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The Paleontology and Stratigraphy of the Magdalena Group of Northern and Central New Mexico

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BY

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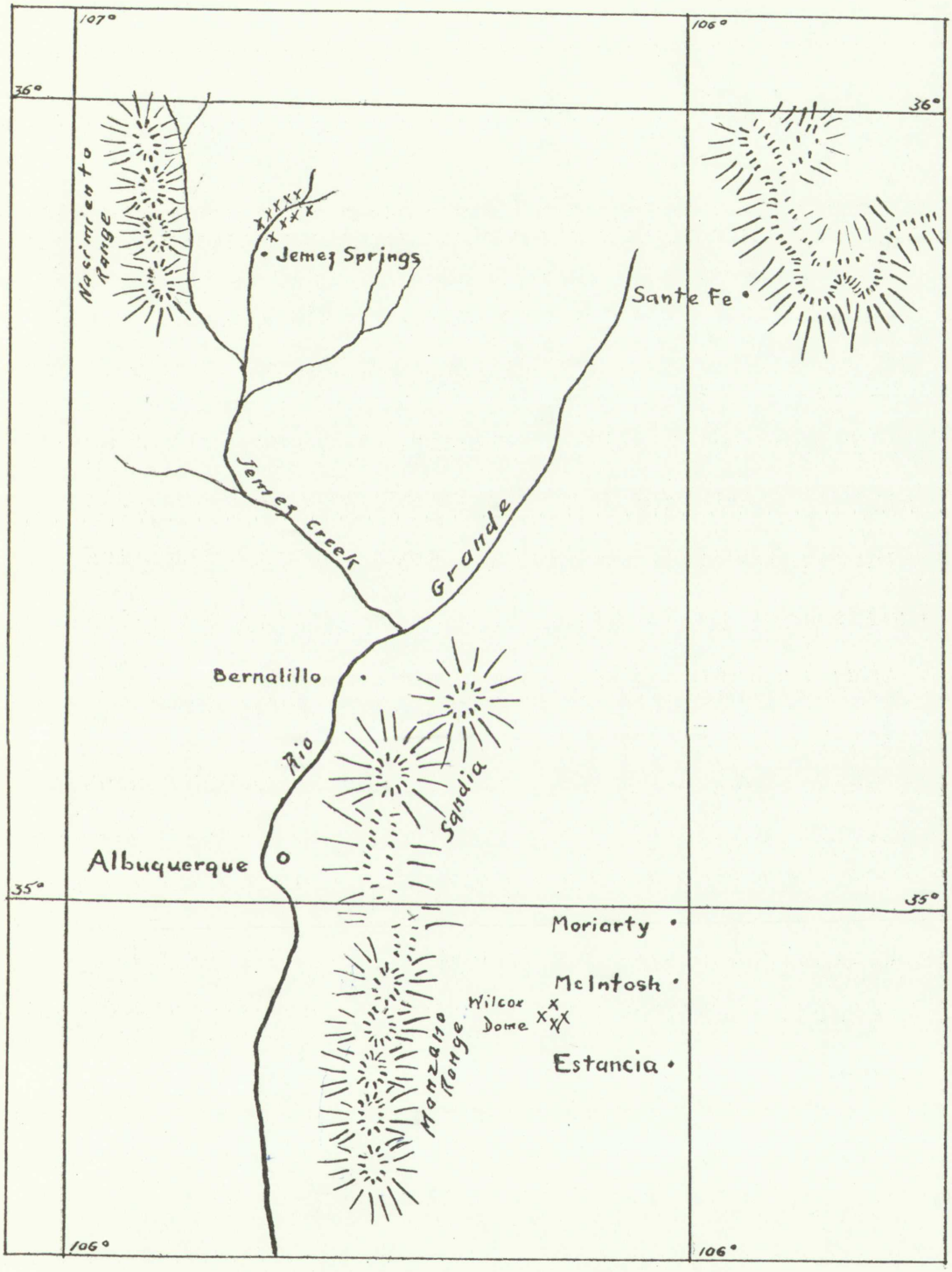

Map showing location of the Jemez and Wilcox Dome areas.
Scale 1 inch to 16 miles.

Introduction

This thesis presents the paleontology of the Magdalena (Pennsylvanian) formation as developed in central and northern New Mexico together with the stratigraphy and correlations of that formation.

The collections from the Jemez area are by far the most extensive and were made during the summer of 1930, by the writer and the students of the University Field School. The collections from the Wilcox Dome area, in the Estancia Valley, were made on several trips during the years of 1929 and 1930. Several other collections are incorporated in the paleontological work, a small one from the Manzano Range taken in the spring of 1930, one from the west side of the Nacimiento Range, and one from the Lime Kilns in Tijeras Canyon, both taken in the spring of 1930.

The stratigraphic studies are based on field work done during the summer of 1930. Some of the field work and all of the laboratory work were carried out under the guidance of Dr. Northrop. Correlations with other states are taken from the literature. The detailed sections given were measured by Dr. S. A. Northrop, of The University of New Mexico.

The location of the Jemez area is in Canyon San Diego, Sandoval County, New Mexico, in Ranges 2 and 3 East and in Townships 17,18, and 19 North. All of the stratigraphy and the major portion of the paleontology are based on this area.

The mouth of the canyon is about fifty miles by road from Albuquerque, New Mexico. It is reached by the Albuquerque-Cuba Highway to San Ysidro, then to the north on a Forest Service road which goes the length of the canyon.

The name, San Diego, is given the canyon rather than the name of the creek (Jemez Creek) that cuts it. Desert country passes into mountainous country rather swiftly from San Ysidro up the Canyon into the heavily forested regions of the volcanic uplands. The average width from rim to rim is about a mile and a half and the cross-section profile is almost that of a V. The stream is geologically in its youth as it is still cutting down through the volcanics and limestones and sandstones which make up the vast plateau capped by the volcanic rocks.

History of Investigation of Magdalena.

One of the earliest published reports of the Geology of the Jemez area was the "Report of a Geological Reconnaissance in Western Socorro and Valencia Counties, New Mexico", by C.L. Herrick, who was then President of the University of New Mexico. This is found in the American Geologist*. This report merely mentions the Jemez mountains and the occurence of Pennsylvanian strata there and a few fossils.

A.B. Reagan, in the American Geologist, volume 31, number 2, had a paper on the Geology of the Jemez-Albuquerque Region, New Mexico. He was resident farmer for the government there, and the paper covers the particular region of this report, i.e., Canyon San Diego. Reagan erroneously dated the volcanics as Cretaceous. They are now held to be Tertiary.

The name Magdalena for the Pennsylvanian strata in New Mexico was applied by C.H.Gordon, who was working with Lindren and Graton, for the U.S.G.S. on the ore-deposits of New Mexico. The first publication defining the formation is The Journal of Geology, 1907**.

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*American Geologist, volume 25, page 331.
**The Journal of Geology, vol.15, page 805.

The title of the paper is: Notes on the Pennsylvanian Formations of the Rio Grande Valley of New Mexico. It contains a description of the Manzano Group which overlied the Magdalena and the then called Magdalena Group with two formations, the Sandia and the Madera. Later work on the Pennsylvanian has brought out the disposal of the two formations, except as a local division in the Sandia and Manzano Ranges.

Charles H. Gordon, in connection with Lindgren and Graton, in Professional Paper 68*, describes the Magdalena as he did in the Journal of Geology. The title of this paper is The Ore Deposits of New Mexico. It was published in 1910. It seems to be the same material as in his former paper.

N. H. Darton's U.S.G.S. Bulletin 794, The "Red Beds" and Associated Formations of New Mexico, which is really a handbook of New Mexico geology, contains information of a general nature on the whole state. It gives fossil lists from the Magdalena in general, but from no particular locality.

The most recent paper on any part of the area is B. Coleman Renick's Water Supply Paper 620**, "Geology

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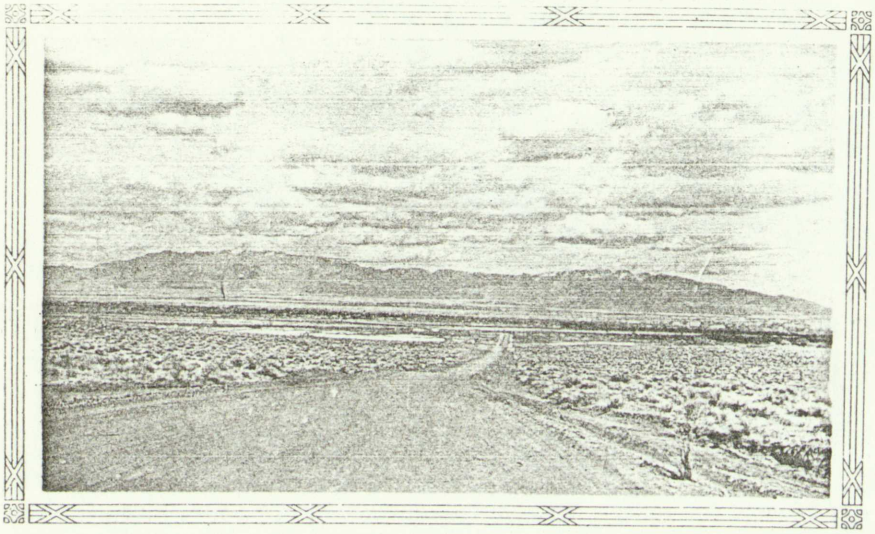
*Professional Paper 68, page 246.
**United States Geological Survey Water Supply Paper 620, 1931, 117pp.

and Ground-Water Resources of Western Sandoval County, New Mexico. His report covers just a part of Canyon San Diego, but a section of the Magdalena is given together with a list of fossils identified by G.H. Girty, who states that they are a representative Magdalena fauna.



Sandia Range; Looking east
Rio Grande and Albuquerque in foreground.

General Geology of the State*

The state of New Mexico is an ideal place for the study of geology. The scenery varys from the arid regions where desert characteristics are noted to the forested mountain regions. Nearly every type of scenery is represented. The Great Plains of the central portion of the United States extend into the state. The southern extension of the Rocky Mountain System joins the Sonoran Desert region of Mexico in its northern extent. Thus, in traveling over the state, one encounters conditions that vary from the wind-blown sands of the desert through vast areas of inland drainage, of which the Estancia Valley is one of the largest in the United States, through plains as level as a dining room table to hills that gradually grow to mountains reaching altitudes of 11,000 feet.

The geologist finds exposures of all kinds of rocks, sedimentary, igneous and metamorphic, and of all known geologic ages. Regions that have long been classic for volcanic necks and laccoliths are to be found in the state. Volcanic rocks of all kinds are found in

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*Abstracted from United States Geological Survey Bulletin 794.

the northern part of the state.

The geologic history begins with the pre-Cambrian and ends with the Quaternary. The Paleozoic in New Mexico is a long series of progressive overlaps of the seas from the south. Each successive invasion of the sea came a little farther northward. The Pennsylvanian sea was the first to completely submerge the state, with the possible exception of Pedernal Ridge and the Zuni Mountain area. The Paleozoic sediments other than Pennsylvanian are confined to the southern half of New Mexico.

During Cambrian time seas came in from the south and west. They are represented by a sandstone formation known as the Bliss Sandstone. The type locality of the Bliss is in the Franklin Mountains in Texas and New Mexico. It forms a very prominent feature of this range. The age is Upper Cambrian as determined by the fossils. The Bliss is exposed at the base of the sedimentary section in the Hatchet Mountains but thins out in the San Andres Mountains. In all places it lies unconformably on granite or schist and grades upward into the El Paso limestone. The basal beds are quartizitic and locally conglomeratic but the higher ones are softer

and fine grained. Brown is the prevailing color. It varys from 0 to 300 feet in thickness.

Ordovician seas came into New Mexico from the same general direction. Strata of Lower Ordovician age, the El Paso limestone, appear to grade down to the Bliss sandstone. Outcrops occur in the type locality, the Franklin Mountains, the San Andres, the Sacramento, the Florida Mountains. The last outcrop north is in the Oscura Mountains. The middle Ordovician is missing from all of the sections. Upper Ordovician is represented by the Montoya limestone. These two formations are separated by a break in sedimentation, and the top of the Montoya is limited by a similar break.

The El Paso limestone is about 1,000 feet thick and is magnesian grey in color. The Montoya limestone is from 200 to 300 feet thick and is darker than the El Paso and contains thin layers of chert. At nearly all the exposures fossils of Richmond age occur.

The Silurian seas invaded New Mexico for a short time and deposited the Fusselman limestone which is of Niagara age. It has a thickness of about 1,000 feet in the Franklin Mountains and thins out to the north. The Fusselman everywhere overlies the Montoya with a

plane of erosional unconformity. Overlying it are the Percha Shale in most places, in the Franklin Mountains a limestone of Pennsylvanian age, and the Gym limestone of Permian age in the Florida Mountains. The Fusselman has two members in most places. The upper one is dark and fossiliferous and the lower one is fine-grained and weathers nearly white. It is the ore container in the Cooks Peak and Victorio mining regions.

The Devonian seas brought in the first black shales. They are rather widespread in Southern New Mexico but are absent in the Franklin, Florida and Victorio Mountains. This shale was named the Percha from Percha Creek, near Kingston. It is separated by a break in sedimentation from the underlying beds. The Percha is about 500 feet thick at Silver City and thins out in the San Andres Mountains. The fossils are of late Devonian Age.

The Lake Valley limestone of Mississippian age is exposed in the mountain ranges of southern New Mexico. It overlies the Percha Shale in most places, but in the Magdalena and Sierra Ladrones Mountains, it rests on pre-Cambrian granite.

With the coming of Pennsylvanian time came the first widespread seas and land movements. Nearly all

portions of the state were visited by them. Sediments are to be found now in all the mountain ranges except the Zuni uplift and Pedernal Ridge which extends along the center of the eastern half of the state. The Magdalena group (Pennsylvanian) overlies the Lake Valley limestone and is separated by a break that probably represents all of late Mississippian time. The thickness varys up to 500 feet in the Cooks Range. Greyish blue to white is the characteristic color of the Lake Valley limestone. The Kelly limestone is of early Mississippian age but is not very wide spread. It is ore-bearing in the Magdalena area. The northernmost Mississippian limestone is exposed in the Sierra Ladrones Mountains.

The Magdalena Group is of Pennsylvanian age and occurs in nearly all portions of the state except in the northeastern, where wells are drilled through the Abo into the granite. Limestone is the predominant rock with interbedded sandstone and shale. The thickness ranges from 500 to 1,000 feet. The Abo and Chupadera overlie it in most places , and it rests on the Lake Valley limestone in some places and on pre-Cambrian granite in other places.

The Hueco limestone is in the Franklin Mountains and contains a fauna of both Chupadera and Magdalena elements. It is an extension of a formation in Texas and is correlated with the Abo in the northern part of New Mexico.

