. A. Stainbrook, 1947 (Jour. Paleontology, v 21, p 297-328), suggested that the Percha might be of Miss. age on the basis of brachiopods in Box memb.

A. K. Miller and C. Collinson, 1951 (Am. Jour. Sci., v 249, p 600-603), describe a clymenid ammonite in the Box memb. of the Percha.

G. A. Cooper, 1954 (Jour. Paleontology, v 28, p 325-332) Syringospira prima Kindle from the Percha closely related to Sphenospira alta (Hall) from the Chagrin formation, Conewango group of New York and Penn.

Named for Percha Creek, Sierra Co., N. Mex.

Perchan series

See under Martinian series.

Petaca schist member (of Ortega quartzite)

Precambrian: Central northern New Mexico (Petaca area)

E. Just, 1937 (N. Mex. Bur. Mines and Min. Res. Bull. 13, p 43). Petaca schist. - As in the Picuris area the Ortega qtzite contains a minor qtz muscovite schist phase, which is here named the Petaca schist. The Petaca schist is nearly restricted to Mesa la Jarita. Locally the schist contains qtzite membs., and in places it is conglomeratic. Along the strike it grades into typical Ortega qtzite. In places the schist is quite feldspathic.

Name from town of Petaca.

Picuris basalts

Precambrian: Central northern New Mexico (Picuris and Petaca areas)

E. Just, 1937 (N. Mex. Bur. Mines and Min. Res. Bull. 13, p 23-24, 44). Picuris basalts. - The Picuris basalts comprise a series of basalt flows that occur principally interspersed with the sedimentary schists of the Hopewell series. The basalts could be grouped as part of the Hopewell series, except that they persist up into the Ortega qtzite. Therefore the basalt extrusives have been given a distinctive name. Most of the dark hornblende schists of the Hopewell series probably belong to the Picuris basalts, but the development of schistosity has destroyed their original textures. The best exposure of the Picuris basalts observed in the Picuris area is near the mouth of Picuris Canyon. Here, although the basalts are schistose, their igneous nature is established by the presence of lath-shaped phenocrysts of plagioclase. The phenocrysts are oriented parallel to the flows and show typical flow-band structure. Most of the Hopewell series in the Petaca area consists of dark hornblende-chlorite schists that are metamorphic derivatives from basalt and andesite flows.

A. Montgomery, 1953 (N. Mex. Bur. Mines and Min. Res. Bull. 30, p 21). The Vadito fm. consists of metasedimentary rocks that are interbedded with flows and contain sills of various types of meta-igneous rocks. It seems best to describe all of these rocks under the Vadito fm.

Named for the town of Picuris.

Pilar phyllite member (of Ortega formation)

Precambrian: Central northern New Mexico (Picuris range)

E. Just, 1937 (See entry under Hondo slate).

A. Montgomery, 1953 (N. Mex. Bur. Mines and Min. Res. Bull. 30, p 19-21). Ortega fm. consists of lower qtzite, Rinconada schist memb., and Pilar phyllite memb. The Pilar phyllite, or Hondo slate of Just, is the youngest rock of the Ortega fm. and the most distinctive horizon-marker in the Picuris range. The old name, Hondo, had been applied to other rocks prior to Just's usage, and hence is abandoned. TI-;e' rock is carbonaceous, dense, homogeneous, hard, gray black to black, with a gray sheen on cleavage surfaces. Muscovite flakes on cleavage surfaces are discernable with a hand lens. Cleavage is irregular, slabby, some corrugated. Commonly contains many qtz veins; large ones follow joints and thin ones parallel cleavage. Large veins contain limonite masses and may be stained yellow. Close folding prohibits accurate determination of thickness, but Pilar phyllite appears to be 2,300 ft. in min. thickness as exposed in the Picuris range.

Named for village of Pilar.

#Pinos Altos limestones

Ordovician: Southwestern New

Mexico

C. R. Keyes, 1904 (Am. Jour. Sci., 4th, v 18, p 360-362). Pinos Altos fm. - consists of 400 ft. of lss. of Ord. age, underlying Dev. Chloride fm. (lss.) and overlying Camb. sss.

Probably named for town in Grant Co., and probably includes Fusselman ls. (Sil.) and Montoya and El Paso lss. (Ord.).

Priest granite

Precambrian: Central New Mexico (Southern Manzano Mtns)

J. T. Stark and E. C. Dapples, 1946 (Geol. Sco. America Bull., v 57, p 1121-1172). Priest granite. - A coarse-grained rock composed chiefly of pink feldspar, qtz, and biotite. At many localities there are irregular areas of pegmatite with gradational borders into the finer-grained granite. Feldspar crystals are commonly 3 inches long. The rock weathers readily to rounded knobby surfaces. The granite contains many xenoliths of schist which increase in size and number near the contacts. Xenoliths of qtzite are less common. Both types of inclusions are more resistant than the granite and stand out above the eroded surface as knobs. The rock is made up of 60-65 percent feldspar; orthoclase, microcline, and albite, partly saussuritized, kaolinized, and epidotized. Qtz makes up 35 percent of the rock, biotite most of the remainder. Believed to be correlative with Los Pinos granite.

Named for Priest Peak, Southern Manzano Mtns.

#Pueblo quartzite

Precambrian: Central northern New Mexico (Taos County)

J. W. Gruner, 1920 (Jour. Geology, v 28, p 731-742). Pueblo qtzite. -• As a whole is yellow, but southern end becomes reddish and purplish gray. Exposed at head of Pueblo Creek (T. 26 and 27 N., R. 14 and 15 E.), Taos Co.

