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The Arbuckle Mountains, Oklahoma

THE FOSSIL COLLECTOR'S HAPPY HUNTING GROUND

By
CHESTER A. REEDS

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FIG. 1.—SOUTHERN GATEWAY TO THE ARBUCKLE MOUNTAINS, OKLAHOMA—THE WASHITA RIVER GORGE

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By CHESTER A. REEDS

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FOREWORD.—The writer's first experience as a collector in the Arbuckles was in 1903. Between that date and 1915, he traversed these mountains on five different occasions and made large collections of fossils for Oklahoma University, the United States Geological Survey, Yale University Museum, and the American Museum of Natural History.

INTRODUCTION

FEW are the places on the surface of the earth where, in walking a few miles, one can cross as many thousand feet of upturned and beveled-off strata as in the Arbuckle Mountains of Oklahoma. In addition to being wild and picturesque and full of Indian and cowboy lore, the region is a veritable paradise for the geological student. The stratigraphic succession of fossilferous beds ranges from the pre-Cambrian granite to the "Red Beds" of Permian age. Unlike the better-known section of Palæozoic rocks in New York State, the Arbuckle Mountain exposures, which belong to the same era of geologic time, are free of glacial drift and all other coverings.

The Arbuckle Mountain uplift is to be found in the south central part of Oklahoma in the counties of Murray, Carter, Pontotoc, and Johnston. Its area is roughly triangular in shape, having thirty-five miles on a side, with a handle-shaped portion, ten miles north-south by eighteen east-west, extending to the west across the Indian Meridian. The Washita River valley and gorge separate the two portions.

The term Arbuckle Mountains was derived from Fort Arbuckle, which was named for Brevet Brigadier General Matthew Arbuckle, who fought in the Mexican war of 1845. All lands in the former Chickasaw Nation, in fact all sections of what is now Oklahoma, except the panhandle strip north of Texas, were surveyed from a stone post, on the Indian Meridian, 97° 15′ W., which stood on the site of the fort. On the map, page 8, the "base line" of the Survey crosses the Indian Meridian at the stone post, and the township and range line readings on the map start from this bench mark. The fort was maintained by the Federal Government for many years, but has long since been abandoned. On the latest maps the name Arbuckle has been given to the post office, village, and rock-crusher in the Washita River gorge.

Prior to Oklahoma's being admitted to statehood in 1907, all the fine valley lands and considerable portions of the Arbuckle uplift had been allotted as homesteads by the Chickasaw and Choctaw Indians. Choice of 160 acres of first grade or larger amounts of second or third grade lands were allowed each member of an Indian family that possessed full or partial strains of Indian blood. Each former negro slave (freedman) of the Indians could select 40 acres. It is not surprising thus that much of the lowlands was cultivated while the remaining forested belts and rocky lands were devoted to grazing.

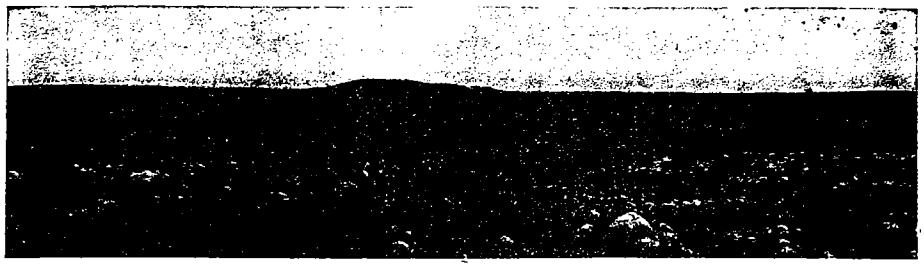

Fig. 2—A typical view of the Arbuckle Mountain Plateau.—Looking southeast across the upturned Arbuckle limestone N.E. ¼, Sec. 21, T. 1 S., R. 1 E., five miles southwest of Davis, Oklahoma. The pre-Cambrian porphyry monadnock, of the East Timbered Hills, is in the background

Fig. 3.—A portion of the Simpson Formation.—Green Simpson shales of lower Ordovician age in the west bank of Dalton Creek, southern limb of the Arbuckle anticline, six miles northwest of Woodford, Oklahoma

The grazed uplands, whether fenced or in open range, were a boon to the collector, for the cattle had cropped the grass close to the rocky surface, not only in places where the strata were gently inclined, but also in others where they were steeply upturned. The shale or shaly limestone zones in many of the formations were weathered to such an extent that in places their surfaces were literally covered with fossils; weathered specimens oftentimes protruded from the harder limestone ledges.