The Abo sandstone is exposed in the uplifts of the central portions of the state which include the Sandias, Manzanos and the Nacimientos. It thins out in the Sacramento Mountains. It appears to lie unconformably on the Magdalena group. The thickness is from 600 to 1,000 feet and the typical color is reddish brown. Several thin limestone members occur in the western part of the state. Overlying the Abo occurs the Chupadera formation which consists of the San Andres limestone above and the Yeso below. The Yeso contains gypsum inter-stratified with the sandstones. In some places the formation attains a thickness of 2,500 feet or more. It overlies the Abo sandstone and forms prominent mesas in the eastern half of the state. Chupadera Mesa in Socorro County is the type locality. The Gym limestone in the southwestern part of the state is the equivalent of the Chupadera Formation. It lies unconformably on the formations from the El Paso to the

Fusselman in the Florida Mountains as the Percha, Lake Valley and Magdalena are absent there.

The Castile Gypsum and Rustler limestone are two Texas formations that extend into New Mexico in the vicinity of Carlsbad and Roswell. They are of Permian age. The combined thickness ranges up to 3,000 feet, east of Carlsbad, and they contain salt and anhydrite.

The Triassic is represented by several formations but their relations are not so well-worked out as are those of the older Paleozoic ones, due to lack of fossil remains. In the western part of the state, west of the Rio Grande, there are three Triassic formations recognized. At the base is the Moenkopi, which is a shale of various colors, maroon, dark purplish and chocolate. It overlies the limestones of the Chupadera Formation. The thickness is about 1,000 feet. Overlying it is the Shinarump Conglomerate. It is light in color and is only 100 feet thick. The Chinle, a red shale occuring in Arizona, extends into New Mexico overlying the Shinarump. The thickness is about 850 feet. All of these formations are well-exposed in the Zuni Mountain uplift. In the Nacimiento uplift and in the Chama Basin, the Poleo sandstone overlies the Abo sandstone. It is massive and resembles the basal member of the Chupadera,

but its fossils are of Triassic age. In the eastern part of the state occurs the Dockum group. It is continuous with the same group in Texas and Oklahoma. The outcrops are widely scattered and for the most part are covered with loose sands and gravels. Red is the predominant color. The extent of the Dockum group is in that part of the state east of the front Range of the Rockies. The Lobo formation occurs in the southwest corner of the state in the Florida Mountains and the Cooks range. It is questionably assigned to the Triassic because of its character and its position between the Gym limestone and the Sarten sandstone. Red shale is the dominant rock with interstratified buff sands and sandy limestones. No fossils have been found in the Lobo formation.

The Wingate Sandstone of Jurassic age is exposed in the Zuni region , the Nacimiento uplift, the Chama Basin, and at the north end of the Sandia Mountains. It is a buff sandstone and is an excellent cliff-former. It overlies the Chinle and is overlain by the Todilto limestone. It is about 300 feet thick in the western part and thins toward the east. The Todilto is a formation of thin-bedded limestones and has an average thickness of ten feet. It occurs at the same

localities as the Wingate sandstone. The Navajo Sandstone overlies the Todilto. It is very extensive in the Zuni region, south of Grants, around Acoma, and at Laguna. The top is grey and the lower member is red. The thickness averages about 400 feet in the west and only about half that in the eastern part of the state. All of these formations are of Jurassic (?) age.

The Cretaceous seas covered the state very widely but have been removed by erosion and in many places the section is incomplete. The earliest formation that possibly belongs to this system is the Morrison, which occurs through the northern half of the state. It consists of sandstones, shales, and clays, light in color. The next in age are the Purgatoire formation and the Sarten group, which occur in the northern and southern parts of the state respectively. The Sarten group contains some limestones, but the Purgatoire is mostly sandstone and shale. They are both of Comanche age. The limestone is used for the manufacture of cement at El Paso, Texas.

The Dakota Sandstone forms the basal member of the Upper Cretaceous and occurs in the northern part of the state. In Rio Arriba County, Chama Basin, and the Zuni

uplift are the best exposures. It is massive, grey and from 80 to 100 feet thick. The Mancos shale is exposed in the Zuni uplift and in the San Juan Valley. Small patches occur in the Cooks Range and east of Socorro. In the Tijeras region a thickness of 1,550 feet has been measured. Coal and sandstone have been found associated with this shale. The upper half of the upper Cretaceous is classed as Pierre shale. Around Raton the thickness is 2,000 feet. As this formation extends southward it includes the Mesaverde group and the Lewis shale and probably the top of the Mancos shale. The Trinidad sandstone, the Vermejo formation, the Pictured Cliffs sandstone, the Fruitland formation, the Kirtland shale, and the McDermott formation are all Cretaceous and occur in the northern part of the state.

The most extensive outcrop areas of Tertiary rocks are in San Juan and Rio Arriba counties. The Ojo Alamo sandstone is at the base of the Tertiary and lies unconformably on Cretaceous rocks. The Galisteo sandstone is exposed in central New Mexico, around the Cerrillos coal fields and east through Madrid where it contains many petrified logs. The Raton formation occupies about 800 square miles in the Raton coal field. It contains the Sugarite Coal seam and rests in places

on the Pierre shale. Many fossil plants have been studied from this sandstone and the age has been fixed as late Eocene. The Puerco, Torrejon, and Wasatch formations are all well-defined by fossils and occur in San Juan county. They are all light-colored sandstones and shales. There are several other Tertiary formations that are undefined and unclassified.

The chief products of Quaternary time in New Mexico are the valley fills or bolson deposits. The principal areas of deposit are the Rio Grande valley, the Tularosa desert, the Estancia Valley and the Florida Plains. Saline deposits in the Estancia and Tularosa Valleys, dune sands of the Pecos, and some probable glacial moraines in the higher parts of the Sangre de Cristo Mountains are thought to be Quaternary. The conglomerate, exposed in some of the deeper valleys of southeastern New Mexico is supposed to be an eastern extension of the Gila conglomerate of eastern Arizona. It is generally regarded as Pleistocene.

Physiography of the State.

The state of New Mexico contains eight physiographic sections and parts of three major divisions of the United States. The Interior Plains, the Rocky Mountain System, and the Intermontane Plateaus are the three major divisions present.

Three sections of the Great Plains Province of the Interior Plains division occur. In the northeast corner of the state is the Raton Section which is characterized by a trenched peneplain surmounted by dissected, lava-capped plateaus and buttes. The High Plains Section extends along the eastern boundary of the state with width varying from seventy-five to twenty-five miles. Its characteristics are broad intervalley remnants of smooth fluviatile plains. The Pecos Valley Section, which also includes the valley of the Canadian River as well as the Pecos River, consists of a late mature to old plain.

Two sections of the Basin and Range Province of the Intermontane Plateaus division are present in the southwestern part of the state. The Sacramento Section lies between the valleys of the Pecos and the Rio Grande rivers and includes mature block mountains of

gently tilted strata, block plateaus and bolsons. The Mexican Highland section contains the Rio Grande river and the southwestern part of the state. It is characterized by isolated ranges separated by aggraded desert plains.

Two sections of the Colorado Plateaus Province are in the northwestern corner of the state. The Navajo section has young plateaus with smaller relief than that of the adjoining section to the north. In the center of western New Mexico is the Datil section with lava flows and volcanic necks.

The Southern Rocky Mountain Province extends from Colorado down into the center of northern New Mexico and includes the Jemez area. Complex mountains with intermont basins are characteristic.

The whole of New Mexico exhibits a varied physiography as it has as many sections as any other state. All of this means that the geology is varied too, as the scenery and physiography are dependent on the geological processes of the past. That is, the present form of the surface features of the earth are the products of a series of geological events which have brought about this present form. Mountains will be

worn down to featureless plains only to be folded or uplifted again so they may be worn down. The surface as we see it today is more or less a cross-section and from it are determined the events of the past.

Physiography of the Jemez Region.

The region of Canyon San Diego is one of dissected plateaus. The Jemez mountains are of the true erosional type. The plateau is capped by thick volcanic rocks, the tuffs and flows. The edge of this plateau is north of Jemez creek as it flows eastward to join the Rio Grande. This can be seen from the road between Bernalillo and San Ysidro. The plateau is surmounted by mounts Redondo and Pelado and the other peaks that form the rim of the Valle Grande, a supposed gigantic crater, 4 to 6 miles in diameter. These peaks are to the north and east of the canyon which is a typical one of youthful streams. Steeply sloping sides with talus slopes developed on the lower formations characterize the canyon. The channal of the stream is more or less permanent until it leaves the canyon mouth and then it shows signs of a tendency to meander over a wide plain that has been developed. This cutting or eroding power of the stream is noticed several times in going along the road up the canyon. In times of flood the road is in danger of being washed away as is the railroad in several places.

The dissected Jemez plateau is included in the

Southern Rock Mountain Province. This province is bounded on the East by the north-south trending Sangre de Cristo Range and on the west by the Nacimiento Range which also trends north-south. The southern boundary of the province is vague and is an arbitrary line drawn between the southern ends of these two ranges. The Mexican Highland section of the Basin and Range Province lies directly to the south.

Fenneman says, "For some distance west and north of Santa Fe, it is impossible to draw a province boundary which shall include all the related mountains without at the same time including considerable areas of plateau continuous with the Colorado Plateau Province. ....The Jemez Mountains consist largely of dissected lava flows and tuffs and are thus similar to the San Juan Mountains to the north, and volcanic cover being continuous between them."*

It was particularly difficult to draw province boundaries placing all the structurally related mountains in the same division. At the present time the line is straight along the dissected plateau, but there is some doubt as to the correctness of this, because of the relations pointed out. The northern boundary of the province separated the Southern from the Middle Rockies and is in Colorado and Wyoming.

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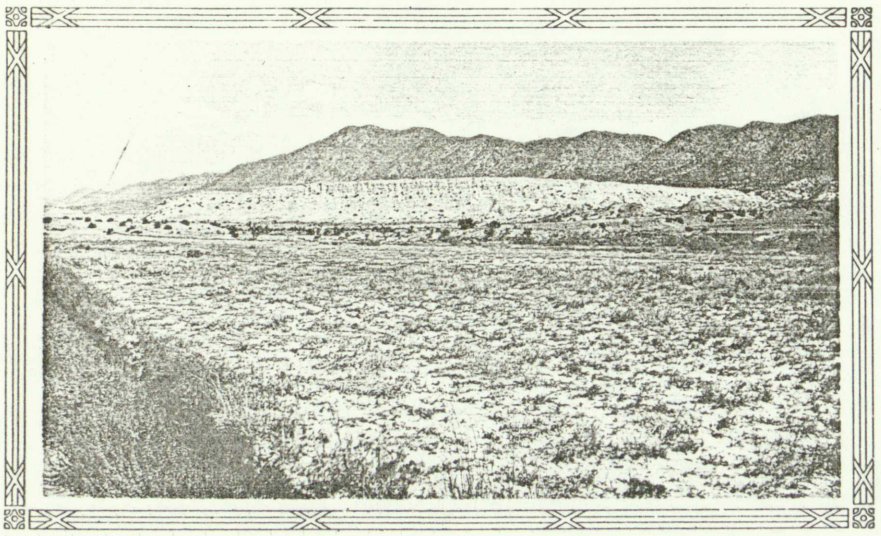
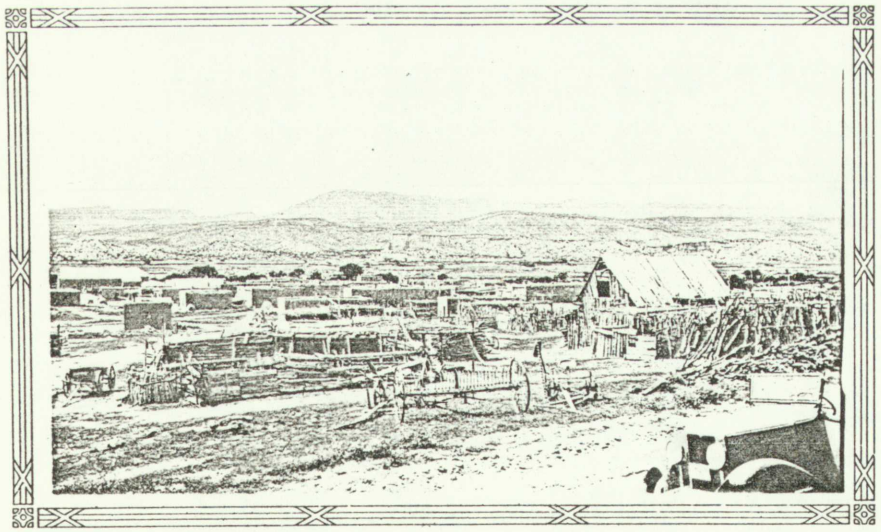
*N.M. Fenneman, Annals of the Association of American Geographers, vol.18,no.4,p.329, 1928.



Nacimiento Range ; Looking northeast
Hogback of Gypsum in foreground.

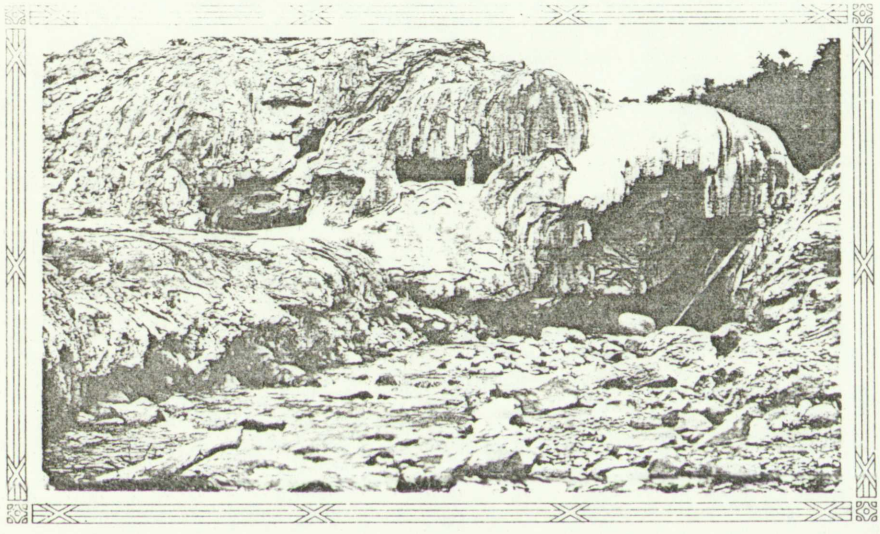


Nacimiento Range ; Looking west.
Jemez Pueblo in foreground.

Geologic History of the Canyon San Diego.

In pre-Cambrian time the countryside presented a thick series of igneous and metamorphic rocks. Then through the Paleozoic era erosion leveled the overlying beds and probably reduced the granite in various ways. The early Paleozoic seas were making inroads farther and farther northward across New Mexico until the coming of the Pennsylvanian seas and the complete submergence of the State with the deposition of the limestones that make up the earliest sedimentary rocks found in the canyon.

A fault was developed across the canyon, bringing up the pre-Cambrian granite into juxtaposition with the Pennsylvanian limestones, in the vicinity of the present Soda Dam, possibly following Pennsylvanian time. The relations here are not entirely clear, but perhaps more intensive study would reveal that the time of the fault was pre-Permian and post-Pennsylvanian. The rocks studied from one side of the canyon seem to show that the limestones were displaced and that the red sandstones were deposited horizontally across the faulted surface of the Magdalena. This is an important relation, and it should be worked out further in connection with the



Soda Dam, one and one half miles above Jemez Springs.