Raven member (of Montoya limestone)

Middle Ordovician: Southwestern New Mexico (Silver City area)

L. P. Entwistle, 1944 (N. Mex. Bur. Mines and Min. Res. Bull. 19, p 18), divided the Montoya into three membs. (ascending): Second Value memb., Par Value memb., and Raven memb. The upper memb. of the Montoya dol., named Raven memb. from typical exposures on the Raven claim, is essentially a thick-bedded gray dol. with some red chert. The base is a shell ls. with abundant fossils of Richmond age. The overlying beds are in general nonfossiliferous but in some places contain colonial corals. The upper part of the Raven memb. is thick-bedded gray cherty dol. The top is not clearly defined. A bed of nodular chert a few inches thick is considered to be the base of the overlying Fusselman ls. Thickness 120 ft.

Type locality and section: Raven claim, Boston Hill area, Central mining dist.

Ready Pay member (of Percha shale)

Upper Devonian: Southern New Mexico and western Texas

F. V. Stevenson, 1945 (Jour. Geology, v 53, p 217-245), divided the Percha sh. into Ready Pay memb. (lower) and Box memb. (upper). The Ready Pay memb. is composed of black, fissile, nonfossiliferous sh.; and in most sections it comprises two-thirds of the thickness of the Percha sh. The Ready Pay memb. grades without any marked break into the Box memb. above. 120 ft. thick at type locality. Lies unconf. on Fusselman ls. (Sil.) at many localities.

Type section: 22 mi. SE. of Hillsboro, SWASWASEA sec. 14, T. 16 S., R. 7 W. Name from Ready Pay Gulch, near "The Box" on Percha Creek.

Rinconada schist member (of Ortega formation)

Precambrian: Central northern New Mexico (Picuris range)

E. Just, 1937 (N. Mex. Bur. Mines and Min. Res. Bull. 13, p 21-22). Rinconada schist memb. - The qtzite and qtz schist fm. that succeeds the Hopewell series is divisible into qtzitic and schistose phase. The schistose phase, called the Rinconada schist in this area, is gray to buff qtz-muscovite schist, which in

many places has interbedded qtzite membs. Some of the qtzite membs. are quite thick; north of Copper Mtn qtzite composed about half the total mass of the Rinconada schist. Although most of the schist is more or less even in texture, in places it contains porphyroblasts of garnet ranging from pinhead to marble size, or of staurolite up to an inch long. Many of the staurolite crystals are twinned. Some of the schist is conglomeratic.

A. Montgomery, 1953 (N. Mex. Bur. Mines and Min. Res. Bull. 30, p 6, 12-19). The Ortega fm. consists of lower qtzite, Rinconada schist memb. and Pilar phyllite memb. The Rinconada schist memb. consists of four distinctive mappable units (ascending): (1) andalusite-biotite hornfels bed, 200-350 ft. thick; (2) staurolite schist and gneiss bed, 200-500 ft. thick; (3) qtzite bed, gray-white qtzite with slabby cleavage, containing some interbedded layers of staurolite and garnet schist several cm. thick, thickness 200-600 ft.; (4) Muscovite-qtz-biotite-garnet phyllite, with thin beds of hornblende granulite, hornblende-garnet hornfels, calc. granulite, and others. Thickness 200-400 ft. Thickness of Rinconada schist memb. 1,800 ft.

Named for town of Rinconada.

Rociada limestone

Precambrian: Central northern New Mexico (Las Vegas region).

C. R. Keyes, 1915 (Iowa Acad. Sci. Proc., v 22, p 257-259; Conspectus of geol. fms. of N. Mex., p 4, 10). Rociada lss. - Main body of Archeozoic lss. in Solitario Mtn dist., NW. of Las Vegas. Thickness 250 ft. (Derivation of name not stated. On p 4 is spelled with final a; on p 10 with final o. The P. 0. is spelled with final a.)

Sais quartzite

Precambrian: Central New Mexico (Los Pinos and Southern Manzano Mtns)

J. T. Stark and E. C. Dapples, 1946 (Geol. Soc. America Bull., v 57, p 1127-1172). Sais qtzite. - Light gray to dark gray fine-grained qtzite with greenish and nearly white facies. Massive qtzose beds 3-5 ft. thick alternate with thinner-bedded zones, commonly sericitic, indicating argil. beds within the original ss. The E. boundary is faulted, no base being exposed. The thickest section measured is 600 ft. near Abo pass. Near the top of the fm. the beds become increasingly sericitic, and no sharp boundary can be drawn between this fm. and the overlying Blue Springs schist fm.

Name from Sais station, on A. T. S. F. R. R. near Abo Pass.

Sandoval granite

Precambrian: Central New Mexico (Magdalena and Sandia Mtns)

C. R. Keyes, 1915 (Iowa Acad. Sci. Proc., v 22, p 257-259; Conspectus of geol. fms. of N. Mex., p 4, 11). Sandoval granites. - Red granites penetrating all pre-Cambric rocks of Sandia, Magdalena, and other ranges. (Derivation of name not given. On p 4 they are assigned to Precamb.)