GENERAL FEATURES

The Arbuckles are not mountains in the sense that they are high above sea-level—for the highest point is only 1350 feet above tide, and the lowest, 750 feet; at present they form a dissected upland exhibiting the basal structures of a mountainous area. From the heart of the plateau outward toward the margins of the uplift, the

record of sedimentary deposition extending from upper Cambrian to Pennsylvanian time is well exposed. The impending events that followed this long era of sedimentation are suggested by the extensive Franks conglomerate of Pennsylvanian age on the northwestern and northeastern sides of the area, the Permian "Red Beds" conglomerate across the west end, and the Cretaceous deposits across the southeastern side of the uplift.

About the middle of the Carboniferous period, the older sediments, which had remained practically flat during successive periods of deposition, were uplifted, folded and faulted, forming high mountains. This development of the Arbuckle uplift is similar to that of the Appalachian Mountains in the eastern part of the United States. The earth forces that folded the rocks in one place buckled up the horizontal beds in the other area; in fact, they may be different parts of the same mountain system, as the former State Geologist of Arkansas, Professor J. C. Branner, and some more recent geologists contend. During and following the uplift and before the end of Permian time, the thousands of feet of rock that comprised the tops of these mountains were eroded away, and the upturned edges of the ancient strata, including the pre-Cambrian granite and porphyry in the heart of the mountains, were laid bare. Land conditions evidently prevailed during the following Triassic and Jurassic periods.

In Cretaceous time, when the waters of the Gulf of Mexico joined with those of the Arctic throughout the High Plains area, the entire Arbuckle Mountain uplift was covered by the sea, and a basal formation consisting of beach and nearshore deposits was laid down horizontally on a nearly smooth floor composed of granite and upturned beds of limestone, shale and sandstone, of varying degrees of hardness.

Following the retreat of the Cretaceous sea, caused by the uplift of the Rocky Mountains and the High Plains region, the streams, which took courses across the sandy formation that covered the Arbuckle uplift, began rapidly to erode the cover from the plateau. As these soft rocks were removed toward the south, the large streams were imposed upon the hard rocks of the Arbuckle plateau. The streams near the eastern end of the uplift, from which the Cretaceous deposits were last removed, still retain their wide shallow valleys. The Washita River, however, flows on a lower plain before reaching and after its passage through its deep and meandering gorge across the Arbuckle Mountains. The soft rocks in its course were worn down more rapidly than the hard limestones in the adjacent areas, and it was only at the two-mile gorge that it had to exert its power.

Along the northeast and southwest margins of the Arbuckle plateau there is a descent of from 100 to 400 feet to the level of the plain formed on the softer Carboniferous rocks. The erosion which produced this plain is probably of Tertiary age. Since the formation of this plain, the Arbuckle plateau and the surrounding region have been tilted slightly toward the southeast, for the large streams have descended in the softer rocks to approximately 200 feet below the level of the Tertiary plain and have cut for themselves wide, flat valleys. The

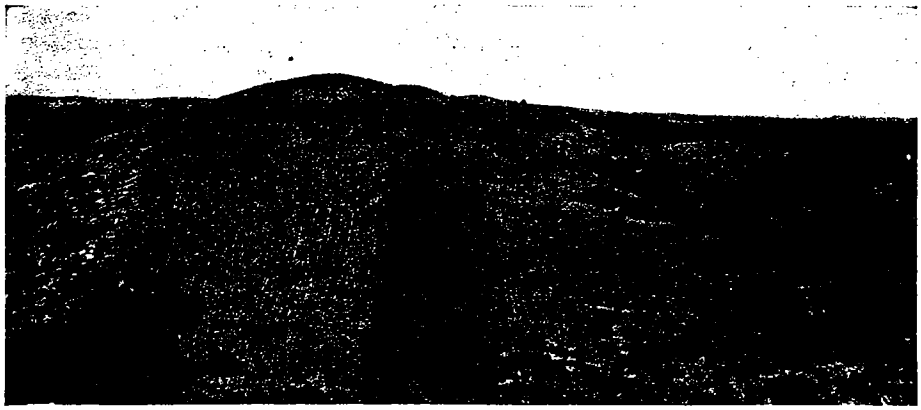

Fig. 4.—General view along the strike of a Viola limestone ridge. The Viola limestone of middle and upper Ordovician age is on edge in the northeast limb of the Arbuckle anticline, four miles south of Davis, Oklahoma. Simpson formation in timbered belt on left margin, Arbuckle limestone in background; in forested area to the right, Sylvan shale, Hunton beds, Woodford chert, and valley of the Washita River

Fig. 5.—A minor fold in the structure of the Arbuckle Mountains. Elbow fold in Viola limestone, Dougherty anticline, Little Cañon of the Washita River, three miles south of Davis, Oklahoma

smaller tributary streams have steeper grades, particularly near their sources.