Nacimiento uplift which is now dated as the Tertiary.

Permian deposition seems to have followed the limestones without much of a break stratigraphically. The land then rose again and was subjected to erosion which left valleys of considerable proportions. Gently rolling hills and valleys characterized the surface. During this time there were several invasions of one kind or another directly to the south that left deposits of sandstone and gypsum which probably formed as the waters receded and left lakes to dry up in the arid climate of the Triassic and Jurassic Periods. Mountain making occured to the west and the volcanic activity that produced the thick series of tuffs and flows that form the cap of the plateau, took place during Tertiary time. Old lake deposits of the later Tertiary from lakes formed by the damming of streams, are south of the canyon mouth.

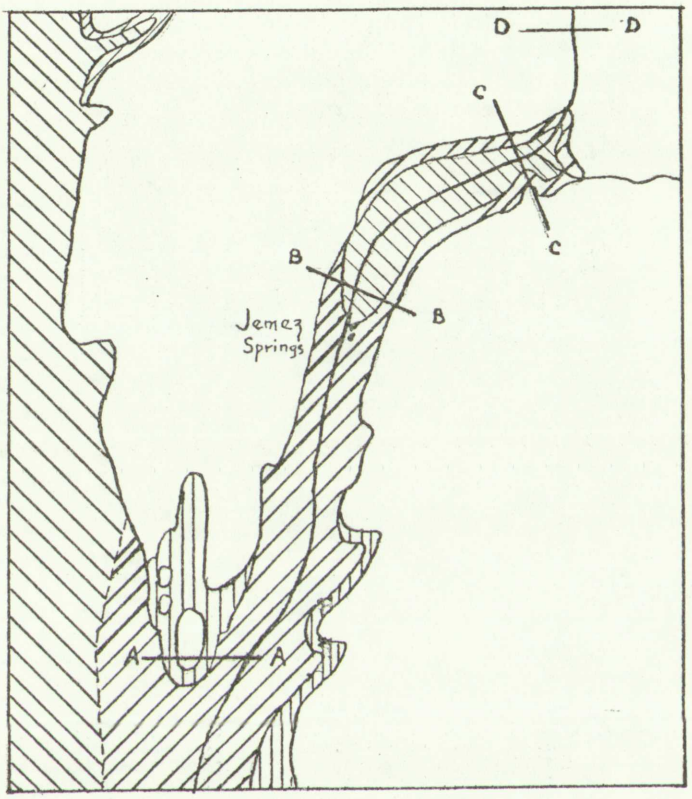
During the cutting down of the canyon, spring deposits formed. The deeper it was cut, the lower came the springs and their deposits. Now the creek cuts through a deposit that can be traced for 1,000 feet up the side of the canyon. The cutting of the canyon and deposition by springs are recent or post Tertiary.

STRATIGRAPHY

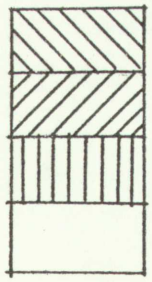
Jemez Springs Area

The location of the Jemez Springs area is shown on the Index map, plate I . The complete stratigraphic section in this area begins with the granite exposed at the Soda Dam, about a mile and a half north of Jemez Springs. (See geologic map and section B-B.) This exposure is about one-eighth of a mile long. The creek bed cuts through for this distance and has cut a gorge in solid granite about 400 feet wide. This narrowing of the canyon is very evident as it opens out on both upstream and downstream sides and vertically above. The age of the granite is pre-Cambrian as are all the granites in New Mexico.

The rock itself is somewhat gneissic in appearance, as the crystal grains are slightly drawn out and the whole mass is broken by many irregular joints. At some time, probably during the faulting in the area, the granite was subjected to dynamic metamorphism. Evidences of stresses and strains throughout the mass are present. The joints were not studied in detail and no sets were defined.



Geologic Map of Canyon
San Diego, showing the
location of sections.

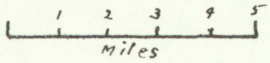


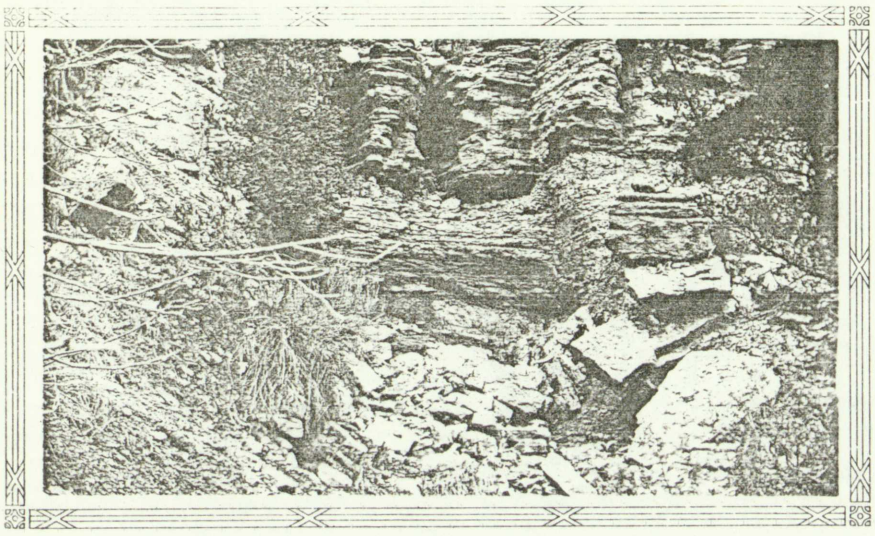
Magdalena (Pennsylvanian)

Abo (Permian)

Poleo (Triassic)

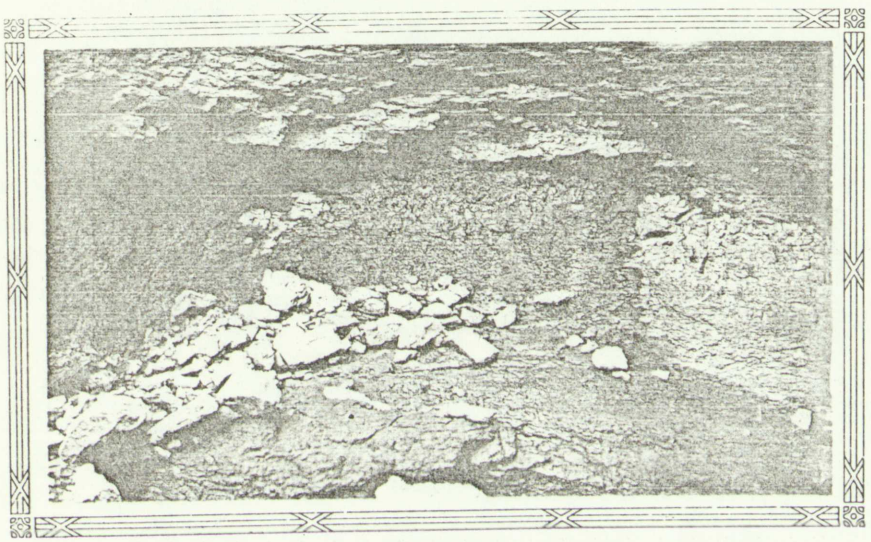
Volcanics (Tertiary)
Tuff and Flow



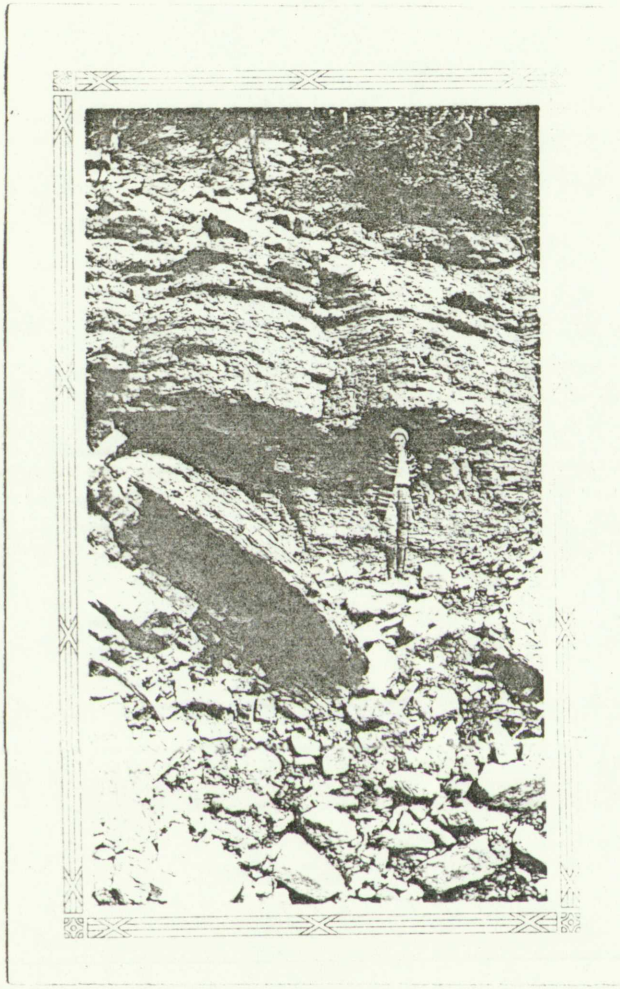


Cliff-Forming Member of the Magdalena. See section. Note solution-widened joints.

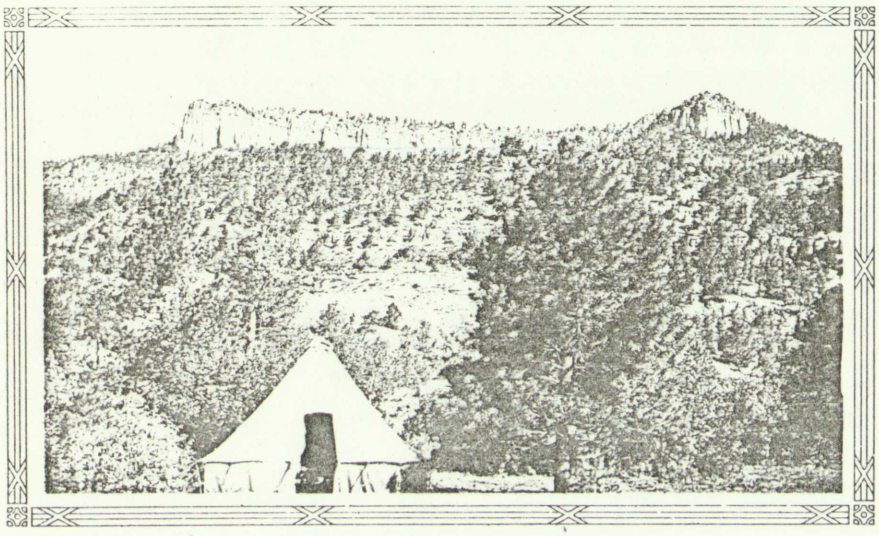
Overhanging Cliff of Limestone same member as above.



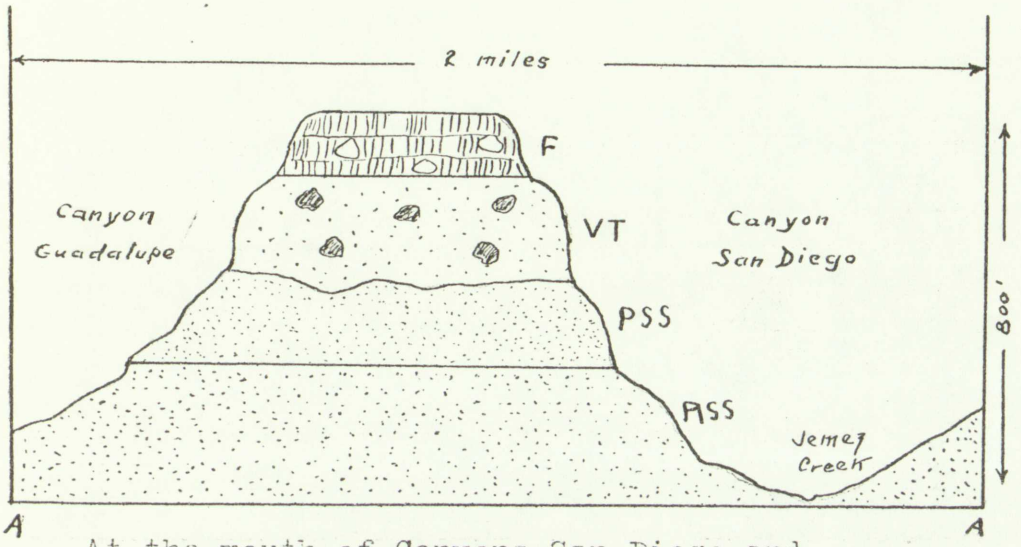
Black Shale in Contact with Limestone.
See section.



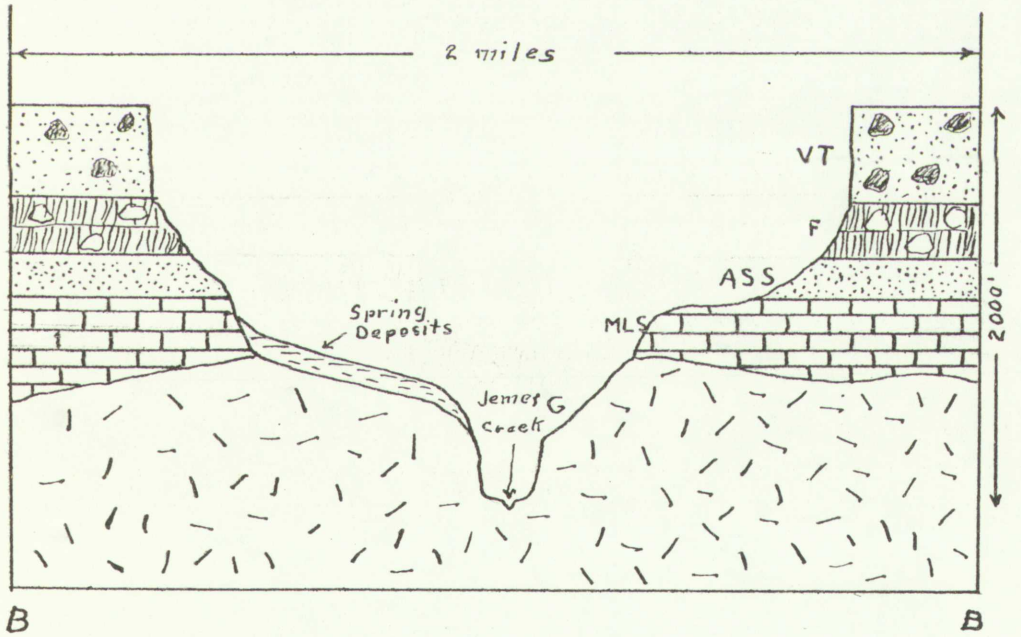
Massive Cliff-Forming Limestone
of the Magdalena. See section.