Santa Rite limestone

Silurian: Southwestern New Mexico (Sierra County)

C. R. Keyes, 1908 (Am. Inst. Min. Eng. Bi-Mon. Bull. 19, p 7-21). Santa Rita ls. - Dark-drab compact lss., 0 to 10 ft. thick, containing Sil. fossils. Type locality Santa Rita, Grant Co. Underlies, unconf., Silver sh. (Dev.) and overlies El Pasan series (Ord.).

Santa Ritan series

A term employed by C. R. Keyes to cover Santa Rita ls.

Sapello quartzite

Precambrian: Central northern New Mexico (Las Vegas region)

C. R. Keyes, 1915 (Iowa Acad. Sci. Proc., v 22, p 257-259; Conspectus of geol. fms. of N. Mex., p 4, 11). Sapello qtzites. - Main body of Archeozoic qtzites below the thick ls. section in Solitario Peak region, NW. of Las Vegas. Thickness 300 ft. (Derivation of name not given.)

Second Value member (of Montoya limestone)

Middle Ordovician: Southwestern New Mexico (Silver City area)

L. P. Entwistle, 1944 (N. Mex. Bur. Mines and Min. Res. Bull. 19, p 16-19), divided the Montoya into three membs. (ascending): Second Value memb., Par Value memb., and Raven memb. The Second Value memb. is the basal

member of Montoya dol. at Boston Hill. Consists of purplish-gray, sandy dol. The sand grains are grouped in wormlike aggregations which in places simulate filled fossil molds. Locally thin, cross-bedded sands with red and black chert fragments occur. The sand is more prom. near the base. Upper part contains fossils of Galena age. The member is locally lenticular. Thickness at type loc. 90 ft.

Type locality and section: Second Value Claim, Boston Hill area, Central mining district.

Serna schist

Precambrian: Central northern New Mexico (Santa Fe region)

C. R. Keyes, 1915 (Iowa Acad. Sci. Proc., v 22, p 257-259; Conspectus of geol. fms. of N. Mex., p 4, 11). Serna schists. - Basal part of Archeozoic section near Picuris, N. of Santa Fe, on W. flank of Rocky Mtns. Thickness 1,500 ft. (Derivation of name not given.)

Sevilleta metarhyolite

Precambrian: Central New Mexico (Los Pinos and Manzano Mtns)

J. T. Stark and E. C. Dapples, 1946 (Geol. Soc. America Bull., v 57, p 1121-1172). Sevilleta rhyolite. - 4,500 ft. of acid flows in two facies. The lower 500 ft. is more or less compact, sericitic rhyolite which grades downward into highly sheared and recrystallized White Ridge qtzite. The light buff to reddish-brown schistose rhyolite is extremely fine-grained and compact and abundantly sericitic. Usually the flows contain phenocrysts of pink orthoclase which range from 1 to 15 mm. in length but where no phenocrysts occur it is difficult to distinguish the schistose rhyolite from the underlying qtzite. The basal schistose facies grades up into progressively less meta-morphosed rhyolite which varies from dark red to black. Phenocrysts of orthoclase and qtz are abundant in a black aphanitic groundmass. In a few places a light silvery sheen indicates the development of sericite, but for the most part the upper flows show only slight alteration. In the upper part

of the section the flow character is apparent from an abundance of flow lines and chilled borders marking the tops of flows.

J. T. Stark, 1956 (N. Mex. Bur. of Mines and Min. Res. Bull. 34), calls this fm. Sevilleta metarhyolite.

Type locality: N. of Los Pinos Arroyo.
Name from Sevilleta Land Grant, in which it is well exposed.

#Shandon quartzite

Upper Cambrian and Lower Ordovician (Canadian): Southwestern New Mexico

C. H. Gordon, 1907 (Jour. Geology, v 15, p 91-92) Shandon qtzite. - Qtzites, ss., and shales with occasional Is. bed. Thickness 50 to 1,100 ft. Of Upper Camb. age. Underlies Mimbres Is.

Bliss ss. has replaced this name in usage in New Mexico.
Named for Shandon, eastern part of Sierra Co.

Sierrite limestone (of El Paso group)

Lower Ordovician (Canadian): Southern New Mexico

V. C. Kelley and C. Silver, 1952 (Univ. N. Mex. Pub. in Geol. 4, p 42-45). The El Paso Is. is raised to a group, consisting of two fms., the Sierrite Is. (lower) and Bat Cave fm. (upper). The Sierrite is a medium-gray thin-bedded Is. with thin crenulated chert laminae.. Crops out as cliff or slabby ledgy slope. Chert laminae form reticulating brown masses on broken surfaces parallel to bedding. When fresh, medium gray to dark gray. Most beds are microgranular but fine- to medium-grained textures are present. Almost entirely calcitic at type locality but may be a Bolo. Is. elsewhere. The chert is light gray to white on fresh surfaces. Thickness 127-167 ft. Essentially conf. with Bliss ss. (below) and Bat Cave fm.

Type locality and section: N. side of Cable Canyon, Caballo Mtns, sec. 10, T. 16 S., R. 4 W.
Named from Sierrite iron mine.

Silver shales

Upper Devonian: Southwestern New Mexico (Grant County)

C. R. Keyes, 1908 (Am. Inst. Min. Eng. Bi-Mon. Bull. 19, p 7-21). Silver shales. - Black argil. shales, nonfossiliferous, 100 ft. thick. Underlie Bella shales and unconf. overlie Santa Rita Is. (Sil.). Assigned to Dev. upon strat. position. Type loc., Silver City, Grant Co.

Appears to correspond to lower part of Percha sh.