The minor topographic features of the Arbuckle plateau are due chiefly to the varying resistance of the formations to erosion since the removal of the Cretaceous rocks. This differential erosion has emphasized the structural elements of the plateau, for the broad truncated anticlines and domes rise higher than the narrow faulted synclines and basins, and the softer forma-

tions outcrop in timbered annular valleys while the harder limestone beds form prominent ridges and cuestas.

GEOLOGIC SECTIONS

From the beautiful Turner Falls on Honey Creek the Colbert porphyry of the East Timbered Hills rises to the triangulation station of the United States Geological Survey, the highest point in the Arbuckle uplift. A view from this station gives one a superb impression of the fossiliferous rocks of the region. Within a distance of five miles southward toward Springer, one may look across 12,150 feet of upturned strata which represent that long era of geologic time known as the Palæozoic. This remarkable section embraces the southern limb of the broad Arbuckle anticline west of the Washita River with all the beds clearly exposed and not disturbed by faulting.

Within a distance of four miles to the eastward of the triangulation station one may see the section repeated in the northeast limb of the Arbuckle anticline. The beds in this limb are more steeply upturned than in the southern one; in fact, most of them are vertically disposed, except at the northern end, where two minor folds have been impressed on the larger structure, as noted on the accompanying geologic map.

The entire section is also well exposed in the gently pitching limb of the Tishomingo anticline extending from the Tishomingo granite in the vicinity of Mill Creek westward toward Dougherty on the Washita River. Various sections of the formations above the thick Arbuckle limestone may be seen to advantage in the eastwardly pitching limb of the Hunton anticline, northward from Bromide; in the Lawrence anticline in the northeast corner of the uplift; and in the smaller Dougherty anticline and Vine dome north of Dougherty.

The extent and major subdivisions of the rocks of the Arbuckle Mountains are shown on the map on page 8, while the minor subdivisions, thickness, position in the geologic time scale and their characteristic fossils are summarized in the table on page 10. In this connection other publications[1] dealing with the Arbuckle Mountains may be examined with profit.

SOME PERSONAL EXPERIENCES

A collector's life in the Arbuckle Mountains is full of thrills. You may be nonplussed when you ride forth on the country physician's horse and inquire the way of a farmer. The farmer looks at the horse and then at you, several times, and finally replies: "You are riding 'Old Baldy' today." When you explain to him that the doctor is ill and that you have permission to ride the horse, he is surprised, and you press your claim. He answers but is not satisfied, for horses have been stolen, and if you are not a "horse thief," what are you? Even at night, when it is too dark to see the way home and you depend upon the horse to keep the road, some chance passer-

[1]Taff, J. A., 1902, U. S. Geol. Surv., Atoka Folio, No. 79. Taff, J. A., 1903, U. S. Geol. Surv., Tishomingo Folio, No. 98. Taff, J. A., 1904, Preliminary Report on the Geology of the Arbuckle and Wichita Mountains in Indian Territory and Oklohoma. U. S. Geol. Surv. Professional Paper, No. 31.