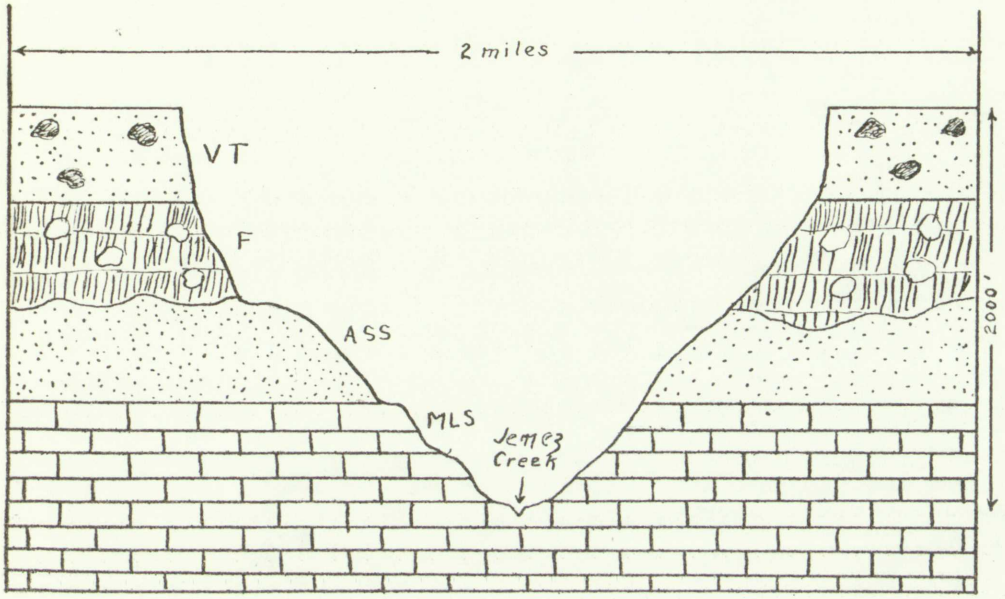
Tertiary Tuff Cliff, Canyon San Diego.
Magdalena in foreground.
See section.



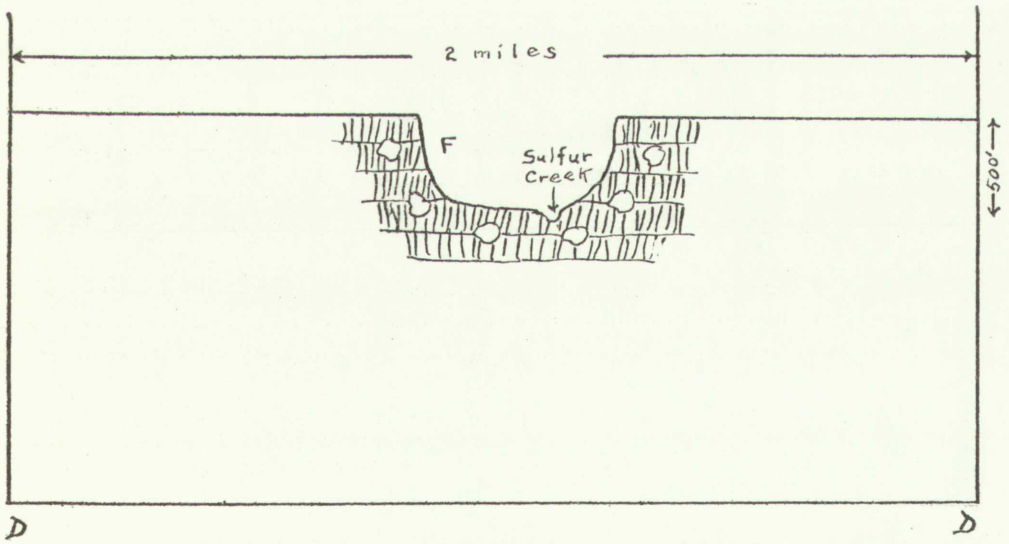
At the mouth of Canyons San Diego and Guadalupe, five miles below Jemez Springs. ASS- Abo sandstone, PSS- Poleo sandstone, VT- Volcanic tuff, F- Flow.



At the Soda Dam, one and one half miles above Jemez Springs. G- Granite, MLS- Magdalena limestone, ASS- Abo sandstone, F- Flow, VT- Volcanic Tuff.



Near the Camp site of the University Field School, five miles above Jemez Springs. MLS- Magdalena, limestone, ASS- Abo sandstone, F- Flow, VT- Volcanic tuff.



Near the head of the canyon, eight miles above Jemez Springs.
F- Flow.

Overlying the granite are the Pennsylvanian limestones and interbedded sandstones and shales that make up the Magdalena formation. The area of outcrop is from the north edge of the town of Jemez Springs to about a mile and a half above the site of the University Field Camp, which is located at Battleship Rock. This is a continuous outcrop of about eight miles. (See geologic map and sections B-B and C-C.)

The thickness of this formation in the two sections measured was 340 and 413 feet. The first section was taken from the creek bed at a point higher than the second. Both begin in the limestone and do not represent the true thickness of the formation. The attitude of the beds is horizontal and the exposure was made entirely by the downcutting of Jemez Creek. The detailed sections are given on the following page.

The Permian system is represented by the Abo sandstone. It rests unconformably on top of the Magdalena limestones, and therefore its area of outcrop is larger than the Magdalena outcrop. (See geologic map.) According to Darton*, the southernmost exposure of Abo is at the mouth of the canyon which is fifteen miles from the

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*United States Geological Survey Bulletin 794,p.159.

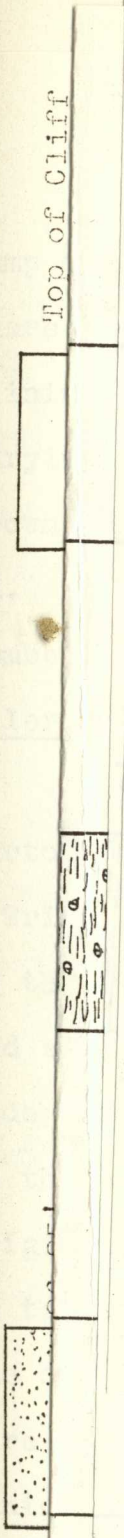


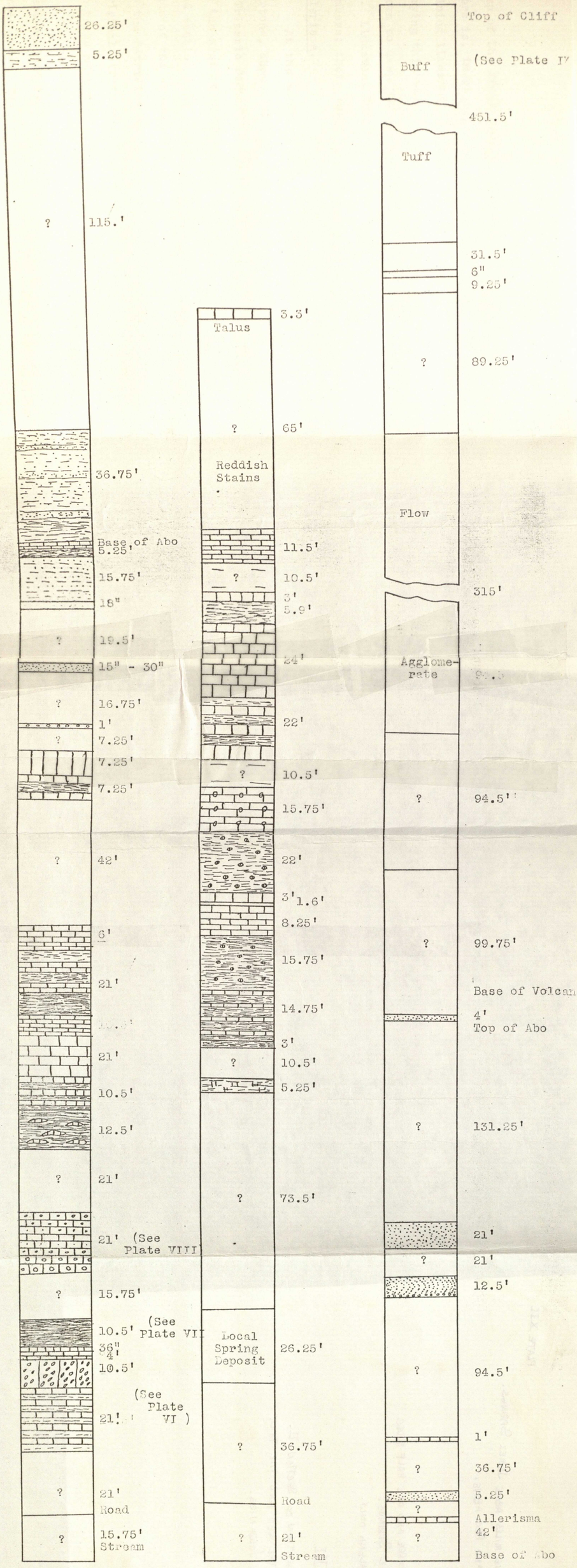
Plate XII

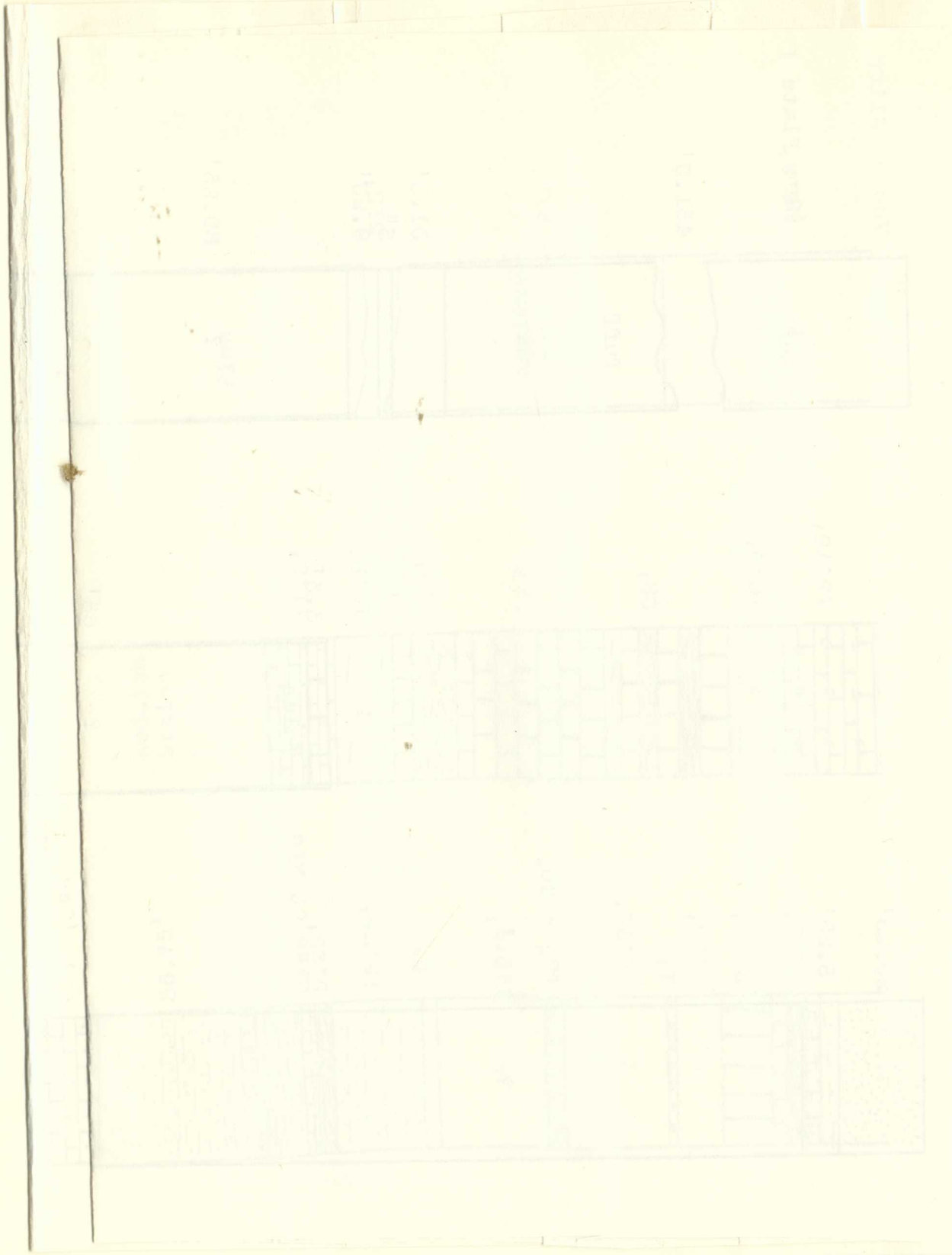
Section I
Measured five miles above Jemez Springs.
Magdalena and Abo above.

Section II
Measured three and one half miles
above Jemez Springs.
The Magdalena only.

Section III
A continuation of Section II.
Showing the Abo and the thick
Tertiary Volcanics.

*United States Geological Survey Bulletin 794.


26.25'
5.25'
? 115.'
36.75'
Base of Abo
5.25'
15.75'
18"
? 19.5'
15" - 30"
? 16.75'
1'
? 7.25'
7.25'
7.25'
? 42'
6'
21'
21'
10.5'
12.5'
? 21'
21' (See Plate VIII)
? 15.75'
10.5' (See Plate VII
36"
10.5'
21' (See Plate VI)
? 21'
Road
? 15.75'
Stream
Section I
Talus
3.3'
? 65'
Reddish Stains
11.5'
? 10.5'
3'
5.9'
24'
22'
? 10.5'
15.75'
22'
3' 1.6'
8.25'
15.75'
14.75'
3'
? 10.5'
5.25'
? 73.5'
Local Spring Deposit
26.25'
? 36.75'
Road
? 21'
Stream
Section II
Top of Cliff
Buff
(See Plate IV
451.5'
Tuff
31.5'
6"
9.25'
? 89.25'
Flow
315'
Agglomerate
? 94.5'
? 99.75'
Base of Volcani
4'
Top of Abo
? 131.25'
21'
? 21'
12.5'
? 94.5'
1'
? 36.75'
5.25'
?
Allerisma
42'
Base of Abo
Section III



Camp of the Field School. At the base of the Permian there is, in places, a thin bed of conglomerate containing limestone pebbles. Shales and sandstones of varying thickness follow with the color changing from brown to deep red as the top of the section is approached. Limestone lenses are found throughout the basal members; these contain fossil clams of the genus Allerisma.

At the mouth of the canyon there is, according to Darton*, above the Abo an outcrop of Poleo sandstone, a Triassic formation that is exposed more extensively to the west of the immediate area. (See geologic map and section A-A). Below Jemez Springs, on the east side of the canyon, petrified logs similar to the ones in the Petrified Forest of Arizona were found. Their original strata could not be determined as they were in talus material on hogback hills jutting out from the canyon wall. It is reasonably certain that they were derived from strata below the level of the volcanic rocks; therefore, they are probably of Triassic age.