#Simpson group

Lower (?) and Middle Ordovician: Central southern Oklahoma (Arbuckle Mtns) and subsurface of western Texas and southeastern New Mexico

J. A. Taff, 1902 (U. S. Geol. Survey Atoka folio, 79). Simpson fm. - Sss. and fossiliferous Is., with interbedded greenish clay shales and marls separable into several quite distinctive members. Thickness 1,600 ft. In Tishomingo quad. and in Arbuckle Mtns, where fm. is completely exposed, it varies in thickness from 1,200 to 2,000 ft. Underlies Viola Is. through transition, and overlies Arbuckle Is.

J. A. Taff, 1903 (U. S. Geol. Survey Tishomingo folio, 98). According to E. 0. Ulrich the fauna of lower part of Simpson fm. has decided similarities to that of Chazy of N. Y. and Canada, and fauna of upper part bears close relations to that of upper div. of Stones River gp. in Tenn. and Ky., but certain species indicate age equal Black River fauna of Minn., though it may be these forms appeared earlier in Tishomingo region.

E. 0. Ulrich, 1911 (Geol. Soc. America Bull., v 22, pl 27), assigned Simpson fm. (restricted) wholly to Stones River (early Chazyan) and an older "unnamed epoch"; allocated the overlying beds, of late Chazy and Black River age, to a new fm. which he called Bromide; and designated the overlying beds of Trenton age as Viola Is.

E.0. Ulrich, 1927 (Okla. Geol. Surv. Bull. 45, p 30), showed Simpson fm. as of upper, middle, and lower Chazy age, and as including at top "typical Bromide (of late Chazy age)", while the overlying beds of Black River age he "provisionally referred to the Bromide fm."

F.C. Edson, 1927 (Am. Assoc. Petroleum Geologists Bull., v 11, p 967-975), suggested that Simpson fm. be divided into (descending): (1) Bromide gp. (all "post-Wilcox" beds, of lower Black River age, underlying Viola Is., of upper Black River and Richmond age); (2) "Wilcox" sand, of upper Chazy age; and (3) Simpson fm. (restricted), of lower Chazy or Stones River age.

E. 0. Ulrich, 1930 (U. S. Nat. Mus. Proc., v 76, art. 21, p 73), showed Simpson fm. as including at top the lower part of Bromide (which part he assigned to

Black River) and divided the rest of the Simpson into several new but undefined fms., named (descending) Criner, Tulip Creek, Falls, McLish, Oil Creek, and Joins, all of Chazy age.

C. E. Decker, 1930 (Am. Assoc. Petroleum Geologists Bull., v 14, p 1498-1505), divided Simpson fm. into (descending) Bromide (including Criner), Tulip Creek, McLish (same as Falls, dropped), Oil Creek, and Joins fms.

C. E. Decker and C. A. Merritt, 1931 (Okla. Geol. Surv. Bull. 55, p 11-13). The Simpson is here raised to a group, divided into 5 fms. (ascending), Joins, Oil Creek, McLish, Tulip Creek, and Bromide. These fms. represent 5 more or less complete sedimentary cycles with a basal sand at bottom of each of 4 upper ones and a cgl. at base of lowest one.

E. 0. Ulrich, 1933 (Geol. Soc. America Bull., v 44, p 105). Simpson gp. is divided into 8 fms.: Bromide fm. (correlates with Lowvil le); Criner fm.; Cool Creek fm.; Tulip Creek fm.; McLish and Falls fm., of middle Chazy age; and Oil Creek and Joins fms., of lower Chazyan age.

C. E. Decker, 1941 (Am. Assoc. Petroleum Geologists Bull., v 25, p 650-667), confirms five-partite div. of Simpson gp. as given in Okla. Geol. Surv. Bull. 55. Joins fm. may be in part Lower Ord.

R. H. Schweers, 1949 (Am. Assoc. Petroleum Geologists Bull., v 33, p 2029-2038). Since, on paleontological grounds, all of the formational units of the Okla. type Simpson can be shown to be represented in the subsurf. of W. Tex. and since the gp. in W. Tex. can also be subdivided on lithologic grounds, not in conflict with the former, it is proposed that the Okla. formational names be applied to the recognized subdivisions of the subsurf. Simpson with the McKee, Waddell, and the Connell sss. as basal sands of the Tulip Creek fm., McLish fm., and Oil Creek fm., respectively.

Named for former village of Simpson, just N. of Pontotoc, Johnston Co.

Solitario slate

Precambrian: Central northern New Mexico (Las Vegas region)

C. R. Keyes, 1915 (Iowa Acad. Sci. Proc., v 22, p 257-259; Conspectus of geol. fms. of N. Mex., p 4, 11). Solitario slates. - Extensive section of tilted Archeozoic beds lying above the main Is. exposed in Solitario Mtn, NW. of Las Vegas. Thickness 800 ft.

Sly Gap formation

Upper Devonian: South central New Mexico

F. V. Stevenson, 1942 (N. Mex. Bur. Mines and Min. Res. Bull. 18, p 22, 23). Sly Gap fm. - Is late Dev. in age. Consists chiefly of thin alternating layers of sh. and siltstone, with a few beds of ls. A zone 8 to 10 ft. thick at the base is more massive than the rest of the fm. In outcrop its characteristic red-brown color contrasts sharply with the lighter colors of the sediments above and below. It contains many fragments of crinoids and brachiopods. The shales range from black, fissile, and carbonaceous to light buff or tan. The siltstones and lss. are, in general, buff. Thickness 0-135 ft. Rests unconf. on Fusselman ls. or Canutillo fm. Overlain conf. by Percha sh.