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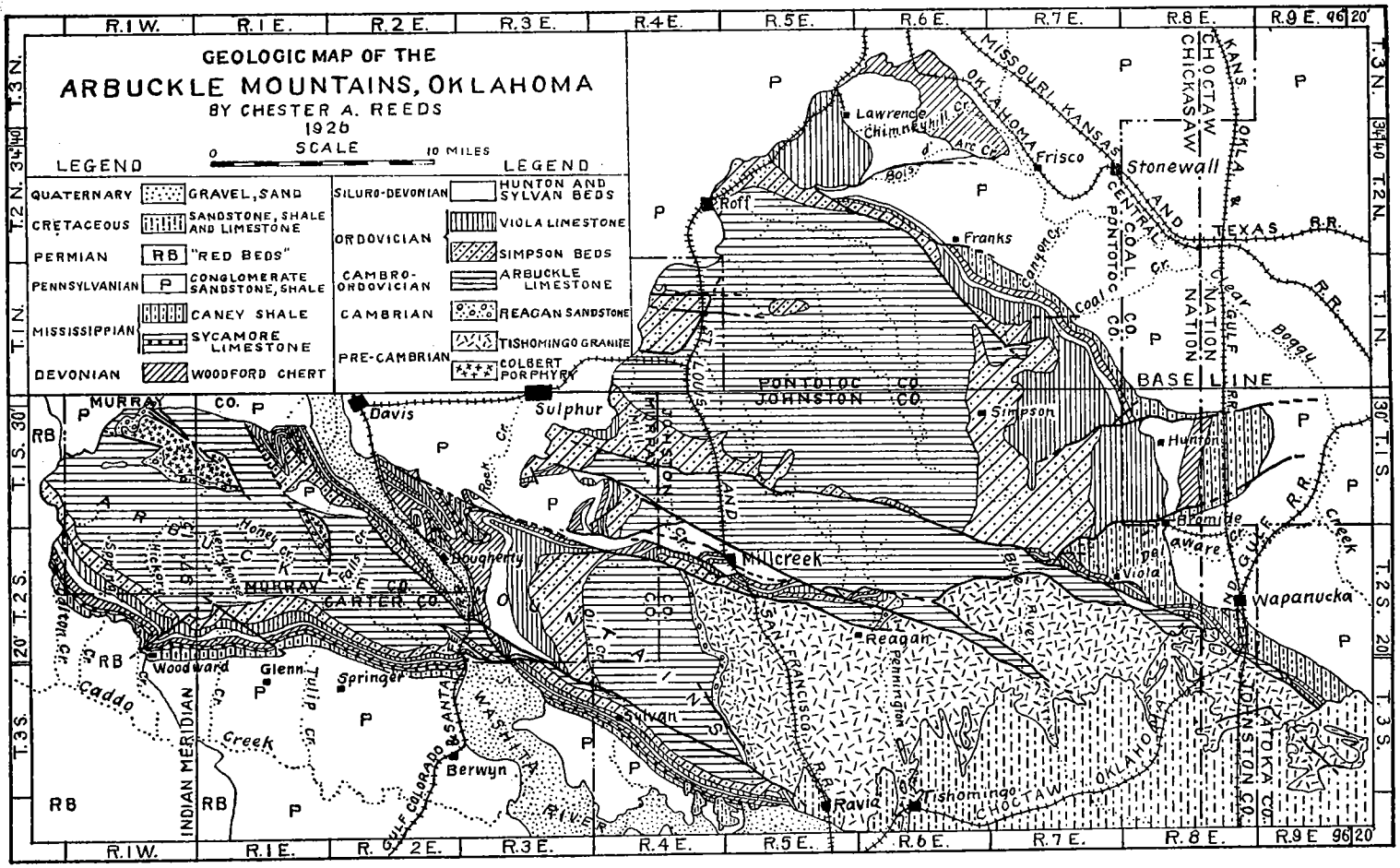

GEOLOGIC MAP OF THE ARBUCKLE MOUNTAINS, OKLAHOMA

Fig. 6.—This map embraces a number of new features not shown in the preliminary map by J. A. Taff, 1904, in Professional Paper No. 31, United States Geological Survey

by will recognize your mount. This sense of recognition of things native seems uncanny.

When you look at your field map and inquire the way to the "Washboard Springs" on Dalton Creek, some individuals will volunteer to show you the way and incidently try to ferret out your business; others will ask "How do you do it?" while still others will spy on you from cover, for they all have the idea that you are looking for the "hidden treasure" that was buried there by the Dalton gang of outlaws, and that you have the maps showing its location.

You may perhaps find several hundred specimens of that rare ball-shaped echinoderm, known as *Camarocrinus* in the Haragan shale, and as you attempt to haul them away a full-blood Indian will ride upon the scene and say "If there is money in these rocks me want it." You tell him that they have no money value, that you are collecting them for a school, an academy. He begins to understand but is not satisfied. Your driver tells him that you are from the Great White Father and that you are taking the specimens with you and will acknowledge John Seeley, Indian from Coal Creek as donor of the specimens. He is satisfied and permits you to depart with your treasure.

You may be innocently breaking fossils out of the Hunton beds on Honey Creek, when a 300-pound man with a shotgun in his hand sternly calls out to you from the bluff above:

"What are yer doing there? Do yer think yer have got yer a gold mine?"

When you reply that you are breaking *Orthostrophia strophomenoides* out of the rock, he asks.

"What did yer say?"

You repeat, but still he does not seem to understand for he begins to feel his way down the cliff with gun in hand. You note then that a ten-foot stream and a seven-strand barbed wire fence, with a "no trespass" sign on it, intervene. Fortunately you are on the outside of the fence and you sit tight. He balances himself well on the foot-log and even climbs through the fence, with difficulty, but not a word until he stands alongside. Between the hurried gasps for breath he repeats "What did yer say?" Then again you tell him that you are breaking *Orthostrophia strophomenoides* out of the rock. He appears a bit disturbed, but when you hand one of the small brachiopod shells to him he replies, "Oh, I didn't know they were there" and adds "I was really only looking for a chicken hawk."