Above the "Red Beds" are the volcanic rocks.

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*United States Geological Survey Bulletin 794.

Resting on the highest Abo and Poleo is a very thick flow rock or agglomerate. It is dark and contains angular fragments of nearly every kind of rock. The size of the fragments is striking as they are sometimes ten to twelve feet across. Above the flow rock occur the tuff beds. The first is yellow followed by a layer of ash, then a thirty foot layer of stratified tuff. The last tuff (and the one that forms the rim of the canyon wall) is 450 feet thick, an almost structureless mass. The age of the volcanics is Tertiary according to Darton*. The older works of Jenks, Herrick**, and Reagan*** place them in the Cretaceous.

The most recent rocks of the Jemez area are the various spring deposits that occur throughout the canyon. The most notable deposit is the Soda Dam, which is entirely built of travertine and calcareous tufa. The springs issue along a fault that trends north 60 degrees west, about a mile above the town of Jemez Springs. There are about twelve flowing springs at the present time along this line, with varying temperatures and amounts of flow. The dam itself is 400 feet long with

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* United States Geological Survey Bulletin 794.
** American Geologist, vol. 25.
***American Geologist, vol.31, no.2.

a width at the base of 50 feet and height of 50 feet. The line of the fault is obliterated by old deposits for 600 feet vertically up the west side of the canyon. These deposits from the old springs form an interesting subject for study and much work remains to be done on them.

About thirteen miles above Jemez Springs is the group of Sulfur Springs with an area of forty acres of sulfurous deposits. At one time the sulfur was mined at this place, but operations have long since ceased.

There are numerous deposits of smaller proportions all along the canyon, some with active springs and others with extinct springs.

Bulletin Number 71 of the University of New Mexico by Clyde Kelly and E.V.Anspach, "A Preliminary Study of the Waters of the Jemez Plateau, New Mexico", gives analyses of all the spring waters mentioned above.

Wilcox Dome Area.

The location of this area is shown on the Index map, plate I. The Wilcox Dome is a small dome, 7 miles west of McIntosh, on the eastern dip slope of the Manzano Range. Fossils were collected in a small canyon about 100 feet wide and 25 feet deep, cut into the

Magdalena limestone. Just where this 25 foot zone comes in the section is not known. The only available clue is that several wells drilled for oil on this dome have penetrated at least 1,000 feet of limestones and interbedded arkosic sandstones (presumably all Magdalena) without encountering the pre-Cambrian basement complex. Therefore, it would appear that the Magdalena exposed on the surface in this area is much higher in the section than the Jemez exposures.

Other Areas.

Tijeras Canyon Area.

The only collection from this area mentioned in the paleontology was one from a lime kiln, built of limestone blocks that are fairly definitely known to be from Magdalena beds which are in place a short distance from the kiln. Tijeras Canyon is 15 miles, by road, east of Albuquerque.

Coyote Springs Area.

This area is located on the west side of the Manzano Range. The Magdalena is on the crest of the mountains and a collection of fossils from the talus slopes was made by the writer and Richard Vann in the spring of 1930. The Coyote Springs area is 20 miles, by road,

from Albuquerque.

Nacimiento Range Area.

Talus slopes on the west side of the Nacimiento Range in the vicinity of Kaseman's Well were examined in the spring of 1930. A few Chaetetes were picked up there and included in the Paleontology. No Magdalena was located in place there. This area is 70 miles by road from Albuquerque.

PALEONTOLOGY

The detailed descriptions of the species have been summarized and are very brief. References are cited and the synonymy has been cut down to two citations in all cases, the first being the oldest one found in the literature and the second being the best modern one at hand. The long synonymies of nearly all the species were considered of not enough value to be included in a work of this nature. Many of the species are definitely identified and very little has been said about them. A few are vague and their identifications are made questionably. Some have not been identified with any species, and they are either new species or the literature has been inadequate for identification. The complete faunal list of the Magdalena is given on the following two pages.

One of the most important references for general geology of New Mexico, used in this work, was U.S.G.S. Bulletin 794, "Red Beds" and Associated Formations in New Mexico, by N. H. Darton. In it are fossil lists prepared by G.H. Girty from Darton's collections in the Magdalena and reference is made in every case to this Bulletin 794.

FAUNAL LIST

PROTOZOAN
- Triticites secalicus

ECHINODERMS
- Archaeocidaris sp.
- Ceriocrinus sp.
- Delocrinus sp.
- Hudreionocrinus sp.
- Crinoid columnals

CORALS
- Lophophyllum profundum Milne-Edwards & Haime
- Syringopora sp.
- Chaetetes sp.

BRACHIOPODS
- Chonetes granulifer Owen
- Ch. verneuilianus Norwood & Pratten
- Punctospirifer kentuckyensis Shumard
- Spirifer cameratus Morton
- Dielasma bovidens Morton
- Derbya crassa Meek & Hayden
- D. bennetti Hall & Clarke
- Pustula punctata Shumard
- P. nebrascensis Owen
- Linoproductus cora d'Orbigny
- Productus costatus
- P. semireticulatus Norwood & Pratten
- Marginifera splendens Norwood & Pratten
- Composita subtilita Girty
- Pugnax osagensis Swallow
- Meekella striatocostata Cox
- Hustedia mormoni Marcou
- Enteletes hemiplicata Hall
- Rhipidomella pecosi Marcou
- Squamularia perplexa McChesney
- Ambocoelia planiconvexa Shumard

PELECYPODS
- Aviculopecten carboniferus Stevens
- Allerisma sp.
- Aviculopecten occidentalis Shumard
- Lima sp.

Myalina subquadrata Shumard
Deltopecten sp.
Schizodus wheeleri Swallow
S. subcircularis
S. sp. King (genus)
Edmondia aspinwallensis Meek
Ed. gibbosa McCoy
Pseudomontis robusta Beede
Pleuropnorus trapidophorus Meek
Astartella vera Hall

GASTROPODS

Orestes Girty
Worthenia sp.
Trepospira depressa Cox
Sphaerodoma primigenia Conrad
Euphemus carbonarius Cox
Meekospira Ullrich (genus)
Strophostylus sp. Hall (genus)
S. remex White
Schizostoma catilloides Conrad
Pharkidonotus percarinatus Conrad

TRILOBITES

Griffides parvulus Girty
Phillipsia sangamonensis Meek & Worthen

PHYLUM PROTOZOA

PHYLUM PROTOZOA

Class Foraminifera.

Family Fusulinidae.

Genus Triticites.

Triticites secalicus ? (Fusulina sp.)

1823 Miliolites secalicus, Say, Longs Exped., p.151.

1915 Fusulina inconspicua, Girty, U.S.G.S. Bull.544, p.15, pl.1,fig.1-8.

Cited in U.S.G.S. Bull. 794.

These little fossils were found weathered out at several localities in the Jemez area and in place in a ledge of limestone in that region. They were also found at the Wilcox Dome area. They are questionably referred to this species as they have not been examined microscopically and no sections have been made.

Horizon: Magdalena.

Locality: Jemez Springs and Wilcox Dome.

PHYLUM COELENTERATA

PHYLUM COELENTERATA

Class Tetracoralla.

Family Syringoporidae.

Genus Syringopora.

Syringopora sp.

1900 Syringopora, Beede, Univ.Geol.Sur.Kan.,vol.6,p.25 pl.5, fig.6.

Not cited in U.S.G.S. Bull.794.

This genus was found at one place in the New Mexico Pennsylvanian, about 16 miles east of Albuquerque in Tijeras Canyon, just east of the locality of Seven Springs, in an old lime-kiln. The coral was in a clay-like matrix, and only portions of corallites were taken out as the mass was very crumbly. It agrees with the description given by Beede* for Syringopora multattenuata, but no positive species identification has been made.

Horizon: Magdalena.

Locality: Tijeras Canyon.

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* University Geological Survey of Kansas, vol.6.

Family Chaetetidae.

Genus Chaetetes.

Chaetetes sp.

1900 Chaetétes, Beede, Univ.Geol.Sur.Kan.,vol.6,p.25, pl.2,fig.11-11B.

Cited in U.S.G.S. Bull. 794.

This genus has been found at two localities in the New Mexico Pennsylvanian; first in the Manzano Range, east and south of Albuquerque, near Coyote Springs, and also on the west slopes of the Nacimiento Range in the vicinity of the Artesian Well mentioned in Dr. J.D.Clark's University Bulletin, on the Saline Springs of the Rio Salado. At this latter locality the specimens were not found in place nor were any strata found in place, but the supposition was that the specimens came from the Magdalena exposed in the higher slopes of the mountains.

The specimens agree with the description in Beede* of C. milleporaceus, but no positive species identification has been made.

Horizon: Magdalena ?

Locality: Manzano and Nacimiento Ranges.

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* University Geological Survey of Kansas, vol.6.

Family Zaphrentidae.

Genus Lophophyllum.

Lophophyllum profundum, Milne-Edwards and Haime.

1851 Cyathaxonia profunda, Milne-Edwards and Haime, Mon. des Polyp. Foss.

1900 Lophophyllum profundum, Beede, Univ.Geol.Sur. Kan.,vol.6,p.17,pl.2,fig.7-7B

Cited in U.S.G.S. Bull. 794.

This species was found at a number of localities in the Jemez area and in the Wilcox Dome area, few in numbers and would be classed as a rare fossil in the New.Mexico Pennsylvanian. It agrees with Beede's* description, but varies greatly in size. Many very small specimens were found attached to other fossils.

Horizon: Magdalena.

Locality: Jemez Springs and Wilcox Dome.

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* University Geological Survey of Kansas, vol.6.

PHYLUM ECHINODERMATA

PHYLUM ECHINODERMATA

Class Crinoidea.

Family Poteriocrinidae.

Genus Ceriocrinus.

Ceriocrinus ? sp.

1900 Ceriocrinus ?, Beede, Univ.Geol.Sur.Kan.,vol.6, p.32,pl.6,fig.9-9B.

Not cited in U.S.G.S. Bull. 794.

One nearly whole calyx was found and is questionably referred to this genus. Exterior diameter, 37mm; thickness of plates, 8mm; interior diameter, 19mm; height, 25mm. The specimen agrees in shape of plates and number of sides with the genus, but has one plate in place that projects above the calyx rim, and the basal portion is decidedly convex instead of concave. This makes the height much more in our specimen than in those described by Beede*.

Horizon: Magdalena.

Locality: Near Old Mission, Jemez Springs.

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* University Geological Survey of Kansas, vol.6.

Genus Delocrinus and Hydreionocrinus

Crinoid Plates

Several radial, basal and first brachial plates were found in the Jemez collections. They agree with the figures in Girty's U.S.G.S. Bull.544, Plate 3, for the genus Delocrinus and the genus Hydreionocrinus. No specific identifications are made.

The plates were found at four localities and are rather rare in the Magdalena.

Horizon: Magdalena.

Locality: Jemez Springs.

Crinoid Columnals.

The columnal remains are very common throughout the whole of the area. They vary rather widely in diameter and thickness of the individual discs or segments. Two or possibly three divisions can be recognized. (This treatment is similar to that given crinoid columnals by Girty in U.S.G.S. Bull. 544).

Division A. This group includes those columnals whose segments are smooth, that is, their outer surface presents a rather flat appearance when several segments

are found together. These are the most common.

Division B. This group is far less common than the first. The edges of the disc-like segments are rounded and the stem-like portion presents a surface that is not smooth but one that has ridges.

Division C. Only one or two sections of a columnal were found that is given another division ranking. These include the specimens which, instead of being round or disc-like, have five sides. They are similar in all respects and are very rare.

Horizon: Magdalena.

Locality: Jemez Springs.

Class Echinoidea.

Family Archaeocidaridae.

Genus Archaeocidaris.

Archaeocidaris sp., McCoy (genus) 1844

1900 Archaeocidaris, Beede, Univ.Geol.Sur.Kans.,vol.6, p.47,pl.8,fig.6,7,10.

Not cited in U.S.G.S. Bull.794.

Many spines and plates with the ball and socket arrangement were found in the Jemez collections, and a few were in the Wilcox Dome collection. The spines

vary in size and are bedded in a shale-like matrix which preserved the smaller spicules on the spine.

Horizon: Magdalena.

Locality: Jemez Springs.

PHYLUM BRYOZOA

PHYLUM BRYOZOA

Family Fenestellidae.

There are about ten species of bryozoans in the Jemez collection belonging to the Fenestellidae. Well-preserved fronds measuring up to four inches across were found. Remains of Bryozoans were collected at nearly all localities. Much work could be done on the bryozoan remains alone, but as they must be studied by means of sections, this has been left for an expert.

Horizon: Magdalena.

Locality: Jemez Springs, and Wilcox Dome.

PHYLUM BRACHIOPODA

PHYLUM BRACHIOPODA

Order Protremata.

Super family Orthacea.

Family Rhipidomellidae.

Genus Rhipidomella.

Rhipidomella pecosi Marcou.

1858 Orthis pecosi,Marcou, Geol. N.Amer.,p.48,pl.6, fig.14.

1900 Rhipidomella pecosi,Beede,Univ.Geol.Sur.Kan., vol.6,not figured,p.90.

Cited in U.S.G.S. Bull.794.

Only two specimens referable to this species were found in the Wilcox Dome collections. None was found at Jemez. They are nearly perfect and agree with the descriptions given in Beede's* work. Very rare in the New Mexico Pennsylvanian.

For identification:

Shimer & Grabau, page 266, vol.1.
N. Amer. Index Fossils.

Horizon: Magdalena.

Locality: Estancia Valley.

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*University Geological Survey of Kansas, vol.6.

Family Schizophoriidae.

Sub-family Enteletinae.

Genus Enteletes.

Enteletes hemiplicata Hall.

1852 Spirifer hemiplicata,Hall,Stansbury's Expl. Gr. Salt Lake,p.409,pl.4,fig.3.

1900 Enteletes hemiplicata,Beede, Univ.Geol.Sur.Kans., vol.6,pl.12,fig.6-6B,p.91.

Length: 20mm.
Width: 24mm.
Convexity: 20mm.
Cited in U.S.G.S. Bull.794.

Eleven specimens referable to this species were found in the Wilcox Dome collections. None was found at Jemez. They agree with the descriptions and figures and are rather uniform in size. The surface is ornamented with radiating plications and parallel striae.

Horizon: Magdalena.

Locality: Estancia Valley.

Super family Strophomenacea.

Family Strophomenidae.

Sub-family Orthotetinae.

Genus Derbyia.

Derbyia bennetti Hall and Clarke.

1892 Derbya bennetti,Hall & Clarke, Pal.N.Y., 8,pt.1,

pp.263-348,pl.11-a,figs.34-39.

1900 Derbya bennetti,Beede,Univ.Geol.Sur.Kans.,vol.6, p.59,pl.8,fig.8-8C.

This species agrees with Beede's* description and figures. It is about as common as D. crassa and differs in that the cardinal area is unusually high, incurved and distorted. The markings are similar to those of D. crassa--being fine thread-like striae.