F. V. Stevenson, 1945 (Jour. Geology, v 53, p 217-245), designates type loc. and section for Sly Gap fm. as on S. side of Sheep Mtn, in Sly Gap, San Andres Mtns, sec. 25, T. 11 S., R. 5 E.

Name from Sly Gap, San Andres Mtns.

#Staendebach member (of Tanyard formation)

Lower Ordovician (Canadian): Central Texas and subsurface of West Texas and southeastern New Mexico

P. E. Cloud, Jr., V. E. Barnes, and J. Bridge, 1945 (Univ. Tex. Pub. 4301, p 133-161), named Staendebach memb. of Tanyard fm. (See this ref. under Ellenburger gp.)

P. E. Cloud, Jr. and V. E. Barnes, 1948 (1946) (Univ. Tex. Pub. 4621). Staendebach memb. - Upper memb. of Tanyard fm. Predom. fine to coarse grained, commonly vuggy to porous, light yellowish gray to woodash gray, and pearl gray, irregularly bedded dols., and sublith., pearl gray to woodash gray and old ivory thick to thin bedded lss. The dol. characteristically weathers rough or smoothly irregular to pitted, craggy, and medium gray to iron-gray with brownish tinges or to yellowish shades of gray and brown. The ls. weathers reticulate to smooth, slabby or thick bedded, and to colors near woodash gray or pearl gray, old ivory, old silver, and cement gray. Gradation between ls. and dol. tends to be abrupt laterally and is of no apparent stratigraphic significance. Characteristically contains an abundance of sparingly dolomoldic porcelanous to semiporcelanous and chalcedonic to semichalcedonic chert. This weathers to solid, shiny, white or bluish white masses, slabs, or chips; and the semichalcedonic cherts are commonly oolitic to crypto-oolitic and pseudospicular. Correlated with Gasconade fm. of Mo. Thickness 230 ft. at type loc.

Type section: 4.5 mi. NE. of State Highway 16 on road from Cherokee to the San Saba-Chappel road, San Saba Co.

Name from Staendebach survey.

Taosan series

A term introduced by C. R. Keyes to cover the oldest Precamb. rocks of N. Mex. Named for Taos Co. (See his Conspectus of geol. fms. of N. Mex., 1915, p 4, 11.)

#Tanyard formation (of Ellenburger group)

Lower Ordovician (Canadian): Central Texas and subsurface of western Texas and southeastern New Mexico

P. E. Cloud, Jr., V. E. Barnes, and J. Bridge, 1945 (Univ. Tex. Pub. 4301, p 133-161), named lanyard fm. (See this ref. under Ellenburger gp.)

P. E. Cloud, Jr. and V. E. Barnes, 1948 (1946) (Univ. Tex. Pub. 4621). lanyard fm. - Extends from Camb.-Ord. boundary to base of Gorman. Predom. fine to coarse-grained, commonly vuggy to porous, light yellowish gray to woodash gray and pearl gray, irregularly bedded dols. and sublith., pearl gray to woodash gray and old ivory thick to thin bedded lss. The Is. weathers reticulate to smooth, slabby to thick bedded, and to colors near woodash gray or pearl gray, old ivory, old silver and cement gray. Gradation btw. dol. and Is. tends to be abrupt laterally. Locally the fm. is dol. from top to bottom. On the basis of chert, supported by grain size differences in the dols. or, in the W. part of the region, by a change from Is. to dol., the lanyard fm. is divided into the Threadgill memb. below and the Staendebach memb. above. The boundary between the membs. is transitional. Thickness ave. 590 ft.

Type locality and section: "The lanyard", on E. bank of Buchanan Lake (Colo. River) opposite mouth of Jim John Creek, and 2-3 mi. N. of the mouth of Fall Creek, in NW. Burnett Co.

Threadgill limestone

See Threadgill member.

#Threadgill member (of lanyard formation)

Lower Ordovician (Canadian): Central Texas and subsurface of western Texas and southeastern New Mexico

Barnes, V. E. (1944) (Univ. Tex. Pub. 4301, p 37). Threadgill Is. - Lower Is. unit of Tanyard fm.

P. E. Cloud, Jr., V. E. Barnes, and J. Bridge, 1945 (Univ. Tex. Pub. 4301, p 133-161). The lowest unit of the Tanyard fm. was revised to include equiv. dol. as well and called Threadgill memb. of Tanyard fm.

P. E. Cloud, Jr. and V. E. Barnes, 1948 (1946) (Univ. Tex. Pub. 4621). Threadgill memb. - Lss. and dols., abruptly transitional, fine to coarse-grained, commonly vuggy, light yellowish gray to woodash gray and pearl gray, irregularly bedded. Lss. sublith. On W. lss. have argil. films and minor silt. Dols. of Threadgill memb. yield vuggy or spongy masses of highly dolomoldic or cellular chert interlaced with qtz druse. Lss. are generally noncherty. Thickness 91 ft. in eastern Llano region, 294 ft. in west.

Type section: Threadgill and Mormon Creeks, S. of Lange's mill, NW. Gillespie Co.