You will tremble from head to foot for an instant when the rattlesnake, that gentlemanly denizen of the prairies and woods, suddenly gives you that shrill, hair-raising warning of an untimely death if you venture nearer. If you are beyond his striking distance and you hold your position, he will uncoil and crawl away, unless you annoy him. In the Arbuckle Mountains there are various species of these rattlers; the writer has observed that some specimens had as many as seventeen rattles besides the button, implying as many years.

You may be on foot in the open range when suddenly a near-by. herd of cattle will follow the leader and charge you, for these animals are not accustomed to seeing a man except on horseback. On the other hand feral horses will come right up to you and beg you to pull the ticks off their breast. In

GEOLOGIC TABLE, ARBUCKLE MOUNTAINS, OKLA.

		— ROCKS —		— CHARACTERISTIC FOSSILS —
PENN		FRANKS CONGLOMERATE		
MISS.		CANEY SHALE Black shales and slates with fossiliferous limestone lentils, 800-1600 ft.		*Lingula albapinensis, L. paracletus, Lingulidiscina newberryi caneyana, Chonetes planumbonus choctawensis, Productella hirsutiformis, Liorhynchus carboniferum, Caneyella nasuta, C. vaughani, Orthoceras caneyanum, Actinoceras.*
		SYCAMORE LIMESTONE Bluish to yellow rock 0-200 ft.		*Menophyllum, Ambocelia levicula, Productella, Chonetes geniculatus, Brachythyris peculiaris, Composita buckleyi, Proetus, Ostracoda.*
DEVONIAN		WOODFORD CHERT Limy chert and black shales 625 to 650 feet thick		*Dadoxylon newberryensis, Lingula cf. spatulata batesvillae, Leptaena rhomboidalis, Productella cf. concentrica-hirsutiformis, Liorhynchus carboniferum, Spirifer moorefieldanus.*
		FRISCO LIMESTONE Gray coquina stone 0-20 feet thick		*Leptostrophia magnifica, L. oriskania, Rensselaeria maryladica, Strophedonta becki, Orthonychia cf. plicatum.*
		BOIS D'ARC LIMESTONE Crystalline limestone-chert. 0-90 feet thick, average 60 ft.		*Cyrtina rostrata, Eatonia singularis, Meristella laevis, Spirifer concinna, Platyceras cf. tenuiliratum.*
		HARAGAN SHALE Variegated marly shale and interbedded marly limestone. 0-166 feet thick, averaging 100 ft.		*Favosites conicus, Striatopora issa, Scyphocrinus (Camarocrinus) ulrichi, Callopora perelegans, Anoplia helderbergae, Atrypina imbricata, Camarotoechia bialveata, Cyrtina dalmani, Dalmanella subcarinata, Orthostrophia strophomenoides, Stropheodonta crebristriata, S. varistriata, Spirifer cyclopterus, Diaphorostoma ventricosa, Platyceras lamellosum, P. ungiforme, Tentaculites gyracanthus, Phacops logani, Dicranurus hamatus.*
SILURIAN	HUNTON GROUP	HENRYHOUSE SHALE Grayish to drab-colored shales and soft marly limestone. 0-223 feet thick. Lower 120 feet with few fossils.	Upper	*Astylospongia praemorsa, Aulopora repens, Eridophyllum rugosum, Favosites niagarensis, F. venustus, Plasmopora folis, Heliolites interstinctus, Pisocrinus milliganae, Strophonella tenuistriata, Rhynchospira globosa, Spirifer crispus, Cyrtoceras subrectum.*
			Lower	*Scenidium insigne, Strophonella prolongata, Ceraurus insignis.*
		CHIMNEYHILL LIMESTONE 3. Crinoidal member, 0-39 ft., averaging 15 ft.	Crin.	*Pisocrinus, Plectambonites tennessensis, Stropheodonta corrugata, Triplecia, Spirifer radiatus, Cyphaspis clintonensis, Dalmanites arkansas, Odontopleura arkansana, Sphaerexochus.*
		2. Glauconitic member 0-25 ft., averaging 15 ft.	Glauc.	*Callopora magnopora, Pachydicta bifurcata, Phenopora fimbriata, P. magna, Rhinopora verrucosa, Plectambonites transversalis, Cyclonema ventricosa, Illaenus ambiguas.*
		1. Oolitic member 0-12 ft., averaging 5 ft.	Ool.	*Atrypa, Schucertella, Rhipidomella, Cyclonema daytonensis.*
		SYLVAN SHALE 60-300 ft. averaging 150 ft.		*Diplograptus, Climacograptus cf. typicalis, Lingula, Leptobulus, Conularia, Conodonts.*
ORDOVICIAN		VIOLA LIMESTONE 3. Upper member, gray crystalline rock, averaging 300 ft.	Upper	*Pachydicta gigantea, Ptilotrypa obliquata, Rhynchotrema.*
		2. Middle member, thin-bedded dark gray limestone, averaging 300 ft.	Middle	*Diplograptus pristis, Climacograptus typicalis, C. bicornis, Schizotreta minutula, Rafinesquina deltoidea, Conularia trentonensis, Trinucleus concentricus, Proetus parviusculus.*
		1. Lower member, massive bedded, light-colored limestone 60-100 ft. thick	Lower	*Tetradium columnare, Phylloporina reticulata, Rhinidictya mutabilis, Escharopora subrecta, Rhynchotrema increbescens, Vanuxemia gibbosa, Cyrtolites retrorsus, Protowarthia pervoluta, Bumastus trentonensis.*
		SIMPSON FORMATION Thick sandstone and thin limestones with interbedded greenish clay shales and marls, 1200-2000 ft. thick.	Upper	*Ischadites iowensis, Stomatopora proutana-pertenuis, Phylloporina sublaxa, Rhinidictya nicholsoni, Pholidops trentonensis, Plectambonites sericea, Strophomena filitexta, Orthis tricenaria, Herbetella bellarugosa.*
			Lower	*Orthis costata, O. cf. holstoni, Leperditia bivia, Leperditia cf. fabulites, Pliomera (Amphion) nevdensis, Bathyurus*
CAMBRIAN		ARBUCKLE LIMESTONE Massive and thin bedded limestones and dolomites; 5000-6000 ft. thick.	Upper	*Cryptozoon proliferum, Billingsella, Maclurea, Ophileta, Eccyliopterus, Euconia, Hormotoma, Trochonema, Orthoceras, Leperditia, Isochilina.*
			Lower	*Syntrophia, Dikellocephalus, Illaenurus*
		REAGAN SANDSTONE Coarse dark sandstone calcareous and shaly in upper part. 0-500 feet thick.	Upper	*Obolus tetonensis ninus, Acrotreta microscopia, Eorthis wichitaensis, E. remnichia, Ptychoparia romeri, P. affinis, Agraulos convexus.*
PRE-CAMBRIAN		TISHOMINGO GRANITE-COLBERT PORPHYRY Coarse red granite, pink porphyry, dikes		*No fossils*