Horizon: Magdalena.

Locality: Jemez Springs.

Derbyia crassa Meek and Hayden.

1858 Orthisiua crassa, Meek & Hayden,Proc.Acad.Nat.Sci. Phila.,p.261.

1900 Derbyà crassa, Beede, Kan.Univ.Geol.Sur.,vol.6, p.62,pl.8,fig.11-11B.

Length:	30mm.	16mm.
Width:	30mm.	18mm.
Convexity:	10mm.	10mm.

Cited in U.S.G.S. Bull. 794.

This species is rare in the Jemez locality and but few perfect specimens were found. It varies fairly widely in size. About fifty specimens come from eleven localities in the Jemez area, and twenty or more come from the Wilcox Dome area. They agree with Beede's*

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* University Geological Survey of Kansas, vol.6.

description, and are about the same size in the case of our larger specimens.

Horizon: Magdalena.

Locality: Jemez Springs and Wilcox Dome.

Meekella striatocostata Cox.

1857 Plicatula striatocostate,Cox,Geol.Sur.Ky.,3,p.568, pl.8,fig.7.

1900 Meekella striatocostata,Beede,Univ.Geol.Sur.Kan., vol.6,p.65,pl.12,fig.9-9c.

Length: 45mm.
Width: 39mm.
Convexity: 35mm.
Cited in U.S.G.S. Bull. 794.

Ten specimens of this species are in the Wilcox Dome collection. The form is fairly large and rather well-preserved. The general shape and ornamentation agree with Beede's* description. The size of the specimens is greater than that of the Kansas ones. The surface is marked by large plications which are covered with very fine, radiating striae, not parallel to the ridges and furrows. High elevation of beaks and cardinal area are characteristic, though this varies somewhat in the specimens. Occurence is rather rare in

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*University Geological Survey of Kansas, vol.6.

New Mexico Pennsylvanian.

Horizon: Magdalena.

Locality: Wilcox Dome.

Family Chonetidae.

Genus Chonetes.

Chonetes granulifer Owen.

1852 Chonetes granulifera,Owen,Rept.Geol.Sur.Wis.Iowa, and Minn.,p.583,pl.5,fig.12.

1915 Chonetes granulifer,Girty,U.S.G.S. Bull.544,p.59, pl.7,fig.13-13A.

Length:	15mm.	7mm.
Width:	24mm.	14mm.
Convexity:	7mm.	2mm.

Cited in U.S.G.S. Bull.794.

This species is rather common in the Jemez area. None of the specimens has spines along the hinge line. The shells agree with Meeks'* description and are very fragile and easily broken. Most of them were found weathered out free. The surfaces are ornamented with very fine radiating striae.

Horizon: Magdalena.

Locality: Jemez Springs and Wilcox Dome.

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*Kansas University Geological Survey, vol.6.

Chonetes verneuilianus
Norwood and Pratten.

1854 Chonetes verneuilianus,Norwood & Pratten,Jour. Acad.Nat.Sci.Phila.,3,p.26,pl.2,fig.6.

1900 Chonetes verneuilianus,Beede,Kan.Univ.Geol.Sur., vol.6,p.72,pl.9,fig.4-4C.

Length: 9mm.
Width: 18mm.
Convexity: 3mm.
Cited in U.S.G.S. Bull.794.

There are five specimens of this species in the Wilcox Dome collection, but none was found in the Jemez area. The shells are very fragile and were found weathered out free. This species differs from the preceding one in that it has a very pronounced fold and sinus. The surface ornamentation has the same very fine radiating striae.

Horizon: Magdalena.

Locality: Estancia Valley.

Family Productidae.

Sub family Productinae.

Genus Productus.

Productus semireticulatus
Norwood & Pratten.

1809 Anomites semireticulatus,Martin,Petref.Derb., p.7,pl.32,fig.1-2.

1900 Productus semireticulatus,Beede,Kan.Univ.Geol.Sur., vol.6,p.78,pl.10,fig.2-2D.

Length: 18mm.
Width: 30mm.
Convexity: 10mm.
Cited in U.S.G.S. Bull.794.

This shell was found at nearly all the localities in the Jemez area and in the Wilcox Dome area.in the Estancia Valley. It has many varieties of form and a wide range in size. P. semireticulatus and its varieties form one of the most common species in the New Mexico Pennsylvanian. It agrees with Beede's description. Surface marked with radiating and concentric costae, giving it the semireticulated appearance, whence the name. The specimens show great variety in preservation, form, convexity and size.

Horizon: Magdalena.

Locality: Jemez Springs and Wilcox Dome.

Productus costatus Sowerby.

1827 Productus costatus, Sowerby,Min.Con.,6,p.115, pl.DLX, fig.1.

1900 Productus costatus,Beede,Univ.Geol.Surv.Kans., pl.9,p.79,fig.8.

Not cited in U.S.G.S. Bull.794.

This species is fairly common in the New Mexico

Pennsylvanian. Many shells found at Jemez and the Wilcox Dome are referred to this species. The strong fold and sinus are characteristic as well as the costae. This species is similar in size and shape to P. semireticulatus.

Horizon: Magdalena.

Locality: Jemez Springs and Wilcox Dome.

Genus Linoproductus.

Linoproductus cora d'Orbigny.

1842 Productus cora,d'Orbigny,Voy,dans.l'Amer.Mer.Pal., p.55,pl.10,figs.8-10.

1900 Productus cora,Beede,Kan.Univ.Geol.Sur.,vol.6,p.75, pl.11,fig.1-1D.

Length: 35mm.
Width: 22mm.
Convexity: 10mm.
Cited in U.S.G.S. Bull.794.

P. cora was found to be fairly abundant at Jemez in most localities. This shell varies greatly in size and general shape, but the ornamentation is rather constant in all sizes. A good many individuals were dug out of the rocks, but some were found weathered out. It agrees with Meeks' description given for Productus prattenianus by Beede* under Productus cora.

*Kansas University Geological Survey, vol.6.

Horizon: Magdalena.

Locality: Jemez Springs and Wilcox Dome.

Genus Marginifera.

Marginifera splendens
Norwood and Pratten.

1854 Productus splendens,Norwood & Pratten,Acad.Nat. Sci.Phila.Jour. 2nd Ser.,vol.3.

1915 Marginifera splendens,Girty,U.S.G.S.Bull.544,p.76, pl.10,fig.1-2B.

Length: 13mm.
Width: 15mm.
Convexity: 8mm.
Cited in U.S.G.S.Bull.794.

The shells referred to this species are very common in nearly all localities at Jemez. The size is more uniform and the general shape is more nearly the same than in P. nebraskensis or P. semireticulatus. The ornamentation is nearly always the same. Most of the Marginifera were found weathered out free from the matrix. They agree with Girty's* description in size and shape.

Horizon: Magdalena.

Locality: Jemez Springs and Wilcox Dome.

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*U.S.G.S. Bull.544.

Genus Pustula.

Pustula nebraskensis Owen.

1852 Productus nebraskensis, Owen, Geol.Sur.Rept.Wis. Iowa, & Minn.p.584,pl.5,fig.4.

1900 Productus nebraskensis,Beede,Kans.Univ.Geol.Sur., vol.6,p.84,pl.9,fig.7-7F.

Length: 24mm.
Width: 27mm.
Convexity: 11mm.
Cited in U.S.G.S. Bull.794.

This species, though not quite as abundant as P. semireticulatus, has the same general shape and size. The ornamentation is different in that there are spines on all of the exterior. P. nebraskensis was found at nearly every locality at Jemez and also at the Wilcox Dome area in the Estancia Valley. The shells referred to this species vary greatly in size. They agree with Meek's* description and are a very common Pennsylvanian species.

Horizon: Magdalena.

Locality: Jemez Springs and Wilcox Dome.

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* University Geological Survey of Kansas, vol.6,p.84.

Genus Pustula.

Pustula punctatus Shumard.

1809 Anomites punctatus,Martin,Petref.Derb.,pl.37, fig.6.

1900 Productus (Pustula)punctatus,Beede,Kan.Univ.Geol. Sur.,vol.6,p.87,pl.10,fig.3.

Length: 70mm.
Width: 50mm.
Convexity: 30mm.

P. semipunctata is cited in U.S.G.S.Bull.794.

This species was found at Wilcox Dome in the Estancia Valley to be extremely large as a general rule, but in the Jemez localities the size is much smaller. P. punctatus is a rather common species in the New Mexico Pennsylvanian. This species agrees with Meek's* description of Productus punctatus, but is listed by Darton** as Pustula semipunctata and by B. Coleman Renick*** Pustula semipunctata. These last two identifications were by G. H. Girty.

Horizon: Magdalena.

Locality: Jemez Springs and Wilcox Dome.

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*Kansas University Geological Survey,vol.6,p.87.
**U.S.G.S. Bull.794,p.19.
***Water Supply Paper 620, p.17.

Order Telotremata.

Super family Rhynchonellacea.

Family Camarotoechiidae.

Sub-family Camarotoechiinae.

Genus Pugnax.

Pugnax osagensis Swallow.

1852 Terabratula pugnus,Roemer,Kreid.von Texas,p.89.

1915 Pugnax osagensis,Girty,U.S.G.S.Bull.544,p.81,pl.10, fig.11-11C.

Length: 7mm.
Width: 7mm.
Convexity: 6mm.
Cited in U.S.G.S.Bull.794.

Only one specimen was found in the Wilcox Dome collection, while none appeared in the Jemez collection. The shell is rather small and agrees in general shape and ornamentation with Meek's* description. Plications occur on all sides and a well-defined fold and sinus with a moderately prominent beak are characteristic.

Horizon: Magdalena.

Locality: Wilcox Dome.

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*University Geological Survey of Kansas,p.93,vol.6.

Super family Spiriferacea.

Family Spiriferidae.

Sub-family Reticulariinae.

Genus Squamularia.

Squamularia perplexa McCheaney.

1855 Spirifer lineatus,Shumard,Missouri,Geol.Sur., p.216.

1903 Squamularia perplexa,Girty,U.S.G.S.,Pro.paper, vol.16,p.392,pl.6,fig.8-11C.

Cited in U.S.G.S. Bull.794.

This species is rather rare having been found at but few of the localities at Jemez, and in the Wilcox Dome area. It agrees with the descriptions in size and shape as well as ornamentation.

Horizon: Magdalena.

Locality: Jemez Springs and Wilcox Dome.

Sub-family Spiriferinae.

Genus Spirifer.

Spirifer Cameratus Morton.

1836 Spirifer cameratus,Morton,Amer.Jour.Sci.1st. ser.,vol.29,pp.32,150,pl.2,fig.3.

1915 Spirifer cameratus,Girty,U.S.G.S.Bull.544,p.87, pl.11,fig.4.

Length: 40mm.
Width: 67mm.
Convexity: 22mm.

Not cited but S.boonensis is in U.S.G.S.Bull.794.

S. cameratus is one of the most common shells in the Jemez area. It has a wide range in size especially in the length of hinge line. At the Wilcox Dome in the Estancia Valley, it is one of the rarer forms. In places at Jemez it is very flat and narrow and in other places it is thick and short. The shells are of original material and are ornamented with striae that are in all the specimens fasciculated or in bundles. Some of the younger specimens seemingly of a variety show a shortening of the hinge line and a more circular shape, but the fasciculated striae are always present.

Horizon: Magdalena.

Locality: Jemez Springs and Wilcox Dome.

Sub-family Martiniiae.

Genus Ambocoelia.

Ambocoelia planiconvexa Shumard.

1855 Spirifer plano-convexa,Shumard,Mo.Geol.Sur.Second Ann.Rept.,p.202.

1915 Ambocoelia planiconvexa,Girty,U.S.G.S.Bull.544, p.94,pl.11,fig.6-7b.

Length: 5mm.
Width: 4mm.
Convexity: 3mm.

This very small species was found in the Jemez area at several localities and in the Wilcox Dome area. It agrees with the description. All specimens are nearly perfect in their preservation. It is a rather rare species in the New Mexico Pennsylvanian.

Horizon: Magdalena.

Locality: Jemez Springs and Wilcox Dome.

Family Spiriferinidae.

Sub-family Spiriferininae.

Genus Punctospirifer.

Punctospirifer kentuckyensis Shumard.

1852 Spirifer octoplicata? Hall, Stansbury's Expd. Great Salt Lake, p.409, pl.4, figs4A-B.

1915 Spiriferina kentuckyensis, Girty, U.S.G.S. Bull.544, p.85, pl.11, fig.8-8A.

Length:	12mm.	5mm.
Width:	18mm.	7mm.
Convexity:	10mm.	4mm.

Cited in U.S.G.S. Bull.794.

This little species is rather common, being found at all localities. The size and general shape of the shell is rather constant. Many individuals are crushed or partially crushed. There are a few in the collection from the Wilcox Dome. They show the same characteristics,

but are much less abundant than in the Jemez area.

Horizon: Magdalena.

Locality: Jemez Springs and Wilcox Dome.

Super family Rostrospiracea.

Family Rhynchospirinidae.

Genus Hustedia.

Hustedia mormoni Marcou.

1858 Terebratula mormonii,Marcou,Geol.N.Amer.p.51,pl.6, fig.11-11C.

1915 Hustedia mormoni,Girty,U.S.G.S.Bull.544,p.103, pl.12,fig.5-6a.

Length: 8mm.
Width: 7mm.
Convexity: 5mm.
Cited in U.S.G.S.Bull.794.

Only one speciman, found in the Wilcox Dome collection, can be referred to this species. None is in the Jemez collections. It agrees with Beede's* descriptions, being small and ovate. The specimen has twelve radiating costae on the dorsal valve which are rather prominent. The uniting margin of the two valves is straight. No growth lines are visible.

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*University Geological Survey of Kansas, vol.6,p.103.

Horizon: Magdalena.

Locality: Estancia Valley.

Family Athyridae.

Sub-family Athyrinae.

Genus Composita.

Composita subtilita.

1842 Terebratula roissyi, D'Orbigny,Voyage dans,l'Amerique Meridionale,Paleontology,vol.3,pl.4, p.46.

1915 Composita subtilita,Girty,U.S.G.S.Bull.544,p.96, pl.12,fig.4-4C.

Length: 28mm.
Width: 23mm.
Convexity: 17mm.
Cited in U.S.G.S. Bull.794.

This species is the most common brachiopod of the New Mexico Pennsylvanian, there being thousands of individuals in the collections. It is found in all fossiliferous localities and is usually well-preserved. It is a much-discussed species and has a synonymy of fifty-one citations in Girty's U.S.G.S. Bull.544. No less than four generic names have been given to it.

Horizon: Magdalena.

Locality: All fossiliferous outcrops.

Superfamily Terebratulacea.

Division A. Terebratuloids.

Family Dielasmatidae.

Genus Dielasma.

Dielasma bovidens Morton.

1836 Terebratula bovidens,Morton,Am.Journ.Sci.,1.vol. 29,p.150,pl.2,fig.4.

1903 Dielasma bovidens,Girty,U.S.G.S. Pro.Paper,vol.16, pl.7,fig.11-11a,p.409.

Length: 20mm.
Width: 12mm.
Convexity: 11mm.