Tijeras quartzite

Precambrian: New Mexico

C. R. Keyes, 1915 (Iowa Acad. Sci. Proc., v 22, p 257-259; Conspectus of geol. fms. of N. Mex., p 4, 11). Tijeras qtzites. - Qtzite beds 250 ft. thick, best exposed in great Tijeras arch of pre-Cambric rocks at S. end of Sandia Range.

#Tintic quartzite

Lower Cambrian: Central Utah and subsurface of southeastern Utah and northwestern New Mexico (Four Corners area)

G. 0. Smith, 1900 (U. S. Geol. Survey Tintic Folio, 65). Tintic qtzite. - Clay slates and qtzites, the qtzites white, weathering brownish red, very pure, compact, and fine-grained, with occasional beds of fine qtz pebbles. Several beds of green, yellow, and red clay slates occur near top. Underlies Mammoth Is. In mapping, the base of the lowest bed of Is. was taken as contact btw. the two fms., so that some slates are included in Mammoth Is. Exposed thickness about 7,030 ft., but base not found.

G. F. Loughlin, 1919 (U. S. Geol. Survey Prof. Paper 107), restricted Tintic qtzite to the massive qtzites, and transferred to his overlying Ophir fm. 100 to 190+ ft. of sh. or slate which were included in Tintic qtzite as originally defined. This is present approved definition.

J. C. Cooper, 1955 (Four Corners Geol. Soc. Guidebook, p 59). Tintic ss. - The Tintic ss. has been correlated with a basal, transgressive, qtzose ss. in the Four Corners area ranging from 0 to 547 ft. Only 7 wells in the entire region have penetrated this unit completely. The Tintic ss., which thickens to the NW. into the Cordilleran geosyncline, consists principally of massive, white, green, maroon to pink ss. with fine to medium grains which grades downward to a very coarse, pebbly conglomerate. The basal 50 to 70 ft. are nearly everywhere abundantly feldspathic. The ss. which locally carries some glauconite, contains minor, intercalated streaks of red and green, micaceous, clayey shales. The Tintic ss. unconf. overlies Precambrian rocks and conf. underlies the Ophir fm. To the E. where the Upper Camb. rocks have been either beveled by erosion or not deposited, the Tintic ss. is overlain by Dev. rocks. The Tintic is equiv. to the Prospect Mtn qtzite, the Tapeats ss. and the Brigham qtzite.

Named for exposures in Tintic Canyon.

Truchas slate

Precambrian: Central northern New Mexico (Santa Fe region).

C. R. Keyes, 1915 (Iowa Acad. Sci. Proc., v 22, p 257-259; Conspectus of geol. fms. of N. Mex., p 4, 12). Truchas slates. - The upper slate section of the Archeozoic succession at Picuris, N. of Santa Fe. Thickness 900 ft. (Derivation of name not given)

#Tulip Creek formation (of Simpson group)

Middle Ordovician: Central southern Oklahoma (Arbuckle Mtns) and subsurface of western Texas and southeastern New Mexico

F. C. Edson, 1930 (Am. Assoc. Petroleum Geologists Bull., v 14, p 947). Tulip Creek fm. is overlain with angular unconf. by Bromide fm.

C. E. Decker, 1930 (Am. Assoc. Petroleum Geologists Bull., v 14, p 1498-1505). Tulip Creek fm. - Chiefly shales and sss., with some lss. Usually a thick ss. at base. Thickness of fm. 0 to 600± ft. Underlies Bromide fm. and overlies McLish fm. Whether of early Black River or late Chazy age to be determined after further study of fossils. Occurs only ii) W., SW., and central parts of Arbuckle Mtns.

C. E. Decker and C. A. Merritt, 1931 (Okla. Geol. Surv. Bull. 55, p 11+). The Simpson is here raised to a group, divided into 5 fms. (ascending): Joins, Oil Creek, McLish, Tulip Creek, and Bromide. A few fossils near the base of

the Tulip Creek seem to be upper Chazy, but those in middle and near top are typical Black River forms.

See also 1933, 1941 entries under Simpson gp.

T. Cole, C. D. Cordry, and H. A. Hemphill, 1942 (Am. Assoc. Petroleum Geologists, v 26, p 279-282), proposed the name McKee ss. memb. for the basal sand of the Tulip Creek in the subsurf. of W. Texas.

R. H. Schweers, 1949 (Am. Assoc. Petroleum Geologists Bull., v 33, p 2029-2038), formally proposed that the recognized subdivisions of the subsurf. Simpson in W. Tex. have Okla. formational names applied, as they are same on paleontological and strat. grounds.

Named for exposures at headwaters of Tulip Creek, in Carter Co., N. of Springer.

Tusas granite

Late Precambrian: Central northern New Mexico (Petaca area)

E. Just, 1937 (N. Mex. Bur. Mines and Min. Res. Bull. 13, p 44-46). Tusas granite. - Considered to be contemp. and possibly identical with the Dixon granite of the Picuris area. The Tusas granite varies greatly in composition and texture. In general it is composed of medium-sized grains and is non-porphyritic. The granite south of Tusas Mtn is pink and noticeably lacking in ferromagnesian minerals. N. of Tusas Mtn the rock is gray, contains a good deal of biotite, and varies from monzonite to qtz monzonite in composition.

Named for Tusas Peak.