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the wild places your saddle-horse will not leave you even if you turn him loose, for seemingly he, too, is impressed with the strangeness of such places. Mutual comradeship is apparent; he is your sole companion and friend and favors are reciprocated.

THE STRATIGRAPHIC SUCCESSION

More than a thousand species of marine invertebrate fossils occur in the sedimentary rocks of the Arbuckle Mountains. The names of 150 of them have been arranged on the accompanying geologic table. All the formations contain fossils, but they are more abundant in the upper Reagan, Simpson, Viola, and Hunton beds than in the Arbuckle, Sylvan, Woodford, Sycamore, and Caney. The exposures visited will depend largely upon the position of the various camps and the time at one's disposal.

The Reagan sandstone representing the upper Cambrian horizon may be examined with profit along the southwestern margin of the East Timbered Hills near the old ranch house; also in the exposures along the western edge of the Tishomingo granite. The lower portion of this formation is conglomeratic and it is only in the upper part that a stroke of the hammer reveals fossils.

The Arbuckle limestone is the thickest and most extensive formation exposed in the uplift. The lower 450 feet are also of upper Cambrian age and contain a number of unidentified species. The overlying extensive dolomite and magnesian limestone beds of Ordovician age, some 4000 feet thick, are not very fossiliferous, but in the uppermost 1000 feet of the Arbuckle, where the beds are more shaly and siliceous, fossils are not uncommon.

The Simpson formation of middle and lower Ordovician age contains abundant fossils in the wooded valleys on the south side of the Arbuckle anticline, north and west of Springer. The lower Simpson fauna is similar to the Chazy of New York and Canada, while the upper one is closely related to the upper Stones river group of Tennessee and Kentucky.