This shell is rare and fewgood specimens were found. Generally they were crushed. Fifteen individuals referable to this species are in the Jemez collections, and five individuals in the Wilcox Dome collection. They agree with the descriptions, but vary in size considerably among themselves. This is probably due to difference in age of the individual. D. bovidens is not very common in the New Mexico Pennsylvanian.

Horizon: Magdalena.

Locality: Jemez Springs and Wilcox Dome.

PHYLUM MOLLUSCA

PHYLUM MOLLUSCA.

Class: Pelecypoda.

Order Asiphonida.

Family Mytilidae.

Genus Myalina.

Myalina subquadrata Shumard.

1855 Myalina subquadrata,Shumard,Geol.Sur.Mo.,p.207, pl.c,fig.17.

1903 Myalina subquadrata,Girty,U.S.G.S.Prof.paper 16, p.424,pl.21,figs.10-10a.

Length: 85mm.
Width: 45mm.
Convexity: 27mm. (both valves)
Cited in U.S.G.S.Bull.794.

This is one of the few clam shells found at Jemez. It is rather rare and usually only the heavy beak portion is found. A few whole specimens were found. This species is not represented in the Wilcox Dome collection.

The nearly whole specimens show the subquadrate form and the surface lamellae appear on the fragments.

Horizon: Magdalena.

Locality: Jemez Springs.

Family Limidae.

Genus Lima.

Lima ? sp.

1900 Lima,Beede,Kan.Univ.Geol.Sur.,vol.6,p.112,pl.13, fig.5.

Not cited in U.S.G.S.Bull.794.

Two fragmental specimens, one a cast and one of original shell material, were found in the Jemez area. They are questionably referred to this genus. Surface ornamentation shows up well. Rather irregularly radiating and sharply angular costae occur on the surface of both fragments. The cast is in a yellowish shale-like material, while the other specimen is in a limey matrix.

Horizon: Magdalena.

Locality: Jemez Springs.

Family Pectenidae.

Genus Deltopecten.

Deltopecten ? sp.

1909 Deltopecten vanuleeti,Girty,U.S.G.S.Bull.389, p.85-89,pl.9,fig.5.

Height: 25mm.

Cited in U.S.G.S.Bull.794 as D.occidentalis.

One rather fragmental portion of a shell found in the Jemez collection is questionably referred to this genus. The species it resembles is cited. Only one dimension is given and it is rather approximate. This

is only one-half as large as D.vanvleeti Beede, as described by Girty*. The striae curve anteriorly on the fragment whereas the figure in Bull.389 shows them to be straight and radiating. The anterior ear, a part of which was preserved, shows many fine concentric growth lines and no striae.

Horizon: Magdalena.

Locality: Jemez Springs.

Genus Aviculopecten.

Aviculopecten carboniferus Stevens.

1859 Pecten carboniferus,Stevens,Amer.Jour.Sci. and Arts,25,p.261.

1900 Aviculopecten carboniferus,Beede,Kan.,pl.13,fig.9, Kan.Univ.Geol.Sur.,vol.6,p.117.

Height: 45mm.
Length: 35mm.
Cited in U.S.G.S.Bull.794.

Shells rather imperfectly preserved and only found at four localities in the Jemez area. Fragmentary casts were found in three places in a yellow shale-matrix. One fragment of original shell material was found. The surface is covered with distinct, regularly arranged lamellae with jagged or dentate edges. Nothing

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* United States Geological Survey Bulletin 389.

that could be referred to this species was found in the Wilcox Dome area.

Horizon: Magdalena.

Locality: Jemez Springs.

Genus Aviculopecten.

Aviculopecten occidentalis.

1855 Pecten occidentalis, Shumard, Geol.Rept.Mo., p.207, pl.c, fig.18.

1900 Aviculopecten occidentalis, Beede, Univ.Geol.Sur. Kan., vol.6, p.114, pl.8, fig.7.

Length: 12mm.
Height: 16mm.
Not cited in U.S.G.S.Bull.794.

Fragments of shells referable to this species were found at two localities in the Jemez area. The whole outline cannot be traced and only approximate dimensions are given. The ears are missing as well as the hinge portions. The radiating costae are flattened and seem crushed. The costae seem to run the length of the shell and number thirty-two.

One of the specimens is slightly larger than the other and shows less flattened and more sharply crested costae, but they have the same radiating curve and the number is the same.

Horizon: Magdalena.

Locality: Jemez Springs.

Family Aviculidae.

Genus Pseudomonotis.

Pseudomonotis robusta Beede.

1900 Pseudomonotis robusta,Beede,Univ.Geol.Surv.Kan., vol.6,p.133,pl.14,fig.2-2c.

Height: 40mm.
Length: 45mm.
Convexity: 20mm. (one valve)
Not cited in U.S.G.S.Bull.794.

About seven fragmental portions and one nearly whole specimen are in the Jemez collection. It agrees with Beede's* description as it is very arcuate. The striae are faint but very regular and the concentric wrinkles of growth are rather prominent. The fragmental portions show the same stiae and possibly belong to this or other species of Pseudomonotis.

Horizon: Magdalena.

Locality: Jemez Springs.

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*University Geological Survey of Kansas, vol.6.

Family Trigoniidae.

Genus Schizodus.

Schizodus wheeleri Swallow.

1862 Cypricardis ? wheeleri,Swallow,Trans.St.L.Acad. Sci.II,p.96,Genus in U.S.G.S.Pro.paper 16, p.439.

1900 Schizodus wheeleri,Beede,Colo.Kan.Univ.Geol.Surv. Kan.,vol.6,p.155,pl.22,figs.1-1c.

Height: 13mm.
Length: 21mm.
Convexity: 10mm. (both valves)
Not cited in U.S.G.S.Bull.794.

Only one specimen from the Jemez collection is referred to this species. It agrees with Meek's* description in every detail in size and general shape. It was found weathered out free, and in a fair state of preservation, one valve being entirely of original shell material, while the other was beginning to break off.

Horizon: Magdalena.

Locality: Jemez Springs.

Genus Schizodus.

Schizodus subcircularis ? Herrick.

1887 Schizodus subcircularis,Herrick,Bull.,Den.Univ., II,p.41,pl.3,fig.24.

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*University of Kansas Geological Survey,vol.6.

1900 Schizodus subcircularis ?,Univ.Geol.Sur.Kan.,vol. 6,not fig.,p.157.

Height: 32mm.
Length: 36mm.
Convexity: 16mm. (both valves)
Not cited in U.S.G.S.Bull.794.

One internal mold is questionably referred to this species. It agrees in general shape with the descriptionsgiven in Beedes* work, but is larger in all dimensions with the same proportions.

Horizon: Magdalena.

Locality: Jemez Springs.

Genus Schizodus.

Schizodus sp. King 1844 (genus)

Height: 28mm.
Length: 31mm.
Convexity: 16mm. (both valves)

One shell found in the Jemez collection is rather closely related to S.wheeleri but differs in that no well-defined ridge on the posterior unbonal slope to the posterior basal extremity is present. It is moderately large, longitudinally subovate, rather gibbous. Greatest convexity below the beaks, which are somewhat depressed and placed slightly anterior to the middle.

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*University Geological Survey of Kansas, vol.6.

Surface markings are obscure.

Horizon: Magdalena.

Locality: Jemez Springs.

Family Astartidae.

Genus Pleurophorus.

Pleurophorus trapidophorus Meek.

1875 Pleurophorus trapidophorus,Meek,Geol.Sur.Ohio,II, Pal.,p.338,pl.19,fig.10a-10-b.

1900 Pleurophorus trapidophorus,Beede,Univ.Geol.Sur. Kans.,vol.6,p.162,pl.20,fig.7.

Height: 8mm.
Length: 15mm.
Convexity: 4mm.
Not cited in U.S.G.S.Bull.794.

Two interior casts that are referred to this species were found in the Jemez collection. They agree with the description as far as can be detected from the material at hand. The beaks are depressed to the line of the cardinal margin, with very little projecting, and are placed, as in Beede's* description, about one-fourth or one-fifth the length of the valves from the anterior margin. Growth lines are faint but distinct on one specimen.

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*University Geological Survey of Kansas, vol.6,p.162.

Horizon: Magdalena.

Locality: Jemez Springs.

Genus Astartella.

Astartella vera Hall.

1858 Astartella vera,Hall,Geol.Iowa,pt.2,p.715,pl.29, fig.1-1c.

1900 Astartella vera,Beede,Univ.Geol.Sur.Kan.,vol.6, p.163,pl.22,fig.10.

Height: 10mm.
Length: 10mm.
Convexity: 6mm. (both valves)
Not cited in U.S.G.S.Bull.794.

Two specimens from the Jemez collection are referred to this species. They agree perfectly with Beede's* description. The oblique ridge extends from the beaks to the posterior basal margin. Surfaces are marked with strong concentric furrows, separated by sharp ridges. Both are of original shell material and very well preserved.

Horizon: Magdalena.

Locality: Jemez Springs.

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*University Geological Survey of Kansas,vol.6.

Sub-order Sinupalliata.

Genus Edmondia.

Edmondia aspinwallensis Meek.

1872 E. aspinwallensis,Meek,Fin.Rept.,U.S.G.S.,Neb. p.216,pl.22,fig.2-2c.

1900 Edmondia aspinwallensis,Univ.Geol.Sur.Kan.,vol.6, p.166,pl.28,figs.3-3b.

Height: 21mm.
Length: 27mm.
Convexity: 9mm. (both valves)
Not cited in U.S.G.S.Bull.794.

Only two specimens in the Jemez collection are referable to this species. The dimensions of the larger are given. It agrees nearly perfectly with the description given in Beede's* work, except that it is a little smaller. Growth lines are distinct on both specimens.

Horizon: Magdalena.

Locality: Jemez Springs.

Genus Edmondia.

Edmondia gibbosa McCoy ? 1844.

1844 Astarte gibbosa,McCoy,Syn.Carb.Foss.Ireland,p.55, pl.8,fig.11.

1915 Edmondia gibbosa,Girty,U.S.G.S.Bull.544,p.107, pl.14,fig.12.

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*University Geological Survey of Kansas, vol.6.

Height: 13mm.
Length: 19mm.
Convexity: 9mm. (both valves)
Not cited in U.S.G.S.Bull.794.

One specimen in the Jemez collection is referred to this species. It agrees with the description given by Girty*. He gives no dimensions other than saying that it is rather small. Nearly the whole shell is preserved and the closely and regularly arranged lamellae adorn the surface.

Horizon: Magdalena.

Locality: Jemez Springs.

Genus Allerisma.

Allerisma sp.

1900 Allerisma,Beede,Univ.Geol.Sur.Kan.,vol.6.

Length: 120mm.
Height: 50mm.
Convexity: 35mm. (both valves)
Not cited in U.S.G.S.Bull.794.

Several specimens of this genus were found in the talus slopes and mingled with Magdalena fossils in the Jemez area. They vary in size from the size and shape of A. subcuneatum to some of six mm. in length. They probably came from higher strata, the Abo, which rests

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*United States Geological Survey Bull.544.

on top of the limestone of the Magdalena.

Horizon: Abo ?

Locality: Jemez Springs.

Class Gastropoda.

Family Pleurotomariidae.

Genus Orestes.

Orestes ? sp. Girty.

1915 Orestes,Girty,U.S.G.S.,Bull.544,p.156,pl.22.

Not cited in U.S.G.S.Bull.794.

One specimen found in the Wilcox Dome area is questionably referred to this genus. It is rather small and in a fragmental condition in that the last whorl is broken away. Portions of the original shell material still cling to the central whorls and the ornamentation is rather clear. The surface is reticulated slightly and each whorl has a double thread-like rim which seems to continue to the last whorl. It differs with the description in that no nodes are present. This may indicate a variety or new species.

Horizon: Magdalena.

Locality: Jemez Springs.

Genus Worthenia.

Worthenia sp.

1915 Worthenia tabulata,Girty,U.S.G.S.Bull.544,p.152, pl.22,

Not cited in U.S.G.S. Bull.794.

Three individuals belonging to the genus Worthenia were found in the Jemez collection. They have the shape and proper amount of coiling for W. tabulata, but since two were casts and the third is badly weathered, definite determination is impossible.

Horizon: Magdalena.

Locality: Jemez Springs.

Genus Trepospira.

Trepospira depressa, Cox.

1857 Pleurotomaria depressa,Cox,Kentucky Geol.Sur.Rept. vol.3,p.569,pl.8,figs.10-10a.

1915 Trepospira depressa,Girty,U.S.G.S.Bull.544,p.158, pl.21,figs.6-11c.

Not cited in U.S.G.S.Bull.794.

One specimen is referred to this species. It is a cast and the ornamentation is not present. It agrees with Girty's description except in size. It is typically depressed and has a very sharp keel. Preservation is rather poor as it occurred in a sandy matrix.

Horizon: Magdalena.

Locality: Jemez Springs.

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*United States Geological Survey Bull.544.

Genus Strophostylus.

Strophostylus remex, White.

1876 Naticopsis remex, White, Powell's Rept. Geol. of Unita Mts., p.109.

1903 Strophostylus remex, Girty, U.S.G.S. Pro. paper no.16, p.463, pl.10, fig.4-5b.

Not cited in U.S.G.S. Bull. 794.

One specimen, a cast, is referred to this species from the general shape, size, and proportions.

Horizon: Magdalena.

Locality: Jemez Springs.

Genus Strophostylus.

Strophostylus sp. Hall 1859 (genus).

Seven specimens are referred to this genus. They are rather low-spired and have a smooth surface. Four volutions are present in the most perfect specimens. No markings are present but all have a generally uniform size that is much smaller than S. remex. The diameter of the body whorl is from four to six mm.

Horizon: Magdalena.

Locality: Jemez Springs.

Family Bellerophontidae.

Genus Pharkidonotus.

Pharkidonotus percarinatus, Conrad.

1842 Bellerophon percarinatus, Conrad, Acad.Nat.Sci. Philadelphia Jour., 1st.Ser.vol.8, p.268, pl.16, fig.5.

1915 Pharkidonotus percarinatus, Girty, U.S.G.S.Bull, 544, p.165, pl.19, fig.4-9c.

Not cited in U.S.G.S.Bull.794.

Conrad's original description - "Subglobose; back with a sharp, elevated, waved, carina; sides with distant transverse acute ribs and intermediate minute striae; volutions concealed".*

One specimen in the Jemez collection agrees with this description perfectly and is nearly whole.

Horizon: Magdalena.

Locality: Jemez Springs.

Genus Euphemus.

Euphemus carbonarius, Cox.

1857 Bellerophon carbonarius, Cox, Ky.Geol.Sur.Rept., vol.3, p.562.

1915 Euphemus carbonarius, Girty, U.S.G.S.Bull.544, p.174, pl.21, fig.1-3b.

Not cited in U.S.G.S.Bull.794.

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*United States Geological Survey, Bull.544, p.167.

Several specimens of this species were found in the Jemez collection. They show variation in many ways, but are rather common in relation to the remainder of the gastropods.

Horizon: Magdalena.