Upham dolomite (of Montoya group)

Upper Ordovician: Southern New Mexico

V. C. Kelley and C. Silver, 1952 (Univ. N. Mex. Pub. in Geol., 4, p 59-60). Upham dol. - Massive-bedded, medium gray to brownish-gray-weathering dol. Microcrystalline to coarsely crystalline and medium gray to dark gray when fresh. Basal beds sandy. Locally contains scattered, irregularly shaped nodules of chert as much as 12 in. in greatest dimension, or thin bands of chert. Fossils scarce. Thickness in Caballo Mtns 20-80 ft. Lies conf. on Cable Canyon ss., conf. overlain by Aleman fm.

Type locality and section: Cable Canyon, Caballo Mtns, NW¼ sec. 10, T. 16 S., R. 4 W.

Named for Upham station on A. T. S. F. R. R., E. of Caballo Mtns.

Vadito formation

Precambrian: Central northern New Mexico (Picuris Range)

A. Montgomery, 1953 (N. Mex. Bur. Mines and Min. Res. Bull. 30, p 8, 21-35). Vadito fm. - Is at least partial equiv. of Hopewell series of Just. The name Hopewell had been applied to other rocks prior to Just's usage, and the type area lies many mi. NW. of the Picuris Range. The rocks younger than the Ortega fm. in the Picuris area are, consequently, renamed. The best exposures of the Vadito occur within a 1-mi. radius of the Harding mine. The fm. consists of a lower cgl. memb. and an upper schist memb. (ascending): cgl. memb.; (1) 750 ft. of cgl. and qtzite interbedded with felsites, meta-dacites, and meta-andesites; (2) 500 ft. of cgl. and qtzite, interbedded with amphibolites; (3) 750 ft. of coarse qtz cgl. and fine-grained qtzite with minute scales of muscovite; schist memb.; (1) qtz-muscovite schist interbedded with flows of plagioclase amphibolites and containing sills of partly porphyritic plagioclase amphibolites, 1,250 ft.; (2) qtz-muscovite schist, qtz-muscovite phyllite, and qtz-biotite granulite, 1,250 ft. The thickness of the Vadito fm. is est. to be 4,500 ft.

Named for town of Vadito.

Valencian series

A term introduced by C. R. Keyes to cover the "latest pre-Cambric succession of volcanics and granites" in N. Mex. (See his Conspectus of geol. fms. of N. Mex., 1915, p 4, 12.)

Vallecitos rhyolites

Precambrian: Central northern New Mexico (Picuris Range and Petaca area)

E. Just, 1937 (N. Mex. Bur. Mines and Min. Res. Bull. 13, p 44). Vallecitos rhyolites. - The Hopewell series and the Ortega qtzite contain a number of flows of rhyolite and trachyte, which are named Vallecitos rhyolites. The flows range in thickness up to three-quarters of a mi. It is assumed that such thicknesses represent aggregates of flows, rather than single flows. In places the flows are somewhat schistose, but characteristically their original textures have been well preserved, and flow-banding is well developed. They range in color from deep pink to brick red, and all contain distinct phenocrysts up to a quarter of an inch in diameter. Trachyte is subordinate to rhyolite.

A. Montgomery, 1953 (N. Mex. Bur. Mines and Min. Res. Bull. 30, p 21), includes these in his Vadito fm.

Named for town of Vallecitos.

Valmont dolomite

Upper Ordovician: Southern New Mexico

L. C. Pray, 1953 (Am. Assoc. Petroleum Geologists Bull., v 37, p 1906-1911). Valmont fm. - The strata consisting predom. of light gray-weathering, thin to medium-bedded, sublith. dol. lying btw. the underlying cherty memb. of the Montoya fm. and the generally massive, darker, and more coarsely crystalline dol, termed the "upper Fusselman dol." by Darton. Equiv. to "lower Fusselman" of Darton. Thickness 150-225 ft. in Sacramento Mtns. Fm. separated into upper and lower membs. by a few ft. of nonresistant argil. dol. from 40 to 70 ft. above the base. Basal contact conf. on cherty Montoya; transitional thru several ft. of strata. Upper contact with Fusselman Is. is disconf. Fauna Ord. Same as Cutter fm. of Kelley and Silver.

Type section: NE. side Alamo Canyon, SE¼SW¼SW¼ sec. 6, T. 17 S., R. 11 E., Sacramento Mtns.

Name from Valmont station, Southern Pac. R. R., 10 mi. S. of Alamogordo.

Waddell sandstone member (of McLish formation)

Middle Ordovician: Subsurface of west Texas and southeastern New Mexico

T. Cole, C. D. Cordry, and H. A. Hemphill, 1942 (Am. Assoc. Petroleum Geologists Bull., v 26, p 279-282). Waddell ss. memb. - Basal sand of McLish fm. Consists of (ascending): (1) medium to coarse-grained angular ss., shaly toward base, 8 ft.; (2) green sh., 1 ft.; (3) medium to coarse-grained ss. with shaly and calc. cementing material, 8 ft.; (4) green splintery sh., 2 ft.; (5) medium to coarse-grained ss. with rare green sh. cementing sand grains, 37 ft.; (6) medium to coarse-grained ss. with abundant large frosted grains, 1 ft. Total thickness 75 ft. Top 480 ft. below top McKee sand and 355 ft. above top of Ellenburger. Same as bed 9, zone 6 of Powers.

Type section: Gulf Oil Corp.'s N. W. Waddell et. al. No. 2, Sec. 17, Blk B-27, PSL surv., Crane Co., Tex.