The gray Viola limestone of middle and upper Ordovician age appears massive on fresh exposures, and thin-bedded where weathered. It outcrops near the margin of the large truncated anticlines as high ridges and rounded knobs. In the small Vine dome and Dougherty anticline it occupies a central axial position. Lithologically and faunally it is divisible into three members. The lowest member is characterized by some twenty-five species which represent the latest Black River and earliest Trenton stages of New York and Minnesota. The species of the middle member are indicative of the upper Trenton stage of the Ordovician of New York. The abundantly fossiliferous beds of the upper member are characteristic of the widely spread Richmond stage of the upper Ordovician period.

The green Sylvan shale, yellowish where weathered, contains few fossils. The basal ledges exposed at the south end of Vine dome are fossiliferous; elsewhere, especially in the northeast corner of the uplift near Lawrence, tabular crystals of barite are common. The age of this formation is still problematical, but may be classed provisionally as lowest Silurian.

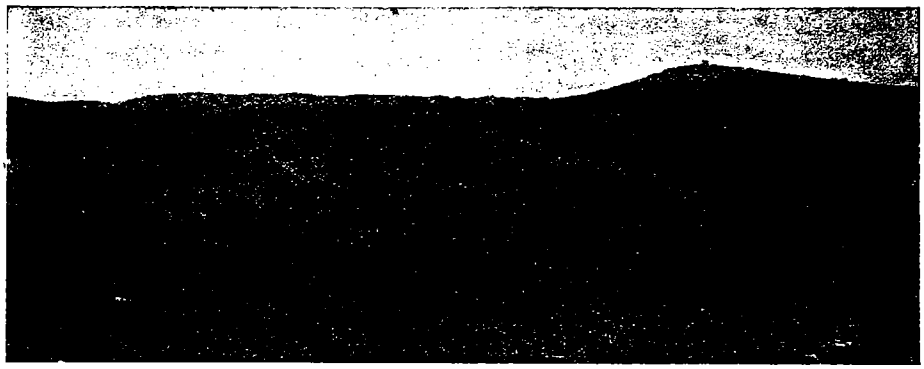

Fig. 8.—Henryhouse Creek section, south side of Arbuckle Mountains. General view looking east along the strike of the Hunton beds (treeless ridge in center). The Sylvan shale appears in the characteristic timbered annular valley on the left margin; the Woodford chert underlies the timbered belt on the right side, while the barren Sycamore limestone covers the back slope of the Woodford chert

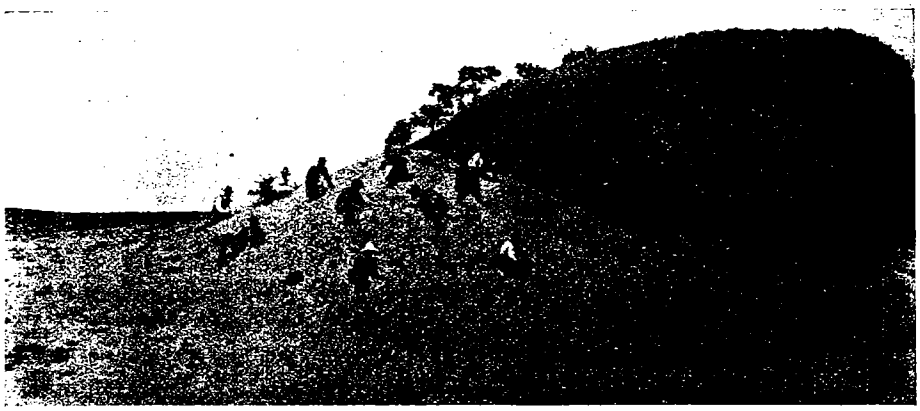

Fig. 9.—One of the numerous shale exposures abounding with fossils. "White Mound," an outlier of the Haragan shale, three miles southeast of Dougherty, Oklahoma. The surface of this mound is literally covered with invertberate fossils, many species being the same as those found in the New Scotland beds (lower Devonian) of New York State. A student party from the University of Oklahoma may be seen busily engaged collecting fossils

The Hunton group of beds, which has been the subject of a special study by the writer, may be subdivided lithologically and faunally, from the bottom upward, as follows: (1) Chimneyhill limestone, with oölitic, glanconitic, and crinoidal members; (2) Henryhouse shale; (3) Haragan shale; (4) Bois d'Arc limestone; and (5) Frisco limestone. The beds, which are well exposed, vary in thickness from place to place, and no one section contains all of them. The first and second subdivisions are Silurian in age, the third, fourth and fifth are Devonian. Some 300 species have been collected from these rocks.