Locality: Jemez Springs.

Family Euomphalidae.

Genus Schizostoma.

Schizostoma catilloides, Conrad.

1842 Inachus catilloides,Conrad,Acad.Nat.Sci.Philadelphia Jour.,1st Ser.,vol.8,pt.2,p.273,pl.15, fig.3.

1915 Schizostoma catilloides,Girty,U.S.G.S.Bull.544, pl.21,p.179,fig.4-5b.

Genus cited in U.S.G.S.Bull.794.

Several fragmental specimens were found that are referred to this species. They all show the thin flat sides and are discoidal. The size varies greatly. The shells are rather poorly preserved.

Horizon: Magdalena.

Locality: Jemez Springs.

Family Pyramidellidae.

Genus Sphaerodoma.

Sphaerodoma primigenis Conrad.

1835 Stylifer primigenia,Conrad,Geol.Soc.Pennsylvania Trans.,vol.1,pt.2,p.267,pl.12,fig.2.

1915 Sphaerodoma primigenia,Girty,U.S.G.S.Bull.544, p.208,pl.24,fig.13-17.

Not cited in U.S.G.S.Bull.794.

One specimen was found in the Jemez collections that can be referred to this species. It agrees with the figure of Girty's in size, shape and general proportions. The growth lines are distant, but the spire is missing.

Horizon: Magdalena.

Locality: Jemez Springs.

Genus Meekospira.

Meekospira ? Ulrich (genus)

Genus not cited in U.S.G.S.Bull.794.

Two specimens, one from the Wilcox Dome collection and one from the Jemez collection, are questionably referred to this genus. They are both fragmental and show the elongate form, with deep whorls. Girty* points out

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*United States Geological Survey, Bull.544.

the relationship of this genus to Bulimorpha and Polyphemopsis and the specimens may belong to any one of these. They have been referred to the genus Meekospira because they are smooth on the surface and lack ornamentation. The three genera are alike in that they are all elongate, fusiform shells, with narrow, flat-sided spires, and with deeply embracing whorls.

Horizon: Magdalena.

Locality: Jemez Springs and Estancia Valley.

PHYLUM CRUSTACEA

PHYLUM CRUSTACEA.

Class Trilobita.

Family Proetidae.

Genus Phillipsia Portlock.

Phillipsia sangamonensis ? Meek & Worthen.

1865 Phillipsia sangamonensis, Meek & Worthen, Acad. Nat.Sci.Philadelphia Proc.,p.271.

1915 Phillipsia sangamonensis,Girty,U.S.G.S.Bull.544, p.265,pl.18,figs.10-13a.

One specimen from the Wilcox Dome area is referred questionably to this genus and species. Only the pygidium was found. It agrees with the description in that the pleural segments appear to be smooth and show no angulation as do the segments of Griffithides. It measures 8mm. in width and 8mm. in length.

Horizon: Magdalena.

Locality: Estancia Valley, New Mexico.

Genus Griffithides Portlock.

Griffithides parvulus ? Girty.

1911 Griffithides parvulus,Girty,New York Acad. Sci. Annals, vol.21,p.154.

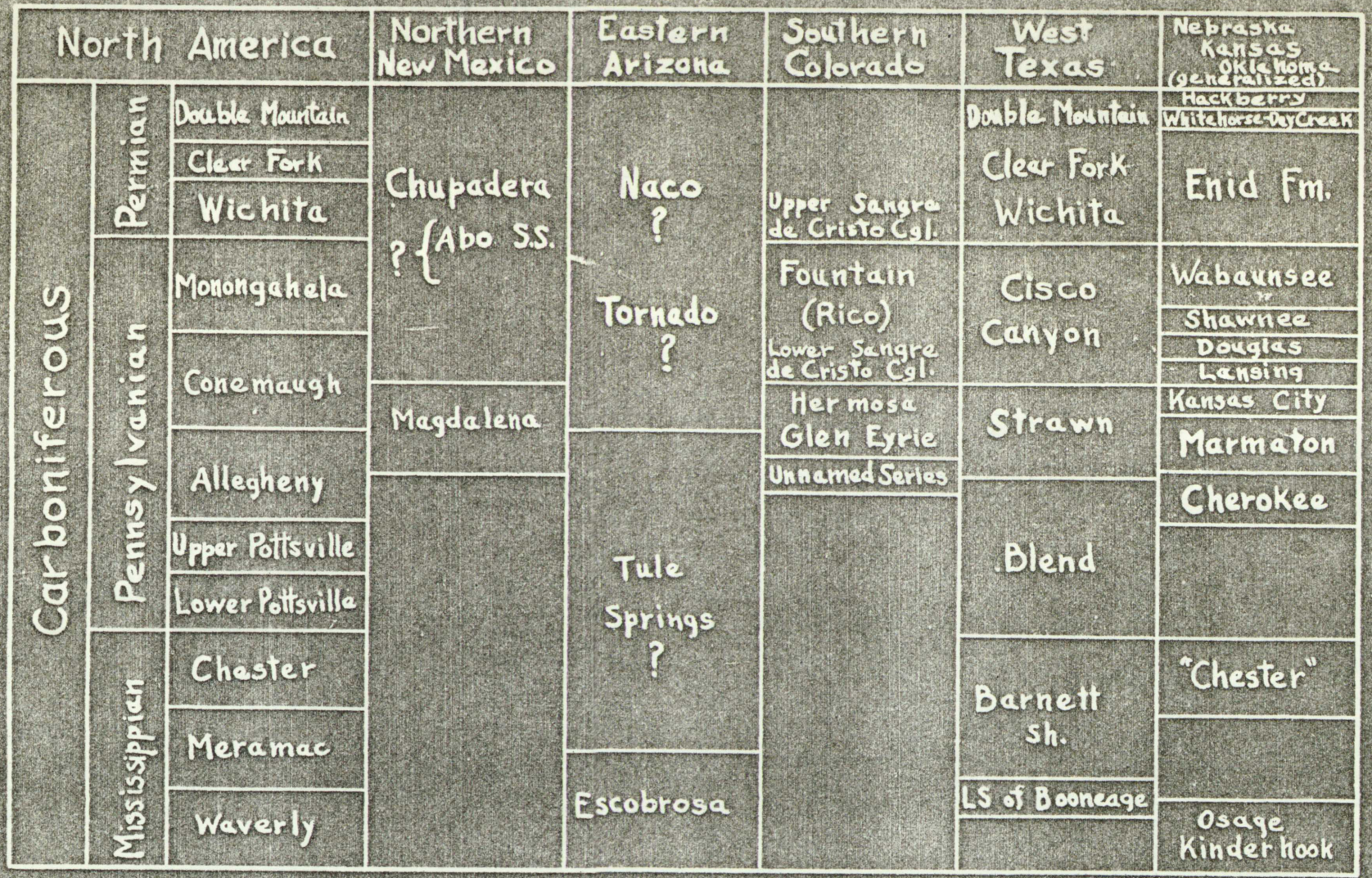
1915 Griffithides parvulus,Girty,U.S.G.S.Bull.544, p.268,pl.18,fig.14-15.

Three specimens, one from the Wilcox Dome and

two from the Jemez collections, are referred questionably to this genus and species. Only the pygidia were found. They agree with the descriptions. The pleural segments show a definite angulation and the remains of nodes. The average specimen is 7mm. in width and 6mm. in length.

Horizon: Magdalena.

Locality: Jemez Springs and Estancia Valley.


North America
Northern New Mexico
Eastern Arizona
Southern Colorado
West Texas
Nebraska Kansas Oklahoma (generalized)
Carboniferous
Permian
Pennsylvanian
Mississippian
Double Mountain
Clear Fork
Wichita
Monongahela
Conemaugh
Allegheny
Upper Pottsville
Lower Pottsville
Chester
Meramac
Waverly
Chupadera ? {Abo S.S.
Magdalena
Naco ?
Tornado ?
Tule Springs ?
Escobrosa
Upper Sangre de Cristo Cgl.
Fountain (Rico)
Lower Sangre de Cristo Cgl.
Hermosa
Glen Eyrie
Unnamed Series
Double Mountain
Clear Fork
Wichita
Cisco
Canyon
Strawn
Blend
Barnett sh.
LS of Booneage
Hackberry
Whitehorse-Day Creek
Enid Fm.
Wabaunsee
Shawnee
Douglas
Lansing
Kansas City
Marmaton
Cherokee
"Chester"
Osage
Kinderhook

Correlations of the Magdalena with Pennsylvanian Strata in Adjoining States.

The Pennsylvanian of Arizona is treated with the Mississippian and Permian and no satisfactory separation has been made as yet. The Tule Springs formation is a limestone series and the lowermost beds are Mississippian (from fossils collected by N.H.Darton and identified by G.H.Girty) The uppermost beds are classed as Pennsylvanian by the same writers. The best exposurers are in eastern Arizona in the Clifton Quadrangle near Tule Creek. The thickness of the Pennsylvanian portion is about 300 feet.

Pennsylvanian fossils have been obtained from the Tornado limestone in the Salt River region in central Gila County. From the lower bed Mississippian forms were obtained.

The Naco limestone occurs overlying the Escabrosa (Mississippian) in southeastern Arizona in the area of Bisbee and Tombstone. The fossils from the uppermost beds are Manzano (Permian), and those from the lower beds are Pennsylvanian. The Naco occurs in nearly all the mountain ranges in southeastern Arizona. Darton* says that the Naco and the Tornado are equivalent to

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* University of Arizona Bulletin 119, Geological Series 3.

each other and that they can be correlated with the Magdalena of New Mexico.

In northern Texas the Pennsylvanian is represented by a series that varies in thickness from 3,500 to 7,500 feet in thickness. The character of the beds is different from those of the New Mexico section in that they are more sandy and shaly. The Cisco is regarded as the top of the Pennsylvanian. It has nineteen members and includes some coal. The Canyon is next and is a rather thick-bedded limestone, with twelve members. Below the Canyon is the Strawn which is mostly sandstone and shale. The lowest is the Blend or Millsap which correlates with the Morrow and Caney of Oklahoma.

The whole North Texas section of Pennsylvanian as it extends westward becomes more of a normal marine series with thicker and thicker limestones coming in. Just what the Magdalena is equivalent to in the section, the writer is not prepared to say, but in all probability the series grades into the Pennsylvanian and Permian.in New Mexico.

The Glass Mountain section, which includes only the Canyon and Strawn is equivalent to the Lower Hueco

in the Guadalupe-Delaware Mountain region. The Hueco is a continuous section that includes both Pennsylvanian and Permian.

The Wewoka formation in Oklahoma is much higher stratigraphically and is formally related to the Magdalena. The Kansas City and Marmaton, of Oklahoma and Kansas, are the equivalent of the Strawn of Texas, which is in turn equivalent to the Magdalena. An interesting point to note in the section in Oklahoma is the amount of sandstones as compared with the predominence of limestones as sections farther west are examined.

The Wewoka Fauna described by Girty* came from the lower portions of the formation, which are limestones, while the upper members are sandstones.

Many fossils described by Beede** are from the Kansas City Formation.

According to the most recent publication***the Magdalena is equivalent to the Hermosa and Glen Eyrie formations in Colorado. The section of Pennsylvanian in southern Colorado includes the Fountain, Rico, Sangre de Cristo Conglomerate, Hermosa and Glen Eyrie. The Sangre de Cristo Conglomerate contains very large

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* United States Geological Survey Bull.544,1915,p.7.
** University Geological Survey of Kansas,1900,vol.6.
***Proceedings of the Fourth Annual Field Conference of the Kansas Geological Society, 1930.

boulders of limestone bearing fossils of Hermosa and Glen Eyrie age, which correspond to the Magdalena. Then lower than these is a formation that is not named. The Hermosa and Glen Eyrie formations are made up of limestones, sandstones, conglomerates, and shales of about equal proportions. The fossils listed* for these beds are the same as those found in the Magdalena at Jemez Springs.

CONCLUSION.

Bearing in mind the fact that Pennsylvanian faunas are notably cosmopolitan, it is not surprising that there are many specific identities between the Magdalena of New Mexico and the Pennsylvanian of Nebraska and Kansas. As yet no comprehensive report on the paleontology and stratigraphy of the Nebraska-Kansas region has been published. Hence, it has not been possible to make any refined correlations. However, it is suspected that the Magdalena is middle to high Pennsylvanian. Further conclusions must await the forthcoming bulletin of the Nebraska Geological Survey on the brachiopods of the Nebraska Pennsylvanian.

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*Proceedings of the Fourth Annual Field Conference of the Kansas Geological Society, 1930.

CONCLUSIONS.

The total fauna of the Magdalena formation comprises 64 species, as follows: 1 protozoan, 3 corals, 3 crinoids, 1 echonoid, 10 bryozoans (not identified),21 brachiopods, 14 pelecypods, 9 gastropods, and 2 trilobites. A total of 56 species occur at Jemez and 36 species occur at Wilcox Dome. 28 species are common to the two areas.

There are some striking differences between the two areas. Perhaps the most notable is the abundance of Spirifer cameratus at Jemez and its scarcity at Wilcox Dome. Pustula punctata in large individuals is, on the other hand, abundant at Wilcox Dome and scarce at Jemez.

The Wilcox Dome collections while not as large as the Jemez ones, afforded no pelecypod remains. They were not abundant at Jemez, but 14 species were determined. The same fact was discovered in regard to the gastropods although the genus Meekospira was found at Wilcox Dome area.

These differences may, of course, be largely ecologic in origin, but on the other hand, they may be indicative of difference in age.

Several places where Carboniferous rocks outcrop and the fossils contained were described or listed are worth mentioning in connection with a conclusion.

In the Glass Mountain Section* in Texas, several identical species were found and reported from Permian strata. Meekella striatocostata, Chonetes verneuilianus, Ch. granulifer, Productus semireticulatus, Linoproductus cora, Hustedia mormoni, Composita subtilita, and Dielasma bovidens are the species that are holdovers from the Pennsylvanian to the Permian.

The fauna of the Phosphate beds of Idaho, Wyoming, and Utah**, which are Upper Carboniferous, includes many species similar to those in the Magdalena.

The Carboniferous formations in Colorado*** bear a close relationship to the New Mexico formations. Their descriptions and figures afforded a means of identification of several Magdalena species.

In the Bisbee Quadrangle of Arizona fossils were collected from the Carboniferous and the Pennsylvanian fauna**** was almost identical to the Magdalena fauna of New Mexico.

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* University of Texas Bulletin, 1930, No.3042.
** U.S.G.S. Bulletin, 1910, No.436.
*** U.S.G.S.Professional Paper 1903, No.16
**** U.S.G.S. Professional Paper 1904,No.21,p.50

At Bingham, Utah, from Carboniferous strata, the Commercial, Jordan, and Butterfield limestones, many of the Magdalena species are listed* by G.H. Girty. This is one of the most western exposures of Pennsylvanian strata in the United States, and the fauna there resembles in many respects the Russian and Asiatic faunas. No connection is here made for the Magdalena with the Pennsylvanian in Asia.

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*U.S.G.S. Professional Paper 1905, No.38, Appendix.

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