White Ridge quartzite

Precambrian: Central New Mexico (Los Pinos and Southern Manzano Mtns)

J. T. Stark and E. C. Dapples, 1946 (Geol. Soc. America Bull., v 57, p 1121-1172). White Ridge qtzite. - Near the base is composed of massive qtzite beds 2 to 7 ft. thick, varying from white to light pink, tan, and red. Impure shaly beds occur throughout the fm. and become prominent near the top. Here thin beds of gray qtzite 1-2 ft. thick alternate with zones of gray and white sericitic schist. Hematite is conspicuous near the top. The beds vary from light pink to red. Recrystallization and shearing have locally altered the impure qtzite beds so that they may be confused with sericitic schists formed by shearing of the overlying rhyolite flows. All of the qtzite is at least slightly sericitic. Thickness 900 to 3,700 ft. The upper part is silic. and sheared by faulting. Overlies Blue Springs schist, overlain disconf. by Sevilleta metarhyolite.

Named from White Ridge, Los Pinos Mtns.

#Woodford chert (shale)

Devonian: Central southern and southeastern Oklahoma (Ouachita Mtns) and subsurface of western Texas and southeastern New Mexico

J. A. Taff, 1902 (U. S. Geol. Survey Atoka folio, 79). Woodford chert. - Thin-bedded chert and fissile black sh., 500 to 700 ft. thick. Underlies Caney sh. and overlies Hunton Is.

S. P. Ellison, 1950 (Univ. Tex. Bur. of Econ. Geol. Rept. Inv. 7). Woodford sh. - Consists of brownish-black, iron sulfide rich, resinous spore-bearing, fissile sh. Small quantities of calc. sh. and brown and black mottled chert are found at various strat. positions within the Woodford. A distinctive detrital memb., sandy and conglomeratic occurs about 100 ft. above the base of the sh. in Winkler Co., Tex. The Woodford in Winkler Co. is divided into three units on the basis of lithology and electric log patterns. Upper unit is brownish-black sh. with very few small resinous spores. The middle unit, the main spore-bearing unit, is marked at the top with a brownish black chert and calc. sh. Various other calc. and cherty beds occur in this unit. The lower Woodford has much chert and calc. material and fewer spores. Thickness max. 610 ft. in Winkler Co., Tex. 0-600 ft. in Lea and Eddy Cos., N. Mex. Upper Devonian; correlates with Ready Pay of Percha in N. Mex. and Woodford and Chattanooga of Okla., Kans., and Ark.

Named for exposures about mi. N. of Woodford, Carter Co., Okla.

Ysidro shale

Precambrian: Central New Mexico (Sandia and Manzano Mtns)

C. R. Keyes, 1915 (Iowa Acad. Sci. Proc., v 22, p 257-259; Conspectus of geol. fms. of N. Mex., p 4, 12). Ysidro shales. - The thick argil. memb. of Proterozoic sediments lying above the great qtzite, which is best exposed in sharp truncated arch in Tijeras Canyon btw. Sandia and Manzano Ranges. Thickness 1,500 ft. (Derivation of name not given.)

APPENDIX

Listing of Names by Geologic Period

Precambrian

Agua Caliente gabbro
Albuquerquian series
Antonio slate
Badito quartzite member
Blue Springs schist
Cabresto metaquartzite
Cleveland Gulch quartzite member
Dixon granite
Embudo granite
Garnuan series
Graphic lavas
Hondo slate
Hopewell series
Incarnation granite
Lacorocah metatuff member
Los Pinos granite
Monte Largo granite
Ninos schist
Ojito granite
Ortega formation
Ortega quartzite
Pecursian series
Penasco quartzite
Petaca schist member
Picuris basalts
Pilar phyl I ite member
Priest granite
Pueblo quartzite
Rinconada schist member
Rociada limestone
Sais quartzite
Sandoval granite
Sapello quartzite
Serna schist
Sevilleta metarhyolite
Solitario slate
Taosan series
Tijeras quartzite
Truchas slate
Tusas granite
Vadito formation
Valencian series
Vallecitos rhyolites
White Ridge quartzite
Ysidro shale

Cambrian

Bliss sandstone (also Ord.)
Carrasco limestone
Chiricahuan series
Chloridian series
Dragoonan series
Hawkins limestone
Lone quartzite
Mangas quartzite
Ophir formation
Shandon quartzite
Tintic quartzite

Ordovician

Aleman formation
Armendaris limestone
Bat Cave formation
Bliss sandstone (also Camb.)
Bromide formation
Cable Canyon sandstone
Cibola limestone
Connell sandstone member
Cristobal limestone
Cutter formation
Ellenburger group
El Pasan series
El Paso group
Frondosa limestone
Gorman formation
Honeycut formation
Joins formation
McKee sandstone member
McLish formation
Mimbresian series
Montoya group
Oil Creek formation
Par Value member
Pinos Altos limestones
Raven member
Second Value member
Sierrite limestone
Simpson group
Staendebach member
Tanyard formation
Threadgill limestone
Threadgill member
Tulip Creek formation
Upham dolomite
Valmont dolomite
Waddell sandstone member

Silurian

Fusselman limestone
Santa Rita limestone

Devonian

Aneth formation
Bella shales
Box member
Canutillo formation
Chloride formation
Contadero formation
Elbert formation
Ignacio quartzite
McCracken sandstone member
Martinian series
Naiad limestone
Onate formation
Ouray limestone
Percha shale
Perchan series
Ready Pay member
Silver shales
Sly Gap formation
Woodford shale

Other

Hunton group (Slurian-Devonian)
Mimbres limestone (Ordovician-Silurian)