The fauna of the Chimneyhill limestone is the equivalent of the Ohio Clinton and Brassfield beds (lower

Silurian) of Ohio, Kentucky, Tennessee, Indiana, Illinois, and Arkansas. The many fine specimens which occur in the oölitic, glanconitic, and crinoidal members are not easy to obtain for they have to be hammered from the hard and persistent ledges.

Although the Henryhouse shale has a great development on Henryhouse Creek, the finest exposures, longest section, and most fossiliferous zones are to be found in the northeast corner of the uplift on Chimneyhill Creek and to the northward. The lower 120 feet have relatively few species, while the upper portion contains many forms. The fauna of this formation is most closely related to the Bob and Lobleville beds (middle Silurian) of Tennessee.

The Haragan shale and marly limestone beds are best exposed on the east side of the Arbuckle uplift from Bromide to Franks and at "White Mound" and Haragan Creek three miles southeast of Dougherty. Many bushels of fossils have been gathered from the surface of "White Mound." The formation is replete with fossils of the New Scotland stage (lower Devonian) of New York.

The Bois d'Arc limestone, being hard, crystalline, and cherty, outcrops as conspicuous hogback ridges throughout its extensive exposures. Its rather abundant fauna is indicative of the Becraft stage (lower Devonian) of New York.

The term Frisco is herewith applied to the massive bedded coquina-like limestone some twenty feet thick which rests upon the Bois d'Arc formation two to three miles northwest of Frisco. The best exposures appear in the bed and bank of Bois d'Arc creek, also in the vicinity of Coal Creek seven miles south of Frisco. The fauna is the equivalent of the Oriskany stage, the highest member of the lower Devonian of New York.

Fig. 10.—The highest formation of the Hunton Group. Massive bedded Frisco limestones of Oriskany age (lower Devonian) exposed in the banks of Bois d'Arc Creek three miles northwest of Frisco, Oklahoma

The Woodford chert, in spite of its extensive exposures, contains but few fossils. A one-foot basal transition bed, noted at various places, contains fossils derived from the underlying formations. Fish scales in concretions and large tree trunks of *Dadoxylon newberryensis* were found in the basal layers in the northeast corner of the Arbuckles. The age of this formation is problematical; it may be in part Devonian and in part Mississippian.

The bluish to yellowish Sycamore

limestone is confined to the southern and west-central part of the Arbuckle Mountains. The few fossils obtained suggest Mississippian age, but its equivalent in other states has not been determined.

The black Caney shale, being a soft rock, is well exposed in the bordering plain along the southern and eastern margins of the Arbuckle Mountain plateau. Limestone lentils in the lower part and sandy beds in the upper part contain fossils. The age of this formation is still problematical; the lower part is generally regarded as Mississippian, the upper portion as Pennsylvanian.

In the vicinity of Franks, Sulphur, Davis, and westward along the northern edge of the Arbuckle Mountains, the Franks conglomerate rests unconformably on the Caney shale and older formations. This deposit which increases in thickness to the westward represents an erosional and depositional stage following the uplift of the Arbuckle Mountains in Pennsylvanian time. To the south of the Arbuckle anticline the Franks conglomerate does not appear, but instead, a thick series of shales and sandstones, known as the Glenn formation, rests against the Caney shale. The Glenn beds are folded and upturned, and, although a rather extensive Pennsylvanian fauna has been collected from them, the exact stage of the development of the high Arbuckle Mountains by folding and faulting has not been fully determined. Extensive deposits of Permian conglomerate, forming plains, appear across the western margin of the Arbuckle uplift.

The preceding description of the Arbuckle Mountains and the abbreviated list of the fossils found therein give but an inkling of the adventures and surprises in store for the fossil hunter who visits the region. The various formations are clearly exposed and the fossils are well preserved. Each little shell has a story to tell of the ages of long ago. From strata to strata the species either recur or show slight variations; in the succeeding beds they are apt to be somewhat different, with new forms appearing. The student becomes impressed with this record of the life of former ages, and notes that the theory of evolution as represented in these rocks and fossils is a reality and not a fancy. To the fossil collector the Arbuckle Mountains of Oklahoma are not only a happy hunting ground, but a great treasure-trove.

IN THE HEART OF THE ARBUCKLE MOUNTAINS

Fig 11.—Beautiful Turner Falls on Honey Creek, six miles southwest of Davis, Oklahoma. The blue-green colors in the deep pool below the falls are attributed to lime-secreting algæ. The rock comprising the falls is composed of travertine. These deposits contain impressions of living plants perhaps 4000 years old. Numerous falls and travertine deposits also appear on Falls Creek three miles to the southeast of